8.3 Environmental Monitoring and Maintenance Plan

The objectives of an environmental monitoring plan in terms of water resources in the present scenario include:

- Water usage and its impact on water potential in the area
- Waste water generation, discharge and its impact on water quality
- Maintenance of storm water management system and its impact on natural water flow conditions

8.3.1 Water Usage for the Project

The total water requirement for the project (phase-I & phase-II) is about 35,496 KLD (35.5 MLD). 32,267 KLD (32.27 MLD) would be sourced from desalination plant of APSEZ Limited and supply through M/s. Mundra Utility Private Limited (MUPL). Balance will be met from treated/blowdown recycled water for greenbelt/cover, lime slurry preparation and reverse osmosis plant and multi effect evaporator. The water allocation letter is enclosed as **Annexure-I**. The details of usage of water and water balance for Flash Smelter Furnace (FSF) and TSL Furnace technologies are presented in **Table-1** and **Figure-3** &**3b**.

The conveyance, storage and discharge system shall be monitored regularly for any leakage, spill or overflow and necessary preventive measures shall be taken up immediately.

No ground water is proposed to abstract for the project usage. However, a ground water level monitoring system shall be established by installing 5 piezometers within the plant premises and monitoring water levels at a monthly interval. Locations of piezometers are shown in **Figure-20**.

Piezometer is a bore/tube well used only for measuring the water level by lowering the tape/sounder or automatic water level measuring equipment. It is also used to take water sample for water quality testing whenever needed.

A permanent display board shall be installed at these piezometer sites providing the location, piezometer number, depth and zone tapped of piezometer for standard referencing and identification.

8.3.2 Waste Water Generation and Discharge

Waste water in the proposed project will be generated from plant facilities, plant operations, cooling system and landfill areas. Sewage generated from plant domestic facilities will be treated in STP and used for plantation, toilets etc. Waste water/reject water generated from plant operations and landfill will be treated in ETPs and will be recycled for horticulture and plantation.

Discharge water quality of STP and ETP outlets shall be monitored quarterly as per EPA-198 Schedule-VI Part-A, General Standards for Discharge of Effluents and necessary corrective measures shall be taken up immediately in the case of any contamination identification.

Ground water quality in the area shall be monitored quarterly collecting samples from piezometers installed.

8.3.3 Storm Water Management System

Storm water from plant operations, storage areas, landfill and other pollution prone areas shall be separated and diverted to ETP for treatment and reused for plantation and other non-potable uses. Provision should be made for surface water from parking/fuelling/repair/maintenance/paved areas to pass through petrol/oil interceptors. Necessary sand filters/gratings shall be arranged before storm water reaching rain water harvesting measures to arrest any suspended pollutants and silt from storm water diverted.

Storm water and garland drains, drains leading to rain water harvesting measures and filtration units shall be regularly monitored and maintained at least before monsoon.

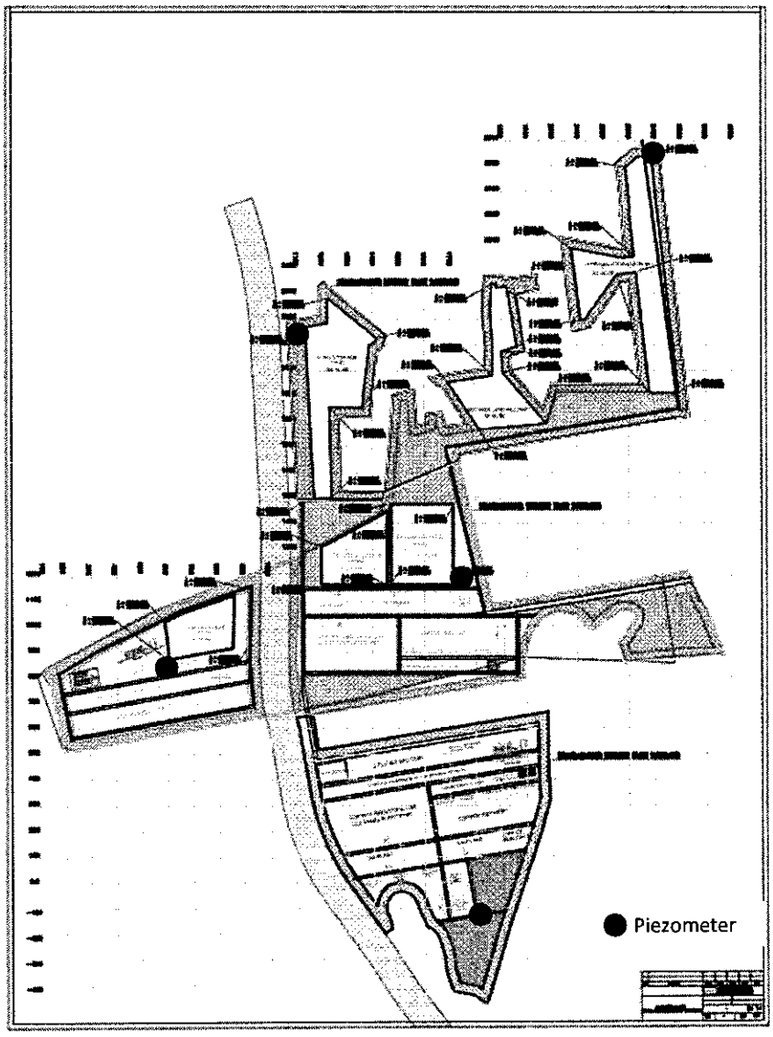


Figure-20. Layout Showing Piezometer Locations



Hydrogeology Team in front of Adani Power before Interaction



FAE-Mr. Rajendra Prasad at Project Site

9.0 CONCLUSIONS

Adani Enterprises Limited proposes to set up a Greenfield Copper Refinery project of 10 LTPA capacity in 256.57 ha (634 acres) of area in Siracha and Navinal villages at APSEZ, Mundra taluka, Kutch district, Gujarat.

The climate around Mundra and Mandvi area is called a desert climate. During the year, there is virtually no rainfall in this area. The average annual rainfall based on IMD data is 432.4 mm on 15 average rainy days.

Elevation in the project site ranges from 3.0 m amsl in the south 9.0 m amsl in the north with general slope towards south into Gulf of Kachchh. Danesri Nadi, a seasonal stream passes through western part of the project site. Danesri Nadi originates from north of study area (3.80 km from study area) and has a catchment area of 3.75 sq km from railway line near project site. Stream flow only for a few hours after peak rainfall events is reported in this stream at Siracha, 1.5 km NW of project site. Danesri Nadi along the project boundary will not be disturbed and maintained with necessary bank stabilization will be done with compaction/stone pitching and raising the bund up to 2.0 m.

Of the total study area of 413.68 sq km, 75.67 sq km (18.29%) of the southern part is covered by Arabian Sea, the Gulf of Kachchh. Remaining study area is entirely occupied by Holocene/Quarternary sediments with surface lithological boundaries running almost parallel to coast line (E-W). Proposed project site, Adani Power & other industrial set-ups in APSEZ area are located on older coastal plain. Resistivities of different lighological units in the study area range from <1 Ωm to >300 Ωm. ERT1 and 2 are located in project site lying on older tidal flat and marsh deposit with resistivities ranging from <1.0 Ωm to 5.0 m. The resistivity at these locations decreases to <1.0 Ωm with depth indicating saline nature.

The study area form part of Kachchh Basin and does not show any major tectonic evidences except few geomorphic lineaments parallel to drainage courses and a minor fault of structural origin in the SE. The nearest major fault is North Kathiawar Fault (NPF) towards south. As per Composite Hazard Risk & Vulnerability Atlas, Gujarat State Disaster Management Authority (GSMDA), the project site is located in unclassified zone covering Little and Great Rann of Kachchh including Mundra coastal area, but close to very severe intensity zone.

The thickness of alluvium is observed to be 2.0 m in the north to 18.0 m and tidal flat and marsh deposits are more than 20 m in thickness. The alluvium is underlain by sandstone of Sandhan Formation and laterite at places. Sandstone forms productive aquifer at places. The alluvium yields small quantities of brackish water to shallow wells. The depth to water level in dug wells during field visit (2nd week of February 2019) ranges from 7.85 m to 16.12 m bgl whereas the depth to water level in tube wells ranges from 2.00 m bgl in Adani piezometers near project site to 44.38 m bgl in an agricultural well near Gelada. The average water levels in dug wells during field visit, pre and post monsoon are 12.42 m, 12.13 m and 6.23 m bgl respectively with a water level fluctuation of 7.15 m.

General ground water flow direction in major part of the study area is towards Gulf of Kachchh with depressions of deeper levels below mean sea level between Bhadia Mota and Bhadia Nana, around Navinal and east of Bhujpar Mota. Reduced water levels <0 around Bhadia Mota, Bhadia Nana, Tragadi, CGPL and Wandh in the west and to the east of Bhujpar Mota in the northeast indicate that ground water movement is towards inland encouraging sea water intrusion.

TDS of Moti Khakhar, Desalpar and Siracha (2660.7 mg/l to 3322.3 mg/l), Total Hardness of Siracha (659.9 mg/l), Chlorides of Siracha (1321.6 mg/l), Sulphates of Moti Khakhar (486.5 mg/l), Manganese of Siracha (0.36 mg/l) and Iron of Jarpara (0.31 mg/l) samples show higher values than permissible limits. In the present study, water type of all ground water samples is Sodium Chloride indicating brackish/saline origin.

The present stage of ground water development in the study area is estimated as 102.37% and can be categorized as "Over-exploited".

The total water requirement for the project (phase-I & phase-II) is about 35,496 KLD (35.5 MLD). 32,267 KLD (32.27 MLD) would be sourced from desalination plant of APSEZ Limited and supply through M/s. Mundra Utility Private Limited (MUPL). Balance will be met from treated/blowdown recycled water for greenbelt/cover, lime slurry preparation and reverse osmosis plant and multi effect evaporator.

An integrated water system is proposed. The effluent from the process units is treated and reused to reduce water demand. It is also proposed to install a secondary Reverse Osmosis (RO) plant to further treat water from the effluent plant facility for effective use. Rejects from the reverse osmosis plant will be sent to Multi Effect Evaporator (MEE) for further recovery and solids generated will be sent to Secured Land Fill (SLF).

This water would be utilized to meet the DM water and plant/utility requirement of proposed project. The water system is highly integrated and is designed for Zero Liquid Discharge (ZLD).

The Secured Land Fill will have impervious layers of clay liner and HDPE liner. This will ensure that the ground water will not be impacted by the storage of the ETP cake. In case of any rupture/breakage or failure of the SLF bottom liner, any contaminant reaching sub-surface strata and water table will move towards Gulf of Kachchh following the ground water flow direction in the project area.

The annual volume of rain water available from the project site spread in 256.57 ha (634 acres) is estimated at 6,11,007 m^3 (0.611 MCM) and during SW and NE monsoon periods is 6,00,057 m^3 (0.600 MCM). **A roof top harvesting system** covering administration building, canteen, SAP office building and engineering stores will harvest **0.006 MCM** and a rain water harvesting system using run-off from **green belt and other areas** will harvest **0.085 MCM.** A 70% efficient rain water harvesting system would harvest 0.080 MCM from these areas, which will be used for production, green belt, toilets etc.

Rain water from Concentrate Storage, Smelter Area, Slag Storage and Gypsum Storage will be collected in separate tanks installed in the areas of feed stock storage and conveying, smelting system and gypsum storage. **Rain water from Production Plant premises** will be collected in a separate tank installed in the plant premises to collect rain water from all roofs. The water collected in these tanks will be treated in initial rain water treatment station and then goes to the advanced treatment section of the production effluent treatment plant for treatment before it is reused for production and thereby reducing the fresh water consumption. Additional water if any will be used for spraying purpose in the Gypsum Storage area.

Though ground water abstraction is not envisaged for the present project, the project proposes to implement drinking water supply to the nearby villages, afforestation, water spreading channels, check dams and bandharas, which would help in limiting the ground water abstraction, enhance ground water recharge and thereby **reduce salinity** in the area as a corporate responsibility.

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ANNEXURE-VI
WATER SUPPLY LETTER

adani

Ref: APSEZ/GEN/ST/2016/10 Date: 16th April 2016

To

Adani Enterprises Limited
Adani House
Mithakhali Six Road, Navrangpura,
Ahmedabad -380009
Gujarat, India

Subject – Water requirement for Adani Enterprises Ltd's (AEL) 10LTPA Copper Smelter Plant at Mundra APSEZ.

Reference: Your request for supply of about 32,800 m^3/Day of raw water for the Copper Smelter Plant at Mundra APSEZ

Dear Sir,

With above reference, we would like to convey that M/s. Adani Ports and Special Economic Zone Ltd, (APSEZL) principally agree to supply required quantity (~ 1,000 m^3/Day during project construction and ~ 32,800 m^3/Day for the plant operations) and quality of water for your proposed Copper Smelter Plant at Mundra APSEZ.

Once necessary clearances/ approvals are obtained by M/s. AEL from concerned authorities, APSEZL will provide necessary support. Augmentation of the existing infrastructure, if required will be taken up by M/s. APSEZL on mutually agreed terms & conditions, with necessary permission and clearance from concerned authorities.

Water will be supplied at standard terms and conditions of M/s. Adani Ports and Special Economic Zone Ltd, (APSEZL) as per tariff fixed by M/s. APSEZL.

Thanking You.

Yours Faithfully
For Adani Ports and Special Economic Zone Ltd,

Amit Uplenchwar
President - SEZ

Adani Ports and Special Economic Zone Ltd
Adani House
Nr Mithakhali Circle, Navrangpura
Ahmedabad 380 009
Gujarat, India
CIN: L63090GJ1998PLC034182

Tel +91 79 2656 5555
Fax +91 79 2555 5500
info@adani.com
www.adani.com

Registered Office: Adani House, Nr Mithakhali Circle, Navrangpura, Ahmedabad 380 009, Gujarat, India

AVI-1

ANNEXURE-VI
WATER SUPPLY LETTER

MEMORANDUM OF UNDERSTANDING (MOU)

THIS MOU is entered on this 05th day of December Month, 2018 Year between **Adani Enterprises Limited,** a company registered under the Companies Act, 2013, and having its registered office at Adani House, Near Mithakhali Six Roads, Navrangpura, Ahmedabad 380009, Gujarat, India (hereinafter referred to as **"AEL"**, which expression shall, unless excluded by or repugnant to the context or meaning thereof, be deemed to include its successors and assigns) being the party of the **FIRST PART.**

and Adani Port & SEZ Ltd, a Company registered under the Company's Act 2013 and having its registered office at 1st Floor, Infrastructure House, Nr. Adani House, Navrangpura, Ahmedabad (hereinafter referred to as **"APSEZ"** which expression shall, unless excluded by or repugnant to the context or meaning thereof, be deemed to include its successors and assigns) being the party of the **SECOND PART.**

Both AEL & APSEZ may hereinafter also be referred to jointly as the **'Parties'** and severally as a **'Party'**

WHEREAS

AEL is setting up an integrated copper smelting & refinery complex at Mundra, Gujarat (hereinafter referred to as **"Plant"**) with an annual production capacity of 10,00,000 TPA.

Since, APSEZ is already having the land, power & water availability in the proposed area, AEL would like to utilize these resources for its Plant.

NOW, THEREFORE, IN CONSIDERATION OF THE ABOVE PREMISES AND OF THE UNDERTAKINGS HEREIN FURNISHED, IT IS HEREBY AGREED BY AND BETWEEN THE PARTIES AS FOLLOWS:

1.0 APSEZ will make available to AEL 634 acres of land on long term lease basis. The payment terms & the other commercial terms & conditions will be mutually decided by both the parties at a later convenient date.

2.0 APSEZ will make available to AEL 300 MW of power & 32,800 m3/day of desalinated water for the Plant operations. The payment terms & the other commercial terms & conditions will be mutually decided by both the parties at a later convenient date.

EFFECTIVE DATE, COMMENCEMENT DATE & VALIDITY OF THE MOU

1.0 The effective date shall be the date of this MOU.

2.0 This MOU shall remain valid till the time a definitive detailed agreement incorporating all the commercials, scope, penalty and legal related matters is executed between the parties.

SETTLEMENT OF DISPUTES

1.0 In case of any disputes, differences, claims between the parties hereto arising out of this MoU, the same shall be referred to respective senior management of each Party, who in turn will work out an amicable settlement.

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ANNEXURE-VI
WATER SUPPLY LETTER

OTHER CONDITIONS:

1.0 Any amendment to this MoU in order to be valid shall be in writing.

2.0 This MoU shall be executed in duplicate and both the counterparts shall be treated as original.

Validity:

This MoU shall remain valid until execution of the Definitive Agreements to this effect.

IN WITNESS WHEREOF THE .PARTIES HERETO HAVE HEREUNTO SET THEIR RESPECTIVE HANDS AND SEALS THE DAY, MONTH AND YEAR FIRST ABOVE WRITTEN.

For AEL

Signed and delivered by the

Signature: P.A Suryarao

Name: PRASAD SURYARAO

ADANI ENTERPRISES LTD. AHMEDABAD

Witness:

Signature:

Name: RAVI TADARDA

For APSEZ

Signed and delivered by the

Signature:

Name: Jai Bhuva

ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED

Witness:

Signature:

Name: Anil Nair

EAC OBSERVATION:

Occupational health assessment envisaged for the employees and workers has not been submitted.

REPLY:

A detailed study on Occupational health hazards assessment & monitoring plan was carried out by **M/s. Indian Council of Medical Research-National Institute of Occupational Health (ICMR-NIOH);** Department of Health Research, Ministry of Health & Family Welfare, Government of India; to protect and promote health of human resources employed at the Copper Refinery Project.

Study covers the following:

- Potential Health Hazards
- Health Effects and Prevention
- Summary of Occupational Health and work place monitoring unit-wise.
- Occupational Health Assessment/ Medical Evaluation

Following tests and frequency of the test has been identified based on the comprehensive Occupational Health study.

- Clinical assessments;
- Electrocardiogram (ECG) for persons aged > 45 years;
- Blood investigations;
- Biological monitoring programme;
- Liver function test;
- Renal function test;
- Audiometry;
- Ophthalmic evaluation;
- Dermatological evaluation;
- Neurological evaluation; and
- Biological monitoring.

Unit-wise various tests and frequency of the test has been identified based on the comprehensive Occupational Health study. Adani Enterprises Ltd. has allocated **Rs. 2000/ person/ year as budget** for monitoring the health of the human resources engaged at the Copper Refinery Project.

A detail study report on Occupational Health Hazards Assessment and Monitoring Plan for proposed Copper Refinery project by ICMR- NIOH is attached as **Annexure-19.**

ANNEXURE-19

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Occupational Health Assessment and Monitoring Plan for the Proposed Copper Refinery Project

INDIAN COUNCIL OF MEDICAL RESEARCH
NATIONAL INSTITUTE OF OCCUPATIONAL HEALTH

OCCUPATIONAL HEALTH ASSESSMENT AND MONITORING PLAN FOR THE PROPOSED COPPER REFINERY PROJECT

INDIAN COUNCIL OF MEDICAL RESEARCH

NATIONAL INSTITUTE OF OCCUPATIONAL HEALTH

आई सी एम आर-राष्ट्रीय व्यावसायिक स्वास्थ्य संस्थान
स्वास्थ्य अनुसंधान विभाग,
स्वास्थ्य और परिवार कल्याण मंत्रालय, भारत सरकार
ICMR - National Institute of Occupational Health
Department of Health Research
Ministry of Health and Family Welfare, Government of India

Foreword

We are grateful to Adani Enterprises Ltd. (AEL) for having entrusted Indian Council of Medical Research- National Institute of Occupational Health (ICMR- NIOH), Ahmedabad for preparing Occupational Health Monitoring plan for the employees and workers for the proposed 1.0 MTPA Copper Refinery project at Adani Port Special Economic Zone Land in Village(s) Siracha and Navinal, Taluka Mundra, District Kutch, Gujarat.

The purpose of this Occupational Health Monitoring plan is to protect and promote the health of human resource employed at proposed project. This plan is prepared, considering the possible hazards from the proposed copper refinery project. The objective of this plan is to bridge this gap, and give insight to all possible hazards involved in the activity of Copper Refinery project.

We express our sincere gratitude to the team of AEL for their continuous interaction with the core team members of ICMR- NIOH and extending support and guidance to complete the study on time.

We gratefully acknowledge the involvement and intellectual support provided by scientists from the division of "Clinical Epidemiology", "Occupational Hygiene" and "Regional Occupational Health Centre – Bengaluru" towards development and preparation of this report.

We greatly acknowledge the untiring efforts of ICMR- NIOH core team members and support staff for timely completion of the study.

Dr Kamalesh Sarkar 10/5/20
Director and Scientist 'G'
ICMR- NIOH, Ahmedabad

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Preamble

The National Institute of Occupational Health (NIOH), is premier institute under the aegis of the Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Govt. of India. The NIOH is India's specialist research organization engaged in research in the field of occupational health. The NIOH has a dedicated endeavour with the following purpose and function:

- To promote intensive research in the field of occupational and environmental health;
- To promote the highest quality of occupational health through fundamental and applied research.
- To use basic data towards devising of new technique(s) for the clinical or experimental purposes.

The research and training activities of the Institute are primarily focused on national priorities adopting a multi-disciplinary approach, encompassing epidemiological, experimental studies, ergonomics and intervention technologies, wherever necessary. The ICMR-NIOH and its regional centres are being constantly sought by judiciary and policy makers in decision-making regarding occupational health and its related activities.

Section 1: Introduction to occupational health

The purpose of this Occupational Health manual is to protect and promote the health of human resource employed at proposed Copper Refinery Project by M/s Adani Enterprises Limited (AEL) at villages Navinal and Siracha, Taluka Mundra, District Kutch, Gujarat.

It is the application of preventive medicine principles in all places of employment. The scope of occupational health is not limited to diagnosis of specific occupational diseases and their treatment alone, but its horizon goes far beyond, to the realms of promotion of health, prevention of illnesses, early diagnosis and rehabilitation. Its roots seek out the deep reaches of the psycho-social environment inside the work place thus meeting the definition of health as 'being a state of complete physical, social and mental wellbeing of a person, and not merely the absence of disease or infirmity' as defined by the World Health Organisation.

Occupational Health deals with:

- Prevention of exposure to occupational hazards / working conditions among the employees that might lead to departure from health;
- Protection of employees in their employment from risks factors that result adverse health;
- Placing and maintenance of the employees in an occupational environment adapted to his physiological requirement.
- Promotion and maintenance of the highest degree of physical, mental and social well-being of employees in all occupations

To summarize Occupational health services, facilitate "The adaptation of work to man and each man to his job."

The occupational health manual:

Occupational Health, is yet in a neonatal form in India, and is thus not understood by management and employees. Occupational Medicine is a branch of Preventive Medicine, which is not understood by doctors themselves. Yet, it is closely related to all three groups (management, employee and doctors / health care providers).

This manual is prepared considering the possible hazards from the proposed copper refinery project. The manual is based on the current understanding and literature, while a definite protocol should be prepared after precisely the weighing the hazards later to the establishment of copper refinery. The objective of this manual is to bridge this gap, and give insight to the employer of Copper Refinery project, so as to establish a safe place along with lucrative business.

The manual is meant to be a guideline for the development of uniform Occupational Health Practices, and to provide a healthy, happy and productive worker at the work place. The importance of such a worker is well known in international labour circles, for not only earn millions but also save billions.

A road map is hereby suggested, which should lead to the highway of established occupational health practices in the future.

The AEL has expressed to employ approximately 1000 on roll employees (regular employment) and 1000 off roll employees (on contractual basis), working in various units of the copper plant.

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Section 2: ADANI copper plant

Copper is a strategic metal for development of industry in India. It is considered to be the third most important industrial metal next only to iron and aluminium. Combination of its excellent properties such as high electrical and thermal conductivity, high strength, malleability, easy workability, corrosion resistance and its ability to produce alloys with other metals in an attractive range of colours has made copper a strategic metal for the engineering industry. Specific applications of copper include power cables and wires, jelly filled cables, building wires, air conditioning and refrigeration tubing, telecom, power, construction, transportation, handicrafts, engineering, consumer durable, defence etc.

Table 2.1: List of units in the ADANI group proposed copper refinery plant

	Plant (facilities) in the proposed Coper Refinery
1	Raw material handling area
2	Copper smelter
3	copper refinery
4	Copper rod plant
5	Precious metal recovery plant
6	Sulphuric acid plant
7	Effluent treatment plant
8	Phosphoric acid plant
9	Aluminium fluoride plant

Table 2.2: List of possible hazards in each of the units of proposed copper refinery plant.

Plant (facilities) in the proposed Coper Refinery	**Potential hazards**
Construction of the individual facilities / units	• Hand-arm vibration (grinders, cutters, etc.). • Whole-body vibration (Dozers and loaders, driving heavy vehicles etc.) • Dust • Noise
Raw material handling area	• Exposure to dust of Copper concentrate and Rock Phosphate • Noise • Moving equipment
Copper smelter	• Dust (Copper concentrate) * • Heat (Hot metal) • SO_2 gas • Noise • Work at height
Copper refinery	• Acid fumes (Copper sulphate) • Heat (Steam and hot electrolyte of Copper Sulphate) • Noise • Work at height

Copper rod plant	• Heat (Hot metal) • Noise • Work at height
Precious metal recovery plant	• Dust (Anode slime containing Pb, As, Se) • Heat (Hot metal) • SO_2 gas • Acid fumes • Noise • Work at height
Sulphuric acid plant	• SO_2 gas • sulphuric acid fumes • Vanadium Pentoxide • Heat (Steam and hot sulphuric acid) • Noise • Work at Height
Effluent treatment plan (ETP)	• Dust (ETP Sludge containing Arsenic, Cadmium, Chromium, Lead and other heavy metals) • Acid fumes • Noise • Work at Height
Phosphoric acid plant	• Dust (Rock Phosphate) ** • Acid Fumes (Phosphoric Acid with Fluorine) • Heat (Steam, hot water, hot Phosphoric Acid & slurry) • Phosphoric Acid • Hydro-Fluro-Silicic acid fumes • Noise • Work at Height
Aluminium fluoride plant	• Dust (Aluminium Hydrate) • Aluminium Fluoride Slurry Fumes • Heat (Steam, hot Hydro-Fluro-Silicic Acid, Aluminium Fluoride slurry) • Hydro-Fluro-Silicic acid fumes • Noise • Work at Height
Maintenance in various units of the Refinery	• Vibration (due to use of vibrating equipment such as grinders, cutters, drilling machine, etc.) • Dust • Noise • Heat • Light in metal unit area

*Copper concentrate consist of Copper, Lead, Arsenic, Selenium, Fluorine, Iron, sulphur, SiO_2, CaO, MgO, Al_2O_3, Zinc, Fe_3O_4, Bismuth, Antimony, Nickel, Cadmium, Chlorine, Mercury, Silver, Gold Moisture

**Rock Phosphate consist of P_2O_5, Fe_2O_3, Al_2O_3, CaO, MgO, SiO_2, SO_3, Chlorine, Fluorine, $CaCO_3$, CO_2, Na_2O, K_2O, TCP / BPL, organic matter as Carbon.

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Section 3: Potential health hazards

Employees of the proposed copper plant are exposed to all types of hazards. Broadly these hazards can be classified as:

3.1. Physical hazards

- Noise
- Heat
- Vibration
- Work at Height

3.2. Biological hazards

The biological hazards to which employees are exposed include:

3.2.a. Animal and snakebites

During exploration and preparation of the site for drilling operations, employees have to work in difficult and unfamiliar terrains. Chance encounters may result in animal and snakebites in those working at these sites.

3.2.b. Arthropod borne diseases

At times workers employed both at indoors as well outdoors are exposed to certain arthropod borne diseases such as malaria, dengue, etc.

3.2.c. Rodent and Insect borne diseases

Workplaces such as catering services, garbage disposal areas often attract rodents and vermin, which act as vectors for disease transmission. Thus, exposing these employees to rodent / insect borne diseases.

3.2.d. Food borne diseases

If proper hygienic conditions are not practiced for storage, handling and preparation of food, it will expose a large group of employees to food borne diseases. Food handlers themselves, who are either infected or carriers of disease agents may also be a source of such food borne diseases.

3.2.e. Water borne diseases

Water, which is not properly treated, poses a major hazard. If proper disinfection and storage of supplied water is not done, it may result in water borne diseases.

3.3. Psychological hazards

Stress can commonly result from

1. Constant fear of personal injury.
2. Inherent / personal psychological problems and phobias.
3. Loneliness / family separation due to working at remote and isolated locations.
4. Working at variable duty shifts for a very long time.
5. Increasing demands of the Job

3.4. Ergonomic hazards

Prolonged hours of physical strenuous work as well results in musculo-skeletal problems (viz. general body ache and low back pain).

Administrative and office staff, due to their sedentary nature of work over prolonged periods, using furniture that is not ergonomically designed are subjected to ergonomic hazards. Employees occupied in handling computer work stations at various locations (viz. control rooms and offices) are a major area of concern.

3.5. Injuries / accidents

Injuries / accidents may result from many causes, including slips and falls, lifting heavy weight and handling of heavy machinery / tools / equipment.

3.6. Burns

Burns may be caused by steam, fire, chemicals, corrosives, acids and alkalis.

3.7. Electric shock

Construction workers and labourers are exposed to electric shocks. The consequences of electric shock are transient muscle paralysis, burns, electrocution, arrhythmias and death depending on the voltage of the current.

3.8. Chemical hazards

- Heavy metals (Arsenic, lead, copper, aluminium, selenium, etc.)
- Sulphides
- Oxides
- Nitrites
- Sulphuric oxide
- Sulphuric acid
- Phosphoric acid
- Fluorides
- Hydro-Fluro-Silicic acid
- Other chemicals

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Section 4: Health effects and prevention:

Effects of hazards on the health of employees could be attributed to one or multiple hazards they are exposed, as described earlier. This chapter elaborates these effects.

There are usually four methods of prevention of health effects of Occupational Hazards. They are:

1. Engineering control
2. Administrative control
3. Use of Personal Protective Equipment (PPE)
4. Medical control

4.1. Physical hazards

4.1.a. Noise

Employees exposed to high level of noise at risk for

- Hearing loss (Temporary or Permanent)
- Psychological effects
- Cardiovascular effects

Preventive steps

Noise in industry can be controlled by various means.

Engineering control

The first attempt to reduce noise is engineering control, starting from procurement of machinery to its installation. In some cases, the noise can be reduced in the sound transmission path.

Administrative control

- Pre-employment audiometric examinations are a must for selecting incumbents who are to be placed in potentially high noise areas.
- Noise level meter for octave band analysis & octave frequency analysis, to be measured monthly at minimum of 10 locations as recommended by Central Pollution Control Board (CPCB)
- Equipment Procurement Procedures should have clear equipment specification guidelines on noise and vibration parameters that are tolerable.
- Minimizing exposure duration through reduction in exposure time or by job rotation.
- Organizing for high-risk operation to be conducted out of hours when few employees will be exposed.
- Employees should strictly incline to the work hours as per the Threshold limit values (TLV) to prevent the hazards of exposure to noise

Table 4.1: Threshold limit values for employees exposed to continuous noise.

Hours of exposure / employment	**Decibels**
≤ 8 hours	90 dBA
≤ 4 hours	95 dBA
≤ 2 hours	100 dBA
≤ 1 hour	105 dBA

Medical control

- Pre-placement & periodic audiometric examinations of employees engaged in high noise areas should be evaluated. If deterioration is noticed, withdrawal of the employee from the source of exposure should be done.
- Periodical Audiometric testing. The periodicity of testing is Six monthly
- A drop in 20-30 db of hearing loss as assessed by pure tone audiometry (in all frequencies) should indicate SNHL and suggest a change in workplace of the employee

Personal protection equipment (PPE)

- Noise transmission from source to the human ear can be reduced with the wearing of hearing protectors like earmuffs & earplugs. Hearing protectors have shown to provide attenuation from 15 to 30 dB.

4.1.b. Heat

Heat exposure can produce effects like:

- Heat Syncope
- Prickly Heat
- Heat Hyper pyrexia
- Water and Electrolyte Depletion and Heat Exhaustion
- Heat Cramps
- Heat Stroke

Preventive steps

Engineering control

- Engineering control to minimize exposure to heat will depend upon the nature of the work place.
- Insulation, altering the path of transmission of heat, exhaust ventilation systems are some of the methods employed to reduce heat exposure.

Administrative control

- Persons that are to be placed in such areas should be properly selected. A young, healthy, short, robust, relatively darker complexion individual is more suitable for 'hot work', as compared to his taller, fairer counterpart of comparable health.
- Lightweight cotton clothing should be prescribed as safety gear in workplaces that have a heat hazard.
- Acclimatization & adaptation with the work process will allow employees to become used to heat. When employees are away from hot conditions for more than several days, a re-acclimatization schedule should be adopted.
- Employee's diet should be of proper caloric value depending on their workload requirements in hot conditions, and in addition, contain adequate electrolytes.
- There should be frequent short breaks during shift hours (Table 4.2).

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Table 4.2 Permissible heat exposure & threshold limit values (Values are given in Celsius / Fahrenheit as measured using Wet Bulb Globe Thermometer)

	Work Load		
Work – Rest Regimen	Light	Moderate	Heavy
Continuous work	30.0°C / 86°F	26.7°C / 80°F	25.0°C / 77°F
75% Work – 25% Rest, each hour	30.6°C / 87°F	28.0°C / 82°F	25.9°C / 78°F
50% Work – 50% Rest, each hour	31.4°C / 89°F	29.4°C / 85°F	27.9°C / 82°F
25% Work – 75% Rest, each hour	32.2°C / 90°F	31.1°C / 88°F	30.0°C / 86°F

Medical control

- Pre-placement / pre-employment medical examination: The individual's medical data is to be re assessed before he is placed in a heat hazard area. A particular attention towards renal and cardiovascular system should be exercised.
- Periodic medical examinations must be carried out six monthly.
- If the workplace is outdoors, it may be difficult to eliminate the hazard, in which case, plenty of potable water & salt tablets (where excessive sweating occurs) should be provided to employees.
- Employees with frequent pyrexia (fever) / history of recent fever should be avoided.
- Training and awareness of hazards due to heat, should be provided to employees/supervisors and first aiders
- An outline of thermoregulation, symptoms of heat illness, acclimatization, work demand and clothing
- First -aid measures for each heat related disorders to be made available at the site.
- Emphasis on the hygiene practices, such as adequate hydration, individual responsibility and self-pacing of work.

4.1.c. Vibration

Generalized vibration may give rise to Musculo-skeletal (osteo-arthrosis) and neurological sequelae, whereas localized body part vibrations can result in conditions such as Vibration induced White Finger.

Preventive steps

Engineering control

- Elimination or Reduction of vibration at the design stage.
- Proper & timely maintenance of Engineering control
- Isolation of disturbance from the vibrating surface.
- Reducing the mechanical disturbance causing the vibration
- Anti-vibration devices should be used on vibrating tools and holding tongs.

Administrative control

- Adapting procedures to purchase tools or equipment with minimal vibration.
- Reducing exposure time by breaks and shorter working hours.

Table 4.3: Threshold limit values for exposure of hand to vibration in Xh, Yh or Zh directions

Total daily exposure (Duration in hours)	**Values of the Dominant Frequency – Weighted, rms, Component Acceleration, Which Shall not be Exceeded ^{a}K ($^{a}K_{eq}$)**	
	m/s^2	**g^{Δ}**
4 - 8	4	0.40
2 - 4	6	0.61
1 - 2	8	0.81
< 1	12	1.22

Medical control

Pre-employment medical examination to assess employees who may be susceptible to the effects of exposure to whole body and segmental vibration

The following advice could be given regarding risk associated with exposure to vibration:

- Keep the hands warm and do not allow to become wet & cold
- Employees using vibrating hand Tools must not smoke, as smoking predisposes them to vaso-constrictive disorders.
- Awareness regarding seeking early medical advice at the signs of numbness, tingling or white or blue fingers.

PPE

- Use Anti –Vibration gloves with full fingers.

4.1.d. Working at height:

Physical injuries are common among employees employed at height. It is necessary the employees have adequate control over their balance to work at height and prevent hazard of injuries

Preventive steps

Administrative & Engineering control

- Provision for safety / protective measures (whole body harness, safety net / ropes for sky folding. Extra precautions to be taken to prevent electric shocks.

Medical control

- Pre-employment medical examination should be directed at the detection of neurologic, visual, cardiovascular and general health.
- Individuals with above mentioned disorders should be avoided from engaging in work at height.

PPE

This includes use of helmets, ropes for sky folding.

4.1.e. Illumination

Proper illumination of the work place is of prime importance. Improper illumination is detrimental to the health of the worker. Its effects include – Eyestrain, excessive (general) fatigue, reduced efficiency and accuracy of the worker.

Preventive steps

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Engineering control

- Replace light sources as soon as they get fused.

Administrative control

- Ensure proper illumination from the planning stage of the work place.

Table 4.4: Recommended Values of Illumination are given below:

Areas	**Illumination LUX**
Canteens	150
Entrances, Corridors & Stairs	100
Stockyard, Main entrances, Roads	20
Bathrooms	100
Stairs	100

4.2. Biological hazards

The hazards vary as per the geographical location. General preventive measures are listed below. Specific strategies should be prepared during the project implementing phase.

- Elimination of the hazardous biological agent.
- Adequate ventilation
- Isolation of the persons with infection
- Immunization and health surveillance
- Personal protective equipment like aprons, gloves, eyewear, face shields, respirators, gowns etc.
- Good hygienic and sanitary facilities.
- Periodic examination of food handlers and isolation of food handlers found to be infected
- Providing adequate and quick treatment facilities for animal bites and snakebites

4.3. Psychological hazards

- Psychological effects on the employees are very subtle, and have to be 'looked for' very meticulously by the Occupational Health Physician. They may manifest as obsessive-compulsive behaviour, paranoia, hypochondriac behaviour and absenteeism from work.
- Psychological effects may also manifest as Medical complaints like respiratory infection, fatigue, backache, insomnia, headache, irritability, etc. It is important to differentiate these symptoms from the organic diseases producing them.
- The occupational physician in charge must have proper knowledge of stress related factors and be trained and equipped to advise regarding – proper job placement, counselling and medications to alleviate these problems.

4.4. Ergonomic hazards

Their ergonomic problems should be solved by work place modification and/or mechanization of the processes if possible. Periodic examination of these employees should include radiography of the lumbo-sacral region once a year and employees with chronic symptoms or bony changes should not be further exposed to this type of job. Proper posture and exercise may be taught to these employees to minimize the problem of backache. Administrative staffs also need health education for their ergonomic problems.

4.5. Injuries/ accidents

Injuries are common events in the different operations. Accidents should be prevented by proper maintenance of the machinery, good housekeeping, safety training and use of personal protective devices. First aid treatment must be available for trivial injuries and employees must be trained in first aid.

4.6. Burns

The sites where burns can occur should be identified. Employees should be provided with personal protective devices like fire – proof clothing. There should be also provision of continuous water in case of emergency events.

4.7. Electric shock

Electrical accidents are caused by a combination of unsafe factors including: Equipment and/or installation, environment, and work practices.

- Enclose all the exposed electrical parts
- Isolate electrical parts: Use guards or barriers, replace covers. All conductors must be protected and unused openings to be closed
- Junction boxes, pull boxes and fittings must have approved covers
- Unused openings in cabinets, boxes and fittings must be closed
- Use proper wire for extension cord while using the power tools. If wire is too small the tool will draw more current than the cord can handle, causing overheating & possible fire.
- Avoid usage of damaged extension cords & tools. Cords can be damaged by aging, contact with door / window edges, staples or fastenings, Abrasion from materials and activity in the area.
- Frequent inspection of the ground power supply, electric equipment and electrical circuits to ensure path to ground is continuous
- Inspect electrical equipment every time before usage
- Use Ground Fault Circuit Interrupter (GFCI)
- Worker should use appropriate PPEs as per electrical load

4.8. Chemical hazards

Employees at the proposed copper refinery plant are possibly exposed to many hazardous chemicals; every precaution should be taken to prevent these hazards. Chemicals used vary from region to region, from workplace to workplace. Hence it is beyond the scope of this manual to enumerate all chemicals hazards the employees are exposed to.

However, few hazardous chemicals are being mentioned as a guideline:

1. Copper Concentrate (dust)
2. SO_2 Gas
3. Copper Sulphate Acid fumes
4. Lead, arsenic, selenium dust
5. Sulphuric Acid fumes
6. Phosphoric acid fumes
7. Acid fumes of fluorine
8. Phosphoric Acid
9. Hydro-fluro-silicic acid fumes
10. Aluminium hydrate dust

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11. Aluminium Fluoride Fumes
12. Chlorine Gas
13. HCL Acid
14. Iso Propyl Alcohol
15. Sodium Sulphide
16. Ferric Sulphate

General preventive measure for all chemical hazards:

Chemical burns, irritation / inflammation of respiratory tract / pulmonary system and irritation / inflammation of the anterior chamber of eye (conjunctivitis, keratitis, etc.) are the common injuries encountered in employees exposed to dust / irritants / acid fumes. The general toxic action of acid causes alkaline depletion of the body i.e. an acidosis that affects the nervous system and produces agitation, hesitant gait and generalized weakness.

Preventive steps

Engineering control

- Total enclosure of the process using acid / acid fumes / dust.
- Mechanization of handling procedures to prevent all personal contact with hazards.
- Installation of local exhaust ventilation fitted with bag filters and warning devices for leakages

Administrative control

- Acids should be stored in separated well-ventilated cool, dry premises with an acid resistant cement floor, sheltered from direct sunlight and away from all sources of ignition.
- Empty containers should always be drained and rinsed clean with water.
- Spilt acid should be covered with sand or ashes and never with organic material.
- Showers, baths and washing fountains should be available and eye fountains and emergency showers should be provided.

Medical control

- Pre-employment Medical Examination should be directed at the detection of chronic respiratory, gastrointestinal, hepatic, cardiovascular, nervous disease and any eye & skin disease.
- Periodic Medical Examination of employees

PPE

This includes use of chemical goggles, face screens, mask (Dust/gas), gloves, neoprene or PVC boots and acid resistant clothing.

4.9. Hazards from individual units:

4.9.a. Raw material handling area:

Hazards expected:

- Dust containing Coper Concentrate* and Rock Phosphate**
- Noise (Refer section 4.1.a. "Noise" for details)
- Handling heavy machines / moving equipment

*Copper Concentrate consist of Copper, Lead, Arsenic, Selenium, Fluorine, Iron, sulphur, SiO_2, CaO, MgO, Al_2O_3, Zinc, Fe_3O_4, Bismuth, Antimony, Nickel, Cadmium, Chlorine, Mercury, Silver, Gold Moisture

**Rock Phosphate consist of P_2O_5, Fe_2O_3, Al_2O_3, CaO, MgO, SiO_2, SO_3, Chlorine, Fluorine, $CaCO_3$, CO_2, Na_2O, K_2O, TCP / BPL, organic matter as Carbon.

4.9. a.1. Dust containing copper concentrate and rock phosphate:

Possible harmful effects due to dust containing copper concentrate:

The dust particles can affect eyes, skin, respiratory system, liver, nervous system and kidney due to inhalation, oral ingestion and dermal absorption.

Preventive steps

Engineering control

- Total enclosure of the process using dust.
- Mechanization of handling procedures to prevent all personal contact with the dust.
- Installation of local exhaust ventilation fitted with bag filters and warning devices for leakages

Administrative control

- Monthly evaluation of the metal and metalloid particulates (Cu, Pb, As, Se, Ni, Cd, Hg, Bi, Sb) in workplace atmosphere, using air sampling and inductive coupled plasma (ICP) analysis, as recommended by the occupation safety and health administration (OSHA) method (ID-125G) or Central Pollution Control Board (CPCB) or Bureau of Indian standards methods for monitoring metals at the workplace.
- The occupational exposure limit of Copper, Lead, Arsenic, Selenium, Fluorine, Iron, sulphur, SiO_2, CaO, MgO, Al_2O_3, Zinc, Fe_3O_4, Bismuth, Antimony, Nickel, Cadmium, Chlorine, Mercury, Silver, Gold for 8-hour time weighted average (TWA) for inhalable dust should be limited as per Indian Factories act / NIOSH / OSHA guidelines.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, hepatic, renal disease as well eye & skin disease.
- Serum copper & ceruloplasmin feroxidase, urinary copper should be measured (the difference in urinary copper levels before and after work / shift hours is essential)
- Screen for heavy metals (e.g. mercury, lead, copper, arsenic, cadmium, Bismuth, Antimony and Nickel) in blood and urine. Delta aminolevulinate dehydratase levels should be checked to identify lead toxicity.
- Measure fluoride levels in blood and urine before and after working for 5 – 6 consecutive days
- Frequency of medical examination should be increased when the work place copper / heavy metal levels are higher than threshold limit value.
- An increase in the values of heavy metal/s in the biological samples (blood / urine) as compared to baseline during follow-up is an indication of accumulation of the respective metal/s, necessitating immediate mobilization (replacement) of the worker from further exposure to hazard (metal/s).

PPE

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This includes use of chemical goggles, face screens, mask (Dust/gas), gloves, neoprene or PVC boots and acid resistant clothing.

Dust containing Rock phosphate

Possible harmful effects due to containing rock phosphate:

The dust particles can affect eyes, skin, respiratory system, liver, kidneys, blood and skeletal system due to inhalation, oral ingestion and dermal absorption.

Preventive steps

Engineering control

- Total enclosure of the process using dust.
- Mechanization of handling procedures to prevent all personal contact with the dust.
- Installation of local exhaust ventilation fitted with bag filters and warning devices for leakages
- Provide shower at nearby location

Administrative control

- Monthly evaluation by air samplers to collect particulate matter (PM) 2.5 & PM10 with respirable suspended particulate matter (RSPM) analyser as recommended by CPCB guidelines.
- The occupational exposure limit of P_2O_5, Fe_2O_3, Al_2O_3, CaO, MgO, SiO_2, SO_3, Chlorine, Fluorine, $CaCO_3$, CO_2, Na_2O, K_2O, TCP / BPL, organic matter as Carbon for 8-hour time weighted average (TWA) for inhalable dust should be limited as per NIOSH / OSHA guidelines.
- Phosphoric acid fumes and fluorine (as fluoride) has to be evaluated in the work place and the concentration of phosphorous acid should not exceed 1 ppm or 1mg/m^3 and, fluoride (as F) should not exceed 2.5 mg/m^3, while fluorine should be limited < 1 ppm or 2 mg/m^3.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, hepatic, renal disease, blood and gingival tissue as well eye & skin disease.
- Measure fluoride levels in blood and urine before and after working for 5 – 6 consecutive days
- Frequency of medical examination should be increased when the work place PM2.5 / PM 10 levels are higher than threshold limit value.

PPE

This includes use of chemical goggles, face screens, mask (dust/ gas), gloves, neoprene or PVC boots and acid resistant clothing.

4.9. a.2. Handling heavy machines / Moving equipment

Injuries are common events among employees handling heavy machines / moving equipment. Accidents should be prevented by proper maintenance of the machinery, safety training and use of personal protective devices. First aid treatment must be available for trivial injuries and employees must be trained in first aid.

Their ergonomic problems should be solved by workplace modification and/or mechanization of the processes where applicable. Periodic examination, corrective posture training and exercise may be taught to these employees to minimize Musculo-skeletal problems.

It is necessary the employees are attentive and have adequate control over the heavy machines to prevent accident / injuries

Preventive steps

Administrative & Engineering control as per the recommendations of Indian Factories Act

- Provision for safety / protective measures
- Extra precautions to be taken to prevent electric shocks.
- Adequate training and education regarding the usage of machines

Medical control

- Pre-employment medical examination should be directed at the detection of neurologic, visual, cardiovascular and general health.
- Individuals with above mentioned disorders should be avoided from engaging in heavy machine operation.

PPE

This includes use of helmets, goggles, steel toe boots and other specific recommendations as mentioned in the safety manual of the heavy machines.

4.9.b. Copper smelter:

Hazards expected:

- Dust containing copper concentrate
- Heat due to hot metals (Refer section 4.1.b. "Heat" for details)
- Sulphur dioxide
- Noise (Refer section 4.1.a. "Noise" for details)
- Working at height (Refer section 4.1.d. "Working at height" for details)

4.9. b.1. Dust containing copper concentrate:

Possible harmful effects:

The dust particles can affect eyes, skin, respiratory system, liver and kidney due to inhalation, oral ingestion and dermal absorption.

Preventive steps

Engineering control

- Total enclosure of the process using dust.
- Mechanization of handling procedures to prevent all personal contact with the dust.
- Installation of local exhaust ventilation fitted with bag filters and warning devices for leakages

Administrative control

- Monthly evaluation of the metal and metalloid particulates (Cu, Pb, As, Se, Ni, Cd, Hg, Bi, Sb) in workplace atmosphere, using air sampling and inductive coupled plasma (ICP) analysis, as recommended by the occupation safety and health administration (OSHA)

method (ID-125G) or Central Pollution Control Board (CPCB) or Bureau of Indian standards methods for monitoring metals at the workplace.

- The occupational exposure limit of Copper, Lead, Arsenic, Selenium, Fluorine, Iron, sulphur, SiO_2, CaO, MgO, Al_2O_3, Zinc, Fe_3O_4, Bismuth, Antimony, Nickel, Cadmium, Chlorine, Mercury, Silver, Gold Moisture for 8-hour time weighted average (TWA) for inhalable dust should be limited as per Indian Factories act / NIOSH / OSHA guidelines.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, hepatic, renal disease as well eye & skin disease.
- Serum copper & ceruloplasmin feroxidase, urinary copper should be measured (the difference in urinary copper levels before and after work / shift hours is essential)
- Screen for heavy metals (e.g. mercury, lead, copper, arsenic, cadmium, mercury, selenium, bismuth, antimony) in blood and urine. Delta aminolevulinate dehydratase levels should be checked to identify lead toxicity.
- Measure fluoride levels in blood and urine before and after working for 5 – 6 consecutive days
- Frequency of medical examination should be increased when the work place copper / heavy metal levels are higher than threshold limit value.
- An increase in the values of heavy metal/s in the biological samples (blood / urine) as compared to baseline during follow-up is an indication of accumulation of the respective metal/s, necessitating immediate mobilization (replacement) of the worker from further exposure to hazard (metal/s).

PPE

This includes use of chemical goggles, face screens, mask (dust/gas), gloves, neoprene or PVC boots and acid resistant clothing.

4.9. b.2. Sulphur dioxide:

Possible harmful effects:

The SO_2 gas can affect eyes, skin, respiratory system .and occasionally kidneys due to inhalation, oral ingestion and dermal absorption.

Preventive steps

Engineering control

- Total enclosure of the process using SO_2 gas.
- Mechanization of handling procedures to prevent all personal contact with the gas.
- Installation of local exhaust ventilation fitted with bag filters and warning devices for leakages
- Provide shower at proximity location

Administrative control

Monthly evaluation of air quality monitoring by air samplers, to measure gaseous samples like SO_2 and NO_x as per the recommendations of CPCB / Indian factories Act.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, renal disease as well eye & skin disease.

- To be vigilant to detect acidosis among the employees.

PPE

This includes use of chemical goggles, face screens, mask (dust/gas), gloves, neoprene or PVC boots and acid resistant clothing.

4.9.c. Copper refinery:

Hazard expected:

- Acid Fumes of copper sulphate
- Extreme high temperature due to the steam & hot electrolyte (Copper Sulphate) (Refer section 4.1.b. "Heat" for details)
- Noise (Refer section 4.1.a. "Noise" for details)
- Working at Height (Refer section 4.1.d. "Working at height" for details)

4.9. c.1. Acid fumes of copper sulphate

Burns, irritation / inflammation of respiratory tract / pulmonary system and irritation / inflammation of the anterior chamber of eye (conjunctivitis, keratitis, etc.) are the common injuries encountered in employees exposed to acid fumes. Acid fumes can be absorbed systemically (surface absorption, oral ingestion and inhalation) causing alkaline depletion i.e. acidosis affecting nervous system would lead to agitation, hesitant gait and generalized weakness.

Preventive steps

Engineering control

- Total enclosure of the process using acid fumes.
- Mechanization of handling procedures to prevent all personal contact with hazards.
- Installation of local exhaust ventilation and warning devices for leakages
- Provide shower at nearby location

Administrative control

- Monthly evaluation of the metal and metalloid particulates in workplace atmosphere, including copper dust and copper fume levels using air sampling and ICP analysis, as recommended by the OSHA method (ID-125G) or CPCB.
- Air samplers to collect gaseous samples like SO_2 and Arsine as per the recommendations from CPCB / OSHA / BIS

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, hepatic, renal disease as well eye & skin disease.
- Serum copper & ceruloplasmin feroxidase, urinary copper should be measured (the difference in urinary copper levels before and after work / shift hours is essential)
- Frequency of medical examination should be increased when the work place copper levels are higher than threshold limit value.

PPE

This includes use of chemical goggles, face screens, mask (dust/ gas), gloves, neoprene or PVC boots and acid resistant clothing.

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4.9.d. Copper rod plant

Expected hazards:

- Heat (Hot Metal) (Refer section 4.1.b. "Heat" under "Physical hazards", page 7)
- Noise (Refer section 4.1.a. "Noise" under "Physical hazards", page 6)
- Work at Height (Refer section 4.1.d. "Working at height", page 10)

4.9.e. Precious recovery plant:

- Dust from the anode slime containing heavy metals such as lead, arsenic, selenium
- Heat (hot metal) (Refer section 4.1.b. "Heat" for details)
- SO_2 gas (Refer section 4.9. b.2. "Sulphur dioxide" for details)
- Acid fumes (Refer section 4.9. c.1. "Acid fumes of copper sulphate" for details)
- Noise (Refer section 4.1.a. "Noise" for details)
- Work at Height (Refer section 4.1.d. "Working at height" for details)

4.9. e.1. Dust from anode slim

Anode slime contains heavy metals such as lead, arsenic, selenium.

Dust of heavy metals can be absorbed systemically by inhalation, oral ingestion and surface absorption leading to systemic effects. Irritation / inflammation of respiratory tract / pulmonary system and irritation / inflammation of the anterior chamber of eye (conjunctivitis, keratitis, etc.) and rarely dermatitis can be caused in these employees. Systemic absorption can cause chronic kidney, hepatic, bone, gastrointestinal, blood, neurological diseases.

Preventive steps

Engineering control

- Total enclosure of the process using heavy metal dust.
- Mechanization of handling procedures to prevent all personal contact with dust.
- Installation of local exhaust ventilation fitted with bag filters and warning devices for leakages
- Provide shower at nearby location

Administrative control

- Monthly evaluation of the metal and metalloid particulates in workplace atmosphere including lead, arsenic, selenium levels using air sampling and ICP analysis, as recommended by OSHA method (ID-125G) or CPCB or Indian Factories Act or American Conference of Governmental Industrial Hygienists (ACGIH) or National Institute of Occupational Safety and Health (NIOSH)
- The occupational exposure limit of lead, arsenic, selenium for 8-hour time weighted average (TWA) for inhalable dust should be limited as per Indian Factories act / NIOSH / OSHA guidelines.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of chronic kidney, hepatic, bone, gastrointestinal, blood, cardiovascular, neurological diseases in addition to chronic respiratory, eye & skin disease.
- Serum & urinary levels of arsenic, lead, selenium should be measured. Delta aminolevulinate dehydratase levels should be checked to identify lead toxicity.

- Frequency of medical examination should be increased when the work place heavy metal levels are higher than threshold limit value.

PPE

This includes use of chemical goggles, face screens, gloves, neoprene or Steel Toe boots and acid resistant clothing.

4.9.f. Sulphuric acid plant

- SO_2 Gas (Refer section 4.9. b.2. "sulphur dioxide" for details)
- Sulphuric Acid fumes
- Heat due to steam and hot sulphuric acid (Refer section 4.1.b. "Heat" for details)
- Noise (Refer section 4.1.a. "Noise" for details)
- Work at Height (Refer section 4.1.d. "Working at height" for details)
- Vanadium Pentoxide

4.9. f.1. Sulphuric acid fumes:

Burns, irritation / inflammation of respiratory tract / pulmonary system and irritation / inflammation of the anterior chamber of eye (conjunctivitis, keratitis, etc.) are the common injuries anticipated in employees exposed to sulphuric acid fumes. Sulphuric acid fumes can be absorbed systemically (oral ingestion, surface absorption and inhalation) and lead to alkaline depletion i.e. acidosis affecting the nervous system and produces agitation, hesitant gait and generalized weakness.

Preventive steps

Engineering control

- Total enclosure of the process using sulphuric acid fumes.
- Mechanization of handling procedures to prevent all personal contact with sulphuric acid fumes.
- Installation of local exhaust ventilation and warning devices for leakages
- Provide shower at proximity location to wash accidental exposure

Administrative control

- Monthly monitoring for 4 – 8 hours for SO_2, SO_3 & acid mist levels by air sampling using silica gel sorbent tubes with personal sampling pump (with calibrated flow in line with silica get tube) followed by analysis with ion exchange chromatograph & electrical conductivity detector / using field monitoring stations as recommended by the OSHA method (ID-113/165SG) or CPCB / Indian factories act.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, renal disease as well eye & skin disease.

PPE

This includes use of chemical goggles, face screens, mask (dust/ gas), gloves, neoprene or PVC boots and acid resistant clothing.

4.9. f.2. Vanadium pentoxide:

Occupational exposure can affect eyes, respiratory system and skin. Irritation / inflammation of respiratory tract / pulmonary system and irritation / inflammation of the anterior chamber

of eye (conjunctivitis, keratitis, etc.) are possible injuries among employees exposed to vanadium pentoxide. Vanadium pentoxide can be absorbed systemically (inhalation, surface absorption and oral ingestion) and lead dysfunction in reproductive system, suspected carcinogenesis and foetal malformation (exposure to pregnant woman).

Preventive steps

Engineering control

- Total enclosure of the process using Vanadium pentoxide.
- Mechanization of handling procedures to prevent all personal contact with Vanadium pentoxide.
- Ensure adequate ventilation, especially in confined areas.
- Provide shower / washing facilities at proximity location to wash accidental exposure

Administrative control

- Monthly monitoring of respirable dust (as vanadium pentoxide) and fumes (as vanadium pentoxide) by ICP analysis as per OSHA guidelines.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, eye & skin disease.
- Caution while employing woman of reproductive age group (risk of foetal malformations).

PPE

This includes use of chemical goggles, face screens, mask (dust/ gas), gloves, neoprene or PVC boots and protective clothing.

4.9.g. Effluent treatment plant

- Dust of the ETP Sludge containing Arsenic, Bismuth, Cadmium, Chromium, Cobalt, Nickel, Lead, Antimony, Selenium, iron, copper, zinc CaO, Sulphates, Silica, etc.)
- Acid fumes (Refer section 4.9. f.1. "sulphuric acid fumes" for details)
- Noise (Refer section 4.1.a. "Noise" under "Physical hazards" for details)
- Work at Height (Refer section 4.1.d. "Working at height" for details)

4.9. g.1. Dust containing heavy metals

Dust of heavy metals can be absorbed systemically by inhalation and dermal absorption and lead to systemic effects. Irritation / inflammation of respiratory tract / pulmonary system and irritation / inflammation of the anterior chamber of eye (conjunctivitis, keratitis, etc.) and rarely dermatitis can be caused in employees exposed to dust. Systemic absorption can cause chronic kidney, hepatic, and bone diseases.

Preventive steps

Engineering control

- Total enclosure of the process using heavy metal dust.
- Mechanization of handling procedures to prevent all personal contact with dust.
- Installation of local exhaust ventilation fitted with bag filters and warning devices for leakages

- Provide shower at nearby location

Administrative control

- Monthly evaluation of the metal and metalloid particulates in workplace atmosphere including lead, arsenic, selenium, cadmium, bismuth, chromium, cobalt, nickel, antimony and zinc levels using air sampling and ICP analysis, as recommended by OSHA method (ID-125G) or CPCB or Indian Factories Act or ACGIH or NIOSH.
- The occupational exposure limit of Arsenic, Bismuth, Cadmium, Chromium, Cobalt, Nickel, Lead, Antimony, Selenium, iron, copper, zinc CaO, Sulphates, Silica for 8-hour time weighted average (TWA) for inhalable dust should be limited as per Indian Factories act / NIOSH / OSHA guidelines.
- Hand or foot swab samples of workers involved in collection, transportation and disposal of ETP sludge should be analysed for heavy metals using ICP-MS methods

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of chronic kidney, hepatic, bone, gastrointestinal, blood, cardiovascular, neurological diseases in addition to chronic respiratory, eye & skin disease.
- Blood & urinary levels of lead, arsenic, selenium, cadmium, bismuth, chromium, cobalt, nickel, antimony and zinc should be measured. Delta aminolevulinate dehydratase levels should be checked to identify lead toxicity.
- Frequency of medical examination should be increased when the work place heavy metal levels are higher than threshold limit value.
- An increase in the values of heavy metal/s in the biological samples (blood / urine) as compared to baseline during follow-up is an indication of accumulation of the respective metal/s, necessitating immediate mobilization (replacement) of the worker from further exposure to hazard (metal/s).

PPE

This includes use of chemical goggles, face screens, mask (dust/ gas), gloves, neoprene or PVC boots and acid resistant clothing.

4.9.h. Phosphoric acid plant

- Dust containing rock phosphate
- Acid fumes of phosphoric acid and fluorine
- Heat due to steam, hot water, hot phosphoric acid & slurry (Refer section 4.1.b. "Heat" for details)
- Phosphoric acid
- Hydro-fluro-silicic acid fumes
- Noise (Refer section 4.1.a. "Noise" for details)
- Work at Height (Refer section 4.1.d. "Working at height" for details)

4.9. h.1. Dust containing Rock phosphate:

Possible harmful effects:

The dust particles can affect eyes, skin, respiratory system, liver, kidneys, blood, spleen, GIT, CNS, gingival tissue due to inhalation, oral ingestion and dermal absorption.

Preventive steps

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Engineering control

- Total enclosure of the process using dust.
- Mechanization of handling procedures to prevent all personal contact with the dust.
- Installation of local exhaust ventilation fitted with bag filters and warning devices for leakages
- Provide shower at nearby location

Administrative control

- Monthly evaluation by air samplers to collect particulate matter (PM) 2.5 & PM10 with respirable suspended particulate matter (RSPM) analyser as recommended by CPCB guidelines.
- The occupational exposure limit of P_2O_5, Fe_2O_3, Al_2O_3, CaO, MgO, SiO_2, SO_3, Chlorine, Fluorine, $CaCO_3$, CO_2, Na_2O, K_2O, TCP / BPL, organic matter as Carbon for 8-hour time weighted average (TWA) for inhalable dust should be limited as per NIOSH / OSHA guidelines.
- Phosphoric acid fumes and fluorine as fluoride has to be evaluated in the work place and the concentration of phosphorous acid should not exceed 1 ppm or 1mg/m^3, fluoride (as F) should not exceed 2.5 mg/m^3 and Fluorine should not exceed 1 ppm or 2 mg/m^3.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, hepatic, renal disease, blood and gingival tissue as well eye & skin disease.
- Screen for heavy metals (e.g. mercury, lead, copper, arsenic, cadmium) in blood and urine.
- Measure fluoride levels in blood and urine before and after working for 5 – 6 consecutive days
- Frequency of medical examination should be increased when the work place PM2.5 / PM 10 levels are higher than threshold limit value.

PPE

This includes use of chemical goggles, face screens, mask (dust/ gas), gloves, neoprene or PVC boots and acid resistant clothing.

Acid fumes of phosphoric acid and fluorine

Common hazards incited include dermal burns, inflammation of respiratory system & eyes. Prolonged exposure to acid fumes of phosphoric acid & fluorine can have immediate fatal effects (acidosis) and rarely chronic effects (osteoflurosis, osteoporosis, hepatitis, periostitis, skeletal deformity)

Preventive steps

Engineering control

- Total enclosure of the process using acid fumes.
- Mechanization of handling procedures to prevent all personal contact with hazards.
- Installation of local exhaust ventilation and warning devices for leakages

Administrative control

- Daily evaluation of the air samples as recommended by OSHA method ID-111 / Bureau of Indian standards (BIS).

- The occupational exposure of Phosphoric acid fumes and fluorine as fluoride has to be evaluated in the work place and the concentration of phosphorous acid should not exceed 1 ppm, fluoride (as F) should not exceed 2.5 mg/m^3 and Fluorine should not exceed 1 ppm or 2 mg/m^3.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, hepatic, renal disease as well eye & skin disease.
- Measure fluoride levels in blood and urine before and after working for 5 – 6 consecutive days

PPE

This includes use of chemical goggles, face screens, gloves, neoprene or PVC boots and acid resistant clothing.

4.9. h.2. Phosphoric acid

Accidental contact with phosphoric acid can lead to dermal burns, inflammation to anterior chamber of eyes (accidental spurting). At high temperatures, phosphoric acid might be present as acid fumes which can cause inflammation of respiratory tract leading to acidosis (affecting nervous system leading to agitation, altered sensorium, etc.) Occasional chronic effects include hepatitis, periostitis, skeletal deformity (commonly mandible & maxilla)

Preventive steps

Engineering control

- Total enclosure of the process using phosphoric acid.
- Mechanization of handling procedures to prevent all personal contact with phosphoric acid.
- Provide shower at nearby location for washing out accidental exposure

Administrative control

- Daily evaluation of the air samples as recommended by OSHA method ID-111 / Bureau of Indian standards (BIS) / Indian factories Act.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, renal disease as well eye & skin disease.

PPE

This includes use of chemical goggles, face screens, gloves, neoprene or PVC boots and acid resistant clothing.

4.9. h.3. Acid fumes of hydro-fluro-silicic acid

Employees exposed to acid fumes of hydro-fluro-silicic acid are prone for accidental dermal burns, inflammation of anterior chamber of eyes (conjunctivitis, keratitis, etc.). Additionally, inhalation of acid fumes can lead to inflammation of respiratory system. Systemic absorption of acid fumes could deplete alkali causing systemic acidosis. Long term systemic absorption could cause osteoflurosis.

Preventive steps

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Engineering control

- Total enclosure of the process using acid fumes of hydro-fluro-silicic acid.
- Mechanization of handling procedures to prevent all personal contact with acid fumes.
- Installation of local exhaust ventilation and warning devices for leakages
- Provide shower at nearby location

Administrative control

- 6 monthly airborne fluoride levels through personal air monitoring for both particulate and gaseous phase fluorides.
- Exposure to hydro-fluro-silicic acid should be restricted to below the threshold limit values as per OSHA/NIOSH guidelines. The occupational exposure of fluoride has to be evaluated in the work place and the concentration of fluoride (as F) should not exceed 2.5 mg/m^3 and Fluorine should not exceed 1 ppm or 2 mg/m^3.
- Biological monitoring for fluorides to be undertaken

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, renal disease as well eye & skin disease.
- Contact lens should be avoided in the workplace.
- Measure fluoride levels in blood and urine before and after working for 5 – 6 consecutive days.
- Fluoride levels in urine should not exceed 4 mg/ gm creatinine (indicate over exposure).

PPE

This includes use of chemical goggles, face screens, gloves, neoprene or PVC boots and acid resistant clothing.

4.9.i. Aluminium fluoride plant

- Dust (Aluminium Hydrate)
- Aluminium Fluoride Slurry Fumes
- Heat (Steam, Hot hydro-fluro-silicic acid, Aluminium Fluoride Slurry) (Refer section 4.1.b. "Heat" for details)
- Hydro-Fluro-Silicic acid fumes (Refer section 4.9. h.3. "Acid fumes of hydro-fluro-silicic acid" for details)
- Noise (Refer section 4.1.a. "Noise" for details)
- Work at Height (Refer section 4.1.d. "Working at height" for details)

4.9. i.1. Dust containing Aluminium Hydrate

Possible harmful effects:

The dust particles can affect eyes, skin, respiratory system due to surface irritation and systemically via inhalation, oral ingestion and dermal absorption.

Preventive steps

Engineering control

- Total enclosure of the process using dust.
- Mechanization of handling procedures to prevent all personal contact with the dust.
- Installation of local exhaust ventilation fitted with bag filters and warning devices for leakages

- Provide shower at nearby location

Administrative control

- Monthly evaluation by air samplers to collect PM2.5 & PM10 with respirable suspended particulate matter analyser for Aluminium hydrate, aluminium fluoride & other fluoride dust levels as recommended by CPCB guidelines.
- The occupational exposure limit of Aluminium hydrate (raw material) for 8-hour time weighted average (TWA) for inhalable dust should be limited as per NIOSH / OSHA guidelines, Additionally, fluoride (as F) levels should be monitored and kept below 2.5 mg/m^3 and Fluorine should not exceed 1 ppm or 2 mg/m^3.

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, eye & skin disease.
- Measure fluoride levels in blood and urine before and after working for 5 – 6 consecutive days
- Frequency of medical examination should be increased when the work place PM2.5 / PM 10 levels are higher than threshold limit value.

PPE

This includes use of chemical goggles, face screens, gloves, neoprene or PVC boots and acid resistant clothing.

4.9. i.2. Fumes of Aluminium Fluoride Slurry

Burns, irritation / inflammation of respiratory tract / pulmonary system and irritation / inflammation of the anterior chamber of eye (conjunctivitis, keratitis, etc.) are the common injuries anticipated in employees exposed to the acid fumes. Systemic absorption of the acid can lead to alkaline depletion i.e. acidosis affecting the nervous system and produces agitation, hesitant gait and generalized weakness. Long term systemic absorption could cause osteoflurosis.

Preventive steps

Engineering control

- Total enclosure of the process using Acid fumes of Aluminium fluoride slurry.
- Mechanization of handling procedures to prevent all personal contact with acid fumes.
- Provide shower at nearby location

Administrative control

- 6 monthly air Quality monitoring by air samplers to collect PM 2.5 and PM 10 with RSPM sampler, fluoride analysis, assessment of metals and metalloid particulates in workplace atmosphere (air sampling and ICP analysis) as per CPCB guidelines
- Fluoride (as F) should not exceed 2.5 mg/m3 and Fluorine should not exceed 1 ppm or 2 mg/m3.
- Biological monitoring for fluorides to be undertaken

Medical control

- Pre-employment and 6 monthly medical examinations should be directed at the detection of respiratory, eye & skin disease.
- Contact lens should be avoided in the workplace.

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- Measure fluoride levels in blood and urine before and after working for 5 – 6 consecutive days
- Fluoride levels in urine should not exceed 4 mg/ gm creatinine (indicative of over exposure).

PPE

This includes use of chemical goggles, face screens, gloves, neoprene or PVC boots and acid resistant clothing

4.9.j. Maintenance in various units of the Refinery

- Vibration (due to use of vibrating equipment such as Grinder, Cutter, Drilling machine, etc.) (Refer section 4.1.c. "Vibration" for details)
- Noise (Refer section 4.1.a. "Noise" for details)
- Heat (Refer section 4.1.b. "Heat" for details)
- Light in metal unit area (Refer section 4.1.e. "illumination" for details)

Summary of the occupational health and work place monitoring for each of the units (for detailed description, refer the respective text)

Project construction phase

Hazards	Possible routes of entry / hazard	Common target organ damage	Screening of hazard event / compound	Frequency	Test (Section 5)
Vibration (use of vibrating equipment such as Grinder, Cutter, Drilling machine, etc.).	Physical	Neurological (peripheral), musckulo-skeletal, circulatory	Peripheral circulation, peripheral nerves, locomotor	Annual	Sensory assessments for peripheral nerves (clinical assessment)
Dust	Inhalation, surface absorption	Eyes, Skin, Respiratory system	Respiratory system evaluation	Annual	Eyes, Skin, Respiratory system evaluation recommended
Noise	physical	Auditory, Circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, circulatory system

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/Method
Vibration (due to use of vibrating equipment such as Grinder, Cutter, Drilling machine, etc.).	As indicated in the text	As indicated in the text	As indicated in the text
Dust	Air samplers sampling PM 2.5 and PM 10 with respirable suspended particulate matter (RSPM) sampler.	Monthly	As per bureau of Indian standards (BIS)/ central pollution control board (CPCB) /Indian factories act
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations) to evaluate octave band octave frequency	Monthly	As per CPCB guidelines

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Raw material handling
(for detailed description refer Section 4.9.a.)

Hazards	**Possible routes of entry / hazard**	**Common target organ damage**	**Screening of hazard event / compound**	**Frequency**	**Test (Section 5)**
Dust (Copper Concentrate & rock phosphate)	Inhalation, surface absorption, oral ingestion	Eyes, skin, respiratory system, liver, kidney blood, nervous system and skeletal system	Respiratory system evaluation, Serum copper & ceruloplasmin feroxidase, urinary copper (measured before and after work / shift hours), serum & urine fluoride levels before and after 5 – 6 consecutive working days, blood & urinary levels of heavy metals (mercury, lead, copper, arsenic, cadmium, mercury),	6 monthly, more frequent monitoring is recommended if the workplace copper, heavy metal levels are higher than TLV	Tests to evaluate eyes, skin, respiratory system, liver, kidney, blood, skeletal system (X-ray) & nervous system
Handling heavy machines / moving equipment	NA	General	General health, circulatory system, vision, neurological evaluation	Annual	Circulatory system, vision, neurological evaluation (
Noise	physical	Auditory, Circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, Circulatory system

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
Dust (Copper Concentrate & rock phosphate)	Metal and metalloid particulates (Cu, Pb, As, Se, Ni, Cd, Hg, Bi, Sb) in workplace atmosphere, (by Air sampling and inductive coupled plasma (ICP) analysis). Evaluation by air samplers to collect particulate matter (PM) 2.5 & PM10 with respirable suspended particulate matter (RSPM) analyser for rock phosphate and fluoride levels. Phosphoric acid fumes and fluorine (as fluoride) has to be evaluated in the work place	Monthly	As per occupation safety and health administration (OSHA) method ID-125G or CPCB guideline
Handling heavy machines / moving equipment	Provision for safety / protective measures. Extra precautions to be taken to prevent contact electric shocks with HT/LT lines.	Daily	Indian factories act
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations), octave band analyser, octave frequency analysis	Monthly	As per CPCB guidelines

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Copper smelter
(for detailed description refer Section 4.9.b.)

Hazards	Possible routes of entry / hazard	Common target organ damage	Screening of hazard event / compound	Frequency	Test (Section 5)
Dust (Copper Concentrate)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidney blood, nervous system and skeletal system	Respiratory system evaluation, Serum copper & ceruloplasmin feroxidase, urinary copper (measured before and after work / shift hours), serum & urine fluoride levels before and after 5 – 6 consecutive working days, blood & urinary levels of heavy metals (mercury, lead, copper, arsenic, cadmium, mercury),	6 monthly, more frequent monitoring is recommended if the workplace copper, heavy metal levels are higher than TLV	Tests to evaluate eyes, skin, respiratory system, liver, kidney, blood, & nervous system
Heat (Hot Metal)	physical	Circulatory system, renal system	Renal system	Annual	Tests to evaluate cardiovascular system and kidney
SO_2 Gas	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin respiratory system	Respiratory system	6 monthly	Tests to evaluate eyes, skin, respiratory system
Work at Height	NA	General	General health, circulatory system, vision, neurological evaluation	Annual	Circulatory system, vision, neurological evaluation (vertigo test, tandem walking test)
Noise	physical	Auditory, Circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, Circulatory system

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
Dust (Copper Concentrate)	Metal and metalloid Particulates (Cu, Pb, As, Se, Ni, Cd, Hg) in workplace atmosphere, copper dust and copper fumes levels to be measured (by Air sampling and ICP analysis)	Monthly	As per OSHA method ID-125G or CPCB guideline / BIS method – monitoring of metals at workplace
Heat (Hot Metal)	Heat stress monitoring , wet bulb globe temperature (WBGT) index	Monthly	Indian factories act
SO2 Gas	Air Quality monitoring by Air samplers to collect gaseous samples like SO_2 and NO_x	Monthly	As per CPCB / Indian factories act guidelines
Work at Height	Provision for safety / protective measures: Such as whole body harness, elevated working platforms, safety net to prevent fall should be practiced. Extra precautions to be taken to prevent contact electric shocks with HT/LT lines when working at heights more than 6 feet from the ground	Daily	Indian factories act & National Safety Council Guidelines for work at heights to be followed if available. If not "Working at Height: A Brief Guide" to be followed (http://www.hse.gov.uk/pubns/indg401.pdf)
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations), octave band analyser, octave frequency analysis	Monthly	As per CPCB guidelines

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Copper refinery
(for detailed description refer Section 4.9.c.)

Hazards	Possible routes of entry / hazard	Common target organ damage	Screening of hazard event / compound	Frequency	Test (section 5)
Acid Fumes (Copper Sulphate)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidney	Respiratory system evaluation, Serum copper & ceruloplasmin feroxidase, urinary copper (measured before and after work / shift hours)	6 monthly, more frequent monitoring is recommended if the workplace copper levels are higher than TLV	Target organ evaluation recommended
Heat (Steam and Hot Electrolyte of Copper Sulphate)	physical	Circulatory system, renal system	Renal system	Annual	Target organ evaluation recommended
Work at Height	NA	General	General health, circulatory system, vision, neurological evaluation	Annual	Circulatory system, vision, neurological evaluation (vertigo test, tandem walking)
Noise	physical	Auditory, circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, circulatory system

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
Acid Fumes (Copper Sulphate)	Air quality monitoring by air samplers to collect gaseous samples like SO_2 and Arsine, followed by metal and metalloid analysis	Monthly	As per BIS / CPCB / OSHA
Heat (Steam and Hot Electrolyte of Copper Sulphate)	Heat stress monitoring , WBGT index	Monthly	Indian factories act
Work at Height	Provision for safety / protective measures (such as net / ropes for sky folding)	Daily	Visual inspection as per Indian factories act
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations) to evaluate octave band octave frequency	Monthly	As per CPCB guidelines

Copper rod plant
(for detailed description refer Section 4.9.d.)

Hazards	Possible routes of entry / hazard	Common target organ damage	Screening of hazard event / compound	Frequency	Test (section 5)
Heat (Hot Metal)	physical	Circulatory system, renal system	Renal system	Annual	Tests to evaluate circulatory system & renal system
Work at Height	NA	General	General health, circulatory system, vision, neurological evaluation	Annual	Circulatory system, vision, neurological evaluation (vertigo test, tandem walking test)
Noise	physical	Auditory, circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, circulatory system

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
Heat (Hot Metal)	Heat stress monitoring , WBGT index	Monthly	Indian factories act
Work at Height	Provision for safety / protective measures: such as whole body harness, elevated working platforms, safety net to prevent fall should be practiced. Extra precautions to be taken to prevent contact electric shocks with HT/LT lines when working at heights more than 6 feet from the ground	Daily	Indian factories act & National Safety Council Guidelines for work at heights to be followed if available. If not "Working at Height: A Brief Guide" to be followed (http://www.hse.gov.uk/pubns/indg401.pdf)
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations) to evaluate octave band octave frequency	Monthly	As per CPCB guidelines

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Precious metal recovery
(for detailed description refer Section 4.9.e.)

Hazards	Possible routes of entry / hazard	Common target organ damage	Screening of hazard event / compound	Frequency	Test (section 5)
Dust (As)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidneys, bone	Arsenic levels urine (preferred) / blood	6 monthly	ICP-MS method
Dust (Pb)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, kidneys, blood, GIT, CNS	Blood Lead & Delta-aminolevulinate dehydratase levels, urine lead levels	6 monthly	ICP-MS method
Dust (Se)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver,	Selenium levels in blood	6 monthly	ICP-MS method
Heat (hot metal)	NA	Circulatory system, renal system	Renal system	Annual	Tests to evaluate circulatory system & renal system
SO_2 Gas	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin respiratory system	Respiratory system	6 monthly	Tests to evaluate eyes, skin, respiratory system
Work at Height	NA	General	General health, circulatory system, vision, neurological evaluation	Annual	Circulatory system, vision, neurological evaluation (vertigo test, tandem walking)
Noise	physical	Auditory, Circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, Circulatory system
Acid Fumes	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, Liver, kidney	Respiratory system evaluation	6 monthly	Tests to evaluate eyes, skin, respiratory system

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
Dust (As)	Metal and metalloid Particulates in workplace atmosphere (Air sampling and ICP analysis)	Monthly	As per American Conference of Governmental Industrial Hygienists (ACGIH) / NIOSH / OSHA method ID-125 or CPCB guideline / Indian factories act
Dust (Pb)	Metal and metalloid Particulates in workplace atmosphere (Air sampling and ICP analysis)	Monthly	As per ACGIH / NIOSH / OSHA method ID-125 or CPCB guideline / Indian factories act
Dust (Se)	Metal and metalloid Particulates in workplace atmosphere (Air sampling and ICP analysis)	Monthly	As per ACGIH / NIOSH / OSHA method ID-125 or CPCB guideline / Indian factories act
Heat (hot metal)	Heat stress monitoring, WBGT index	Monthly	Indian factories act
SO_2 Gas	Air Quality monitoring by Air samplers to collect gaseous samples like SO_2 and NO_x	Monthly	As per CPCB / Indian factories act guidelines
Work at Height	Provision for safety / protective measures: Such as whole body harness, elevated working platforms, safety net to prevent fall should be practiced. Extra precautions to be taken to prevent contact electric shocks with HT/LT lines when working at heights more than 6 feet from the ground	Daily	Indian factories act & National Safety Council Guidelines for work at heights to be followed if available. If not "Working at Height: A Brief Guide" to be followed (http://www.hse.gov.uk/pubns/indg401.pdf)
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations) to evaluate octave band octave frequency	Monthly	As per CPCB guidelines
Acid Fumes	Air Quality monitoring by Air samplers to collect gaseous samples like SO_2, ozone , oxygen and NO_x	Monthly	As per CPCB guidelines or OSHA method ID-200 / Indian factories act

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Sulphuric acid plant
(for detailed description refer Section 4.9.f.)

Hazards	**Possible routes of entry / hazard**	**Common target organ damage**	**Screening of hazard event / compound**	**Frequency**	**Test (section 5)**
SO_2 Gas	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin respiratory system	Respiratory system	6 monthly	Tests to evaluate eyes, skin, respiratory system
Work at Height	NA	General	General health, circulatory system, vision, neurological evaluation	Annual	Circulatory system, vision, neurological evaluation (vertigo test, tandem walking test)
Noise	physical	Auditory, circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, circulatory system
Sulphuric Acid fumes	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, renal	Respiratory system	6 monthly	Tests to evaluate eyes, skin, respiratory system, kidney
Vanadium pentoxide	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system	Respiratory system	6 monthly	Tests to evaluate eyes, skin, respiratory system, kidney
Heat (Steam and Hot Sulphuric Acid)	Inhalation, surface absorption, oral ingestion, local hazard	Circulatory system, renal system	Renal system	Annual	Tests to evaluate kidney, cardiovascular system

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
SO2 Gas	Air Quality monitoring by Air samplers to collect gaseous samples like SO_2 and NO_x	Monthly	As per CPCB / Indian factories act guidelines
Work at Height	Provision for safety / protective measures: Such as whole body harness, working platforms, safety net to prevent fall should be practiced. Extra precautions to be taken to prevent contact electric shocks with HT/LT lines when working at heights	Daily	Visual inspection as per Indian factories act
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations) to evaluate octave band octave frequency	Monthly	As per CPCB guidelines
Sulphuric Acid fumes	Air sampling by Silica gel sorbent tubes with personal sampling pump (with calibrated flow in line with silica gel tube) followed by analysis with Ion exchange chromatograph with electrical conductivity detector or field monitoring stations (monitoring of SO_2, SO_3 & acid mist levels)	4/8 hourly	As per OSHA method ID-113/165SG OR CPCB Guideline / Indian factories act
Heat (Steam and Hot Sulphuric Acid)	Heat stress monitoring , WBGT index	Monthly	Indian factories act

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
Dust (ETP Sludge containing heavy metals)	Air Quality monitoring by Air samplers to collect PM 2.5 and PM 10 with RSPM sampler. Metal and Metalloid Particulates in workplace atmosphere to be measured as well (Air sampling and ICP analysis). Swab samples from foot & hand of employees should be evaluated for heavy metals	Monthly	As per CPCB guideline
Work at Height	Provision for safety / protective measures: Such as whole body harness, elevated working platforms, safety net to prevent fall should be practiced. Extra precautions to be taken to prevent contact electric shocks with HT/LT lines when working at heights more than 6 feet from the ground	Daily	Indian factories act & National Safety Council Guidelines for work at heights to be followed if available. If not "Working at Height: A Brief Guide" to be followed (http://www.hse.gov.uk/pubns/indg401.pdf)
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations) to evaluate octave band octave frequency	Monthly	As per CPCB guidelines
Acid Fumes	Air sampling by Silica gel sorbent tubes with personal sampling pump (with calibrated flow in line with silica gel tube) followed by analysis with Ion exchange chromatograph with electrical conductivity detector or field monitoring stations (monitoring of SO_2, SO_3 & acid mist levels)	4/8 hourly	As per OSHA method ID-113/165SG OR CPCB Guideline / BIS

Effluent treatment plant
(for detailed description refer Section 4.9.g.)

Hazards	Possible routes of entry / hazard	Common target organ damage	Screening of hazard event / compound	Frequency	Test (section 5)
Dust (ETP Sludge containing heavy metals)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidneys, bone	screen for key heavy metals in blood and urine e.g. Hg, Pb, Cu, Ar, Cd, fluoride	6 monthly (Measure fluoride levels before and after 5 - 6 consecutive days of work)	ICP-MS method
Work at Height	NA	General	General health, circulatory system, vision, neurological evaluation	Annual	Circulatory system, vision, neurological evaluation (vertigo test, tandem walking test)
Noise	Physical	Auditory, circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, circulatory system
Acid Fumes	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, Liver, kidney	Respiratory system evaluation	Annual	Tests to evaluate eyes, skin, respiratory system, liver and kidney

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Phosphoric acid plant
(for detailed description refer Section 4.9.h.)

Hazards	Possible routes of entry / hazard	Common target organ damage	Screening of hazard event / compound	Frequency	Test (section 5)
Dust (Rock Phosphate)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidneys, blood, spleen, GIT, CNS, Kidneys, Blood, gingival tissue	Respiratory system evaluation screen for key heavy metals in blood and urine e.g. Hg, Pb, Cu, Ar, Cd,	Annual	Tests to evaluate Eyes, skin, respiratory system, liver, kidneys, blood, spleen, GIT, CNS.
Acid Fumes (Phosphoric Acid with Fluorine)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidneys	Respiratory system evaluation & urinary fluoride by ICP-MS	Annual (Measure fluoride levels before and after 5 - 6 consecutive days of work)	Tests to evaluate eyes, skin, respiratory system, liver and kidney
Heat (Steam, Hot Water, Hot Phosphoric Acid & Slurry)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidneys, circulatory	Respiratory system	6 monthly	Tests to evaluate eyes, skin respiratory system, liver, kidney and circulatory system
Phosphoric Acid	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver	Respiratory system	6 monthly	Tests to evaluate eyes, skin, respiratory system, and liver
Hydro-Fluro-Silicic Acid fumes	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidneys	Respiratory system	6 monthly	Tests to evaluate eyes, skin, respiratory system, liver and kidney
Work at Height	NA	General	General health, circulatory system, vision, neurological evaluation	Annual	Circulatory system, vision, neurological evaluation (vertigo test, tandem walking test)
Noise	physical	Auditory, Circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, circulatory system

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
Dust (Rock Phosphate)	Personal air monitoring to collect respirable dust PM10 & 2.5 dust for rock phosphate and fluoride exposures to be undertaken. phosphoric acid fumes and fluorine as fluoride has to be evaluated in the work place and the concentration of phosphorous acid should not exceed 1 ppm or 1 mg/m^3, fluoride (as F) should not exceed 2.5 mg/m3 and Fluorine should not exceed 1 ppm or 2 mg/m^3. Additionally Co, K, Mg, Mn, Na, Cd, Cu, Cr, Ni, Pb, Zn levels should be monitored	Monthly	As per CPCB guideline NIOSH guidelines
Acid Fumes (Phosphoric Acid with Fluorine)	Phosphorous acid should not exceed 1 ppm, fluoride (as F) should not exceed 2.5 mg/m^3 and Fluorine should not exceed 1 ppm or 2 mg/m^3. Collection by air sampling followed by analysis as per OSHA method ID 111, fluoride analysis	Half hourly and 24 hourly	As per OSHA method ID-111 /BIS
Heat	Heat stress monitoring , WBGT index	Monthly	Indian factories act
Phosphoric Acid	Collection by air sampling followed by analysis as per OSHA method ID 111	Half hourly and 24 hourly	As per OSHA method ID-111 or CPCB guidelines / BIS
Hydro-Fluro-Silicic Acid fumes	Airborne Fluoride estimation through personal air monitoring for both particulate and gaseous phase fluorides. Exposure to hydro-fluor-silici acid should not exceed 2.5 mg/m^3 as per US OSHA/ACGIH/NIOSH guidelines. Contact lens should be avoided in the workplace. Fluoride levels in urine should not exceed 4 mg/L, indicate over exposure. Biological monitoring for fluorides to be undertaken	Once in 6 Months	As per OSHA/NIOSH methods
Work at Height	Provision for safety / protective measures: Such as whole body harness, elevated working platforms, safety net to prevent fall should be practiced. Extra precautions to be taken to prevent contact electric shocks with HT/LT lines when working at heights more than 6 feet from the ground	Daily	Indian factories act & National Safety Council Guidelines for work at heights to be followed if available. If not "Working at Height: A Brief Guide" to be followed (http://www.hse.gov.uk/pubns/indg401.pdf)
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations) to evaluate octave band octave frequency	Monthly	As per CPCB guidelines

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Aluminium fluoride plant
(for detailed description refer Section 4.9.i.)

Hazards	Possible routes of entry / hazard	Common target organ damage	Screening of hazard event / compound	Frequency	Test (section 5)
Dust (Aluminium Hydrate)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system	Respiratory system evaluation urinary fluoride by ICP-MS method	Annual (Measure fluoride levels before and after 5 - 6 consecutive days of work)	Tests to evaluate eyes, skin, respiratory system
Aluminium Fluoride Slurry Fumes	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system	Respiratory system evaluation & urinary fluoride by ICP-MS method	Annual (Measure fluoride levels before and after 5 - 6 consecutive days of work)	Tests to evaluate eyes, skin, respiratory system
Heat (Steam, Hot Hydro-Fluro-Silicic Acid, Aluminium Fluoride Slurry)	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidneys, circulatory	Respiratory system	6 monthly	Tests to evaluate eyes, skin, respiratory system, liver, kidneys, circulatory system
Hydro-Fluro-Silicic Acid fumes	Inhalation, surface absorption, oral ingestion, local hazard	Eyes, skin, respiratory system, liver, kidneys	Respiratory system evaluation urinary fluoride by ICP-MS method	Annual (Measure fluoride levels before and after 5 - 6 consecutive days of work)	Tests to evaluate eyes, skin, respiratory system, liver, kidneys
Work at Height	NA	General	General health, circulatory system, vision, neurological evaluation	Annual	Circulatory system, vision, neurological evaluation (vertigo test, tandem walking test)
Noise	physical	Auditory, circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, circulatory system

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
Dust (Aluminium Hydrate)	Air Quality monitoring by Air samplers to collect PM 2.5 and PM 10 with RSPM sampler, fluoride analysis	Monthly	As per CPCB guideline
Aluminium Fluoride Slurry Fumes	fluoride (as F) should not exceed 2.5 mg/m3 and Fluorine should not exceed 1 ppm or 2 mg/m3. Air Quality monitoring by Air samplers to collect PM 2.5 and PM 10 with RSPM sampler, fluoride analysis, assessment of metals and metalloid particulates in workplace atmosphere (Air sampling and ICP analysis)	Monthly	As per CPCB guidelines
Heat (Steam, Hot Hydro-Fluro-Silicic Acid, Aluminium Fluoride Slurry)	Heat stress monitoring , wet bulb globe temperature (WBGT) index	Monthly	Indian factories act
Hydro-Fluro-Silicic Acid fumes	Airborne Fluoride estimation through personal air monitoring for both particulate and gaseous phase fluorides. Contact lens should be avoided in the workplace. Fluoride levels in urine should not exceed 4 mg/L, indicate over exposure. Biological monitoring for fluorides to be undertaken	at least once in 6 months	As per NIOSH/OSHA/ACGIH methods
Work at Height	Provision for safety / protective measures: Such as whole body harness, elevated working platforms, safety net to prevent fall should be practiced. Extra precautions to be taken to prevent contact electric shocks with HT/LT lines when working at heights more than 6 feet from the ground	Daily	Indian factories act & National Safety Council Guidelines for work at heights to be followed if available. If not "Working at Height: A Brief Guide" to be followed (http://www.hse.gov.uk/pubns/indg401.pdf)
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations) to evaluate octave band octave frequency	Monthly	As per CPCB guidelines

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Maintenance of other units in the refinery
(for detailed description refer Section 4.9.j.)

Hazards	Possible routes of entry / hazard	Common target organ damage	Screening of hazard event / compound	Frequency	Test (section 5)
Vibration (due to use of vibrating equipment's).	Mechanical	Neurological (peripheral), musckulo skeletal, circulatory	Peripheral circulation, peripheral nerves, locomotor	Annual	Sensory assessments for peripheral,
Dust	Inhalation, surface absorption,	Eyes, Skin, Respiratory system	Respiratory system	Annual	Target organ evaluation recommended
Noise	physical	Auditory, Circulatory	Screen for sensory neural hearing loss	Annual	Pure - tone audiometry, Circulatory system
Heat	NA	Circulatory system, renal system	Renal system	Annual	Target organ evaluation recommended
Light in metal unit area	NA	Eyes, skin	ophthalmic evaluation	Annual	Target organ evaluation recommended

Hazards	Workplace monitoring	Frequency of monitoring	Test protocol/method
Vibration	As indicated in the text	Refer text	As indicated in the text
Dust	Work place air quality monitoring using Personal and low volume (area) air samplers to collect PM 2.5 and PM 10. The dust concentrations to be compared with permissible exposure limits (PELs) of Indian Factories Act 1948.	Monthly	As per CPCB guideline / Indian factories act 1948
Noise	Noise level meter equivalent noise level-dB (A) (minimum 10 locations), octave band analyser, octave frequency analysis	Monthly	As per CPCB guidelines
Heat	Heat stress monitoring , WBGT index	Monthly	Indian factories act
Light in metal unit area	Intensity of light in lumens or lux to be measured by Lux meter to be compared with IS:6665:1972 (Reaffirmed in 2005)	Once in 6 Months	National Lighting Standards 2010 applicable for industrial lighting (BIS) or updated version. Or "Code of Practice for Industrial Lighting" IS: 6665:1972 (Reaffirmed in 2005) or ISO 8995-1:2002 to be followed

Table: Reference permissible limit of exposure values for individual hazards

Hazards identified	Permissible limits of exposure (TWA - 8 Hours) @
Copper dust *, (raw)[3]	$(0.2)^3$ mg/m^3
Copper fume *	0.2 mg/m^3
Lead*	0.15 mg/m^3
Arsenic*	0.002 mg/m^3
Selenium^	0.2 mg/m^3
Fluorine *	2 mg/m^3
Iron *	5 mg/m^3
Silicon dioxide *	(30mg/m^3) or (% of SiO_2 + 2)
MgO ^	5 mg/m^3
CaO *	2 mg/m^3
Al_2O_3 ^	5 mg/m^3
Zinc *	5 mg/m^3
Fe_2O_3 *	5 mg/m^3
Bismuth ^	5mg/m^3
Antimony ^	0.5mg/m^3
Nickel *	0.05 ppm or 0.35 mg/m^3
Cadmium *	0.05 mg/m^3
Chlorine *	1 ppm or 3 mg/m^3
Mercury (alkyl compounds) *	0.01 mg/m^3
Mercury (non-alkyl compounds) *	0.05 mg/m^3
Mercury (aryl & inorganic compounds) *	0.1 mg/m^3
Silver ^	0.01mg/m^3
gold	Data NA
P_2O_5 $^{\psi}$	1 mg/m3
SO_3 ^	1 mg/m^3 / Sulphuric Acid
$CaCO_3$ ^	5mg/m^3
CO_2 ^	9000mg/m^3
SO_2 Gas *	5 mg /m^3
Acid Fumes (Copper Sulphate) ^	0.1 mg/m^3
Sulphuric Acid fumes *	1 mg/m^3
Chromic acid / chromates *	0.05 mg/m^3
Chromous salts *	0.05 mg/m^3
Cobalt ^	0.1mg/m^3
Phosphoric acid *	1 mg/m^3
Fluorides *	2.5 mg/m^3
Hydro Fluro Silicic Acid fumes as fluoride ^	2.5 mg/m^3
Dust (Aluminium Hydrate) ^	5 mg/m^3
Aluminium Fluoride Slurry Fumes as fluoride ^	2.5 mg/m^3
Vanadium pentoxide @	0.5 mg / m^3 (as respirable dust) & 0.1 mg / m^3 (as fumes)

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* Data as per Indian factories act
^ Data as per OSHA
Ψ Data as per American Industrial hygiene association
@ The exposure values of vanadium pentoxide is ceiling levels unlike the other hazards that TWA measurement for permissible exposure limit.

Section 5: Occupational health assessment / medical evaluation:

Pre-placement and periodic clinical evaluation is the key towards early identification of occupational illness / disease. All employees should be educated regarding the hazards exposed, as well preventive measures to reduce the hazard. The employees should be trained with first aid measures.

Following clinical evaluation is recommended for the early identification of illness.

Pre-placement & periodic clinical evaluation:

Following details are to be extracted during the clinical examination

1. Socio-demographic details: including age, sex, education, tobacco usage, alcohol usage pattern (habits & addiction)
2. Occupational history (past & present employment): Details of previous employment, exposure risk, type of industry, duration of employment, work hours, etc.
3. Details of previous and present medical illness / diseases or symptoms or reasons for long term medications.
4. Family history of diseases and illnesses
5. For female employees:
    a. Menstrual & obstetric history
6. Clinical assessments:
    a. General physical examination: Temperature, pulse, respiratory rate, blood pressure, anthropometry (height, weight, hip circumference, waist circumference) pallor, icterus, lymphadenopathy (swelling of lymph nodes), oedema, clubbing, cyanosis, thyroid swelling, prominent veins (neck, lower limbs)
    b. System specific examination: should include detailed history of signs and symptoms (if any) of the particular system
        i. Respiratory system
        ii. Cardiovascular system
        iii. Central nervous system
        iv. Gastrointestinal system
        v. Dermatological assessment
        vi. Musculoskeletal system
7. Respiratory system evaluation:
    a. Clinical evaluation should include detailed history of respiratory symptoms, dyspnoea, exertional dyspnoea, cough, cough with expectoration, haemoptysis, pharyngitis, laryngitis, sore throat, respiratory tract infections etc.
    b. Pulmonary function tests (spirometry) as per American Thoracic Society (ATS) / European Respiratory Society (ERS) criteria
    c. Chest X-ray Posterio-Anterior as recommended by the "Guidelines for the use of the ILO international classification of radiographs of pneumoconiosis" (contraindicated in case of pregnant women)

medical officer is expected to watch for other possible acute illnesses and report the notifiable occupational diseases to the local DISH authorities.

- The individuals are expected to be in their best possible health, individuals identified with compromised clinical parameters should not be employed in the particular work place /industry / unit as the occupational exposure could aggravate the aforementioned clinical parameter / illness
- The frequency of evaluation indicated is for individuals with all parameters within normal range and all recommended hazard control measures have been employed.
- A particular individual employed in a particular unit, has the risk of being exposed to all the hazards mentioned, therefore has to be evaluated for the entire hazards described (e.g. individual employed in copper smelter is expected to be screened for all the identified hazards such as noise, dust of copper concentrate, heat, sulphur dioxide, noise and working at height).
- Clinical assessments described under the hazards of "dust", "heat" and "working at heights" are to prevent accidents / ill effects, due to the particular hazards.
- Re-assessment of the employee, confirming the fitness is mandatory at the time of joining back to duty post illness / injury
- Exit examinations of employees are mandatory at the time leaving / discontinuing services at the industry.

8. Cardiovascular system: Electrocardiogram (ECG) for persons aged > 45 years.
9. Blood investigations:
    a. Complete hemogram: Hemoglobin, cell count (TC, DC), blood grouping, platelet, RBC count, peripheral blood smear (PBS), bleeding time (BT), clotting time (CT), erythrocyte sedimentation rate (ESR),
    b. Random blood sugar (RBS)
10. Liver function test:
    a. Clinical examination: change in appetite, jaundice, nausea, vomiting, dyspepsia etc.
    b. Laboratory investigation: Albumin, globulin, AG ratio, SGOT, SGPT, ALP, serum bilirubin, GGT
11. Renal function test:
    a. Blood: Serum urea & creatinine, uric acid,
    b. Urine examination: Protein, sugar
12. Audiometry: Persons exposed to noise / sound level > 90 db time weighed average, are required to undergo 6 monthly periodic screening for noise induced hearing loss (NIHL) using pure tone average (PTA) audiometry.
13. Ophthalmic evaluation:
    a. History such as burning, dryness, redness, water of eyes etc. should be inquired along with clinical evaluation of conjunctiva, cornea, sclera, lens etc.
    b. Screen for refractory errors, colour vision, binocular Vision, peripheral vision etc. (preferably using Titmus vision tester).
14. Dermatological evaluation: clinical evaluation and recording for blisters, keratosis, infection, wound, hyperpigmentation etc. (if any found, these lesions to be recorded and monitored every 3 months)
15. Neurological evaluation (in addition to routine clinical neurological evaluation)
    a. Peripheral: clinical evaluation including detection of paraesthesia, tingling and sensory abnormalities
    b. Balance: clinical vertigo test & tandem walking test
    c. Higher mental (cognitive) functions such as attention, orientation, comprehension and memory should be evaluated.
16. Biological monitoring programme (to be performed periodically post-employment):
    a. Blood, urine, hair, nail samples of representative groups of workers to be evaluated for heavy metal such as arsenic, lead, copper, cadmium, mercury, chromium, nickel, aluminium, iron and zinc

Clinical assessments, at the described frequency should include detailed clinical assessment i.e. "6. Clinical assessments" as well the target organ evaluation tests (described above 7 – 14) mentioned in the list.

If workplace monitoring reveal additional hazards such as arsenic / other heavy metals, the employees will undergo additionally screened accordingly.

- The screening tests described in the document are meant to early detection of the anticipated chronic illness / harmful effects of the particular hazard, however the factory

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EAC OBSERVATION:

As per the Public hearing proceedings, it is noted that there are strong oppositions from the stake holders against the installation of copper smelter unit. Consolidated list of point-wise issues raised and response provided along with action plan for implementation has not been submitted.

REPLY:

Many of the participants in public hearing was also in the support of the project as recorded in public hearing proceedings videos. The consolidated point-wise issues raised and responses along with action plan for implementation has been provided in Chapter-7 of final EIA Report.

A budgetary provision of Rs 1044 Cr for Environmental protection and provision of Rs. 58 Cr has been allocated as Corporate Environment Responsibility (CER). The allocation of fund in CER has been arrived on the basis of issues raised in public hearing and findings of Social Impact Assessment (SIA) study.

The budgetary provision of Rs 1044 Cr for Environmental protection has been allocated for Air protection: Rs. 639 Cr, Water protection: Rs.360 Cr, Solid waste & EMS: Rs. 45 Cr has been detailed in the **chapter-6 of EIA in table-6.5**.

The details about CER is provided in **Annexure-33 of ADS Reply.**

Details of PH proceedings along with action plan is attached as **Annexure-20 of ADS Reply.**

The following issues were raised by the public and the following actions plan has been prepared:

EAC OBSERVATION NO.-20

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Issue Related to Need for project:

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	Plant will produce 30 lakh tons of Sulphuric acid, so why do you want to establish this plant here? We want clean environment	India import ~ 1.5 MMTPA of Sulphur for production of Sulphuric Acid (equivalent qty of Sulphuric Acid 4.5 MMTPA) and 1 MMTPA as a Sulphuric Acid product. Sulphuric Acid is by-product of Copper Refinery Project (Copper Smelter Plant); which is widely used for manufacture of fertilisers and other chemicals. This will reduce import for acids requirement of India and thereby foreign exchange. Mundra location for this project has been selected based on the following advantages: 1. Proximity to Market. 2. Availability of land; and 3. Availability of infrastructure such as port facilities, water, power, road, rail etc. Environmental Management Plan has been developed to keep the environmental parameters within the stipulated limits as per NAAQMS. The comparison of salient features of alternative sites done and details are presented in Table-5.1 and shown in Figure-5.1 of the EIA report.	-

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EAC OBSERVATION NO.-20

Issue Related to Community Development

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	Develop 3 Cowsheds in Kandagara.	Cowshed will be construction in Kandagara village as per Panchayat resolution.	Under CER a budget of Rs. 20 Lakhs has been allocated for Cowshed construction in the said village.
2	What will Adani do for the education, health and fodder for cattle?	Various education and health program is ongoing in the area by Adani Foundation. Establishment of a full fledged a burn care facility at Bhuj District Hospital Fodder issue will be addressed through CSR activities.	It is proposed to establish a full fledged a burn care facility at Bhuj of Rs. 9.5 Crore and Burn care unit at Mundra of Rs. 2 Crore. Establish Smart Classes and Renovation/development of primary/middle schools of Rs. 6.89 Crore.
3	Develop fisheries harbour	Bhadreshwar is outside the study area of this project.	-
4	He represented that this project is only 5 km away from our village. Therefore it is submitted that our village should also be given priority in the manner that Navinal and Shiracha are given priority.	CER Project village wise to be prepared.	-
5	Farming gets affected due to sea water, High TDS in borewell water	Drinking water facility has been proposed by providing overhead tank in the project area villages (Moti Khakhar, Desalpar and Siracha). To reduce the salinity ingress, it is planned to adopt program which is inline with state government activities for watershed management by check dams in upstream areas with due engineering details in consultation with Water Recourses Department.	CER budget (Rs. 16 Crores) for drinking water project by providing overhead tank in the project area villages (Siracha, Jarpara, Desalpar and Moti Khakhar village) has been proposed. Watershed management by check dams in upstream areas with due engineering details in consultation with Water Recourses Department under CER budget (Rs. 10.5 Crores).
6	Dates agriculture development should also take place. Adani Company should establish a laboratory at Mundra for Tissue culture development of date farming.	Tissue cuture laboratory in local dates palm Research Institute, Govt of Gujarat in Mundra, will be established.	Under CER budget Rs. 1.25 Crores has been allocated for development of tissue culture laboratory in local dates palm Research Institute, Govt of Gujarat in Mundra.
7	Jobs and livelihood opportunities for women to be created. How ladies will be given employment?	Local ladies will be made capable by providing training for getting employed in services like horticulture, housekeeping and canteen etc. Apart from this other livelihood opportunities under Self Help Group through Adani Foundation under CSR will be created.	-

EAC OBSERVATION NO.-20

Issue Related to Employment

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	Will I be given job at the new plant? What is the duty time and salary of on roll employees? what is the percentage of local public that will get employment?	Locals will be given preference to employment based on skill set & eligibility requirement as per the job. Facility and infrastructure will be added in existing skill development centre run by Adani Foundation at Mundra. Plant will be operated round o'clock basis. There will be 3 shifts for the plant people and day shift for the non-plant employee and administrative staff. Salary will be based on the skill set, Job experience and role offered. As per the existing regulations of central & state government and availability of skillsets, local people will be provided preference for employment.	Fund of Rs. 2 Crores has been allocated for facility and infrastructure addition in existing skill development centre run by Adani Foundation at Mundra.
2	A committee should be constituted so that the local public gets employment and an open discussion / meeting should be held between the company officers and committee for the purpose of providing employment to local public. Create a database for the qualified persons for providing job opportunities.	Database exchange center facility, in the exiting skill development center run by Adani Foundation; so that records of skilled people from the area will be maintained and will be made available to other industries.	Under CER for proposed project, fund of Rs. 2 Crores has been allocated for database exchange center facility, in the exiting skill development center run by Adani Foundation
3	What steps will been taken to develop the unskilled people to give them the right opportunity? What kind of employment will be given to the unskilled people? How will employment be provided in this plant? what is the percentage of local public that will get employment?	Locals will be given preference to employment based on skill set & eligibility requirement of the job. Required Skillset for the proposed project: • Mechanical Maintenance • Electrical Maintenance • HEMM Operations & Maintenance • Horticulture • C&I Unskilled people will be made capable by providing training for getting employed in services like horticulture, housekeeping and canteen etc.	Under CER for proposed project, fund of Rs. 2 Crores has been allocated for facility and infrastructure addition in existing skill development centre run by Adani Foundation at Mundra.

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EAC OBSERVATION NO.-20

Issue Related to Environment

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
1	Which organization has conducted the study? Which laboratory has conducted the monitoring? Provide certificate of the same.	M/s. Vimta Labs Limited (VLL), Hyderabad is a QCI/NABET accredited and MoEF&CC recognized and NABL accredited Laboratory; who has conducted study and laboratory analysis.	-
2	VIMTA is a Private organization, we don't accept VIMTA's report.	M/s. Vimta Labs Limited (VLL), Hyderabad is a QCI/NABET accredited and MoEF&CC recognized and NABL accredited Laboratory. The credentials of M/s. Vimta Labs Limited are given in Chapter-11 of the EIA Report.	-
3	How many villages of the Mandvi and Mundra taluka are affected in this project? Provide the details about distance.	The study area of 10 km radial distance from the boundary of the proposed project consists of 16 villages. This includes 12 villages from Mundra Taluka (Tunda, Siracha, Navinal, Deshalpar, Khakhar Moti, Kandagara Mota, Nani Bhujpur, Jarpara, Moti Bhujpar, Borana, Pratappar and Dhrab), 4 villages from Mandvi Taluka (Nani Khakhar, Nana Bhadiya, Mota Bhadiya, and Tragadi). The list of Number and locations of monitoring stations (as per CPCB guidelines) are decided based on the nature of project, meteorological conditions, Topography, selected pollution pockets in the area and likely impact areas. Based on the impact assessment modelling, the GLC to land around 2.1 km in NE direction. Total cumulative concentration of pollutants is found to be well within the prescribed limits.	-
4	At the time of making this report, how many numbers of villages have been visited by the company and were the local people present at that relevant point of time?	Baseline monitoring was carried out in the study area of 10 km radial distance from the boundary of the proposed project. It consists of 16 villages. This includes 12 villages from Mundra Taluka (Tunda, Siracha, Navinal, Deshalpar, Khakhar Moti, Kandagara Mota, Nani Bhujpur, Jarpara, Moti Bhujpar, Borana, Pratappar and Dhrab), 4 villages from Mandvi Taluka (Nani Khakhar, Nana Bhadiya, Mota Bhadiya, and Tragadi). Focussed Group Discussion for Social Impact Assessment was also carried out in these villages.	-
5	At the time of presentation, the list of only 8 villages is shown. Why other villages are not included? Why is monitoring done in only 8 villages? Show us the list of 16 villages. Give the proof of 08 villages visited.	The baseline ambient air quality, noise and soil monitoring was carried out at 8 location s per the TOR prescribed by MoEF&CC. The monitoring locations were selected based on the nature of project, meteorological conditions, topography, land use conditions, existing pollution pockets in the area and the likely impact areas. Photograph to be attached/ Hyperlinked.	-
6	1) The photographs of place and equipment used shall be shown from where the samples were	1) The photographs of place and equipment used shall be shown from where the samples were collected. 2) You are showing the photographs of your proposed project, show the photographs of the	1) The photographs of sampling place and

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Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
	collected. 2) You are showing the photographs of your proposed project, show the photographs of the monitoring carried out.	monitoring carried out.	equipment used for monitoring had been shown during the public hearing. 2) Monitoring photographs along with the respective sampling locations have been given Annexure-VIII in the EIA report.
7	As per the EIA report, you state that no perennial river is present within the project land.	Dhaneshwari, a seasonal river and not a perennial river flows in the western part of the proposed site.	-
8	The project proponent has concealed the information in Form-1. As per the S.No. 16 and 26 of Basic Information of Form-1, with reference to the Gochar land, PIL no. 17/2011 judgment, the project proponent has mentioned that there is no pending PIL for this land. This information is not mentioned in Form-1.	We have not concealed any information in Form-1. The PIL has been disposed. The application has been filed for the diversion of forest land. Under the Form-1, it is stated that the non-forest land is of APSEZ and the application for forest land is under process.	-
9	In the S.No. 2 and 10 of Form-1, it is not mentioned that the Daneshwari river passes through the forest land.	In the EIA report, maps are provided and Daneshwari river is shown in it. Dhaneshwari river also referred as Danesri Nadi (as per Topo sheet no: F42 J9 & 10) stream passing within site (west side). Dhaneshwari, a seasonal river which flows in the western part of the proposed site. The river will not be diverted. The flow of the river will be maintained, as shown in the plant layout on Figure-2.1 of EIA report.	-
10	The sr. no. 10 on page C1-4 of the draft EIA report states that, there is no archaeological place at this site. However, at a distance of around 500 to 1000 meters from the proposed	As per Archaeological Survey of India, there is no notified archaeological site present within 10 km radius from the proposed project site. The nearest archaeological site is Kotai Sun Temple, which is 70 km from the project site.	-

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EAC OBSERVATION NO.-20

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
	project site, the site of Navinal Archaeological site is present. I have the report of the MS University which states that it relates to the Harappa civilization.		
11	How many villages are affected? What is the radius of affected area? How many people were met? How many villages were visited?	The study area of 10 km radial distance from the boundary of the proposed project consists of 16 villages. This includes 12 villages from Mundra Taluka (Tunda, Siracha, Navinal, Deshalpar, Khakhar Moti, Kandagara Mota, Nani Bhujpur, Jarpara, Moti Bhujpar, Borana, Pratappar and Dhrab), 4 villages from Mandvi Taluka (Nani Khakhar, Nana Bhadiya, Mota Bhadiya, and Tragadi). The list of Number and locations of monitoring stations (as per CPCB guidelines) are decided based on the nature of project, meteorological conditions, Topography, selected pollution pockets in the area and likely impact areas. Based on the impact assessment modelling, the GLC to land around 2.1 km in NE direction. Total cumulative concentration of pollutants is found to be well within the prescribed limits.	-
12	What effect will this project produce on sea creatures that have direct connection with fishermen?	No treated effluent will be released into the sea. The proposed project has been designed based on zero liquid discharge system consisting of effluent treatment plant, RO plant and Multi Effect Evaporator. No treated effluent will be discharged outside the plant premises. Rain water collection pond (4*4000 m3) will also be constructed to collect runoff from the process areas. This collected water will be recycled in plant operation. A total of Rs 360 crores will be invested for ETP design and wastewater management.	-
13	What would be the constituents in raw material that would be stored?	Raw materials Copper Ore Concentrate contains mainly copper, iron, sulphur, trace of precious metals and traces of heavy metals. Rock Phosphate contains mainly Calcium Phosphate and Calcium Fluoride. Detailed analysis is provided in the ADS point no:	-
14	which water will be used in the upcoming plant?	APSEZ will provide desalinated water from its Desalination plant.	-
15	You have mentioned that you will make road from the waste. Which waste will be used for road making?	Copper Slag is useful for road making ad NHAI has issued a directive for use of copper slag in road construction.	-
16	Is there any chance of any kind of blast?	HIRA study has been done. There is a chance of blast, if water comes in contact with hot metal. Based on HIRA study as well as recommendation from the technology supplier, adequate measures will be put in place to avoid such incidents. There will be continuous monitoring of flow and temperature of cooling water circulating within the furnace copper cooling elements.	-

EAC OBSERVATION NO.-20

3588

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
17	How much water will be obtained for this project and from which place will it be taken? Have you conducted study for the impact of desalination plant on the marine ecology? What is the impact?	The proposed project will require about 32,800 m^3 desalinated water per day, supplied by desalination plant of APSEZ, who has already obtained the Environmental Clearance.	-
18	Sulphur Di-Oxide impact in a radius of 20-25 km	Modelling studies reveal that the maximum incremental short term 24 hourly ground level concentrations (GLC) will be 17.90 mg/m3 for SO_2 at a distance of 2.2 km in NE direction. The resultant concentrations are predicted to be well within the standards specified by CPCB.	-
19	concentration of Sulphur Dioxide and height of its release quantity of Sulphur Dioxide will be released in air and density of Sulphur Dioxide?	Sulphur Dioxide Concentration in residual gases post tail gas scrubbing and FGD system will be 300 mg/Nm^3 at the outlet of Process Stack. Proposed stack height will be 150 m. About ~375 kg per hour of Sulphur Dioxide will be released in air which will be dispersed quickly with atmospheric air flow and Ground level concentration for SO_2 will remain well within the NAAQ standards as modelling has been done.	-
20	Where the Acidic Water and Chemicals will be released?	No treated effluent will be released into the sea. The proposed project has been designed based on zero liquid discharge system consisting of effluent treatment plant, RO plant and Multi Effect Evaporator. No treated effluent will be discharged outside the plant premises. Rain water collection pond (4*4000 m^3) will also be constructed to collect runoff from the process areas. This collected water will be recycled in plant operation. A total of Rs. 360 Crores will be invested for ETP design and wastewater management.	-
21	In the production of copper plant, Sulphur is to be used and this will have acidic processes.	Installation of Sulphuric Acid Plant for conversion of sulphur di-oxide off-gases generated from the smelting and converting furnaces into sulphuric acid. Installation of Scrubbers for treating fugitive and tail gas emission generated during the production processes with the help of high suction hoods.	-
22	The project is entirely chemical based, which will have impact on water, air, noise, land, etc. and it will affect the agricultural land. What are the measures for protection from such kind of project? Such projects are welcome. We	Based on the baseline monitoring and the impact assessment modelling Environmental Management plan has been prepared to safeguard the environment. Air Pollution Protection: High suction hoods for collection of fugitive gases and scrubbing system to treat the same before releasing through process stack in the atmosphere. Water Pollution Protection: Plant will be operated under Zero Liquid Discharge (ZLD) System and all the treated water will be recycled within the plant process. No treated water will be released outside the plant boundaries. Ground/ Soil Pollution: All the raw material will be stored in concrete paved and covered	-

3293

EAC OBSERVATION NO.-20

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
	are 100% in favour of the development but not at the cost of environment.	storage. Solid waste generated will be handled and stored as per CPCB Guidelines. Rs 1,044 Crore environmental protection budget has been proposed for pollution control equipment's within the proposed project site.	
23	It is required that 33% green belt shall be provided	Total of > 33% Greenbelt has been proposed including 15 m wide greenbelt around the plant boundary. Native species with rich canopy will be planted. Following Species will be planted: 1) Neem (Azadirachta indica) 2) Sisoo, Shisham (Dalbergia sissoo) 3) Babul (Acacia nilotica) 4) Imli (Tamarindus indica) 5) Karanj (Pongamia pinnata) 6) Piloo (Salvadora persica) The trees will be planted in several rows with a tree density of 2000-2500 trees/ha with adequate width around the plant boundary and maintained as per CPCB guidelines.	-
24	No one is against development. The fishermen should also not be affected	No treated effluent will be released into the sea. The proposed project has been designed based on zero liquid discharge system consisting of effluent treatment plant, RO plant and Multi Effect Evaporator. No treated effluent will be discharged outside the plant premises. Rain water collection pond (4*4000 m^3) will also be constructed to collect runoff from the process areas. This collected water will be recycled in plant operation. A total of Rs. 360 crores will be invested for ETP design and wastewater management. Take additional input from SIA findings.	-
25	how will you control the air emissions that will be released in the atmosphere? What is the facility that is done by you as for this? How impact of sulphur dioxide on environment is reduced? The sulphur dioxide that is released in air will damage health and so what steps have been taken by the company?	Installation of Sulphuric Acid Plant for conversion of sulphur di-oxide off-gases generated from the smelting and converting furnaces into sulphuric acid. Installation of Scrubbers for treating fugitive and tail gas emission generated during the production processes will the help of high suction hoods. The residual SO_2 gases post manufacturing of Sulphuric Acid and treatment in tail gas scrubbing & fugitive gas desulphurization approx. **~300 mg/Nm^3, which is lower than the stipulated standard.**	-
26	This area is under the CRZ-1 area. There is no provision for approval of such land.	The proposed project is outside the CRZ area and project boundaries superimposed on CRZ Map prepared in 2011 by MoEF&CC authorised agency is submitted Chapter1 In EIA. Further, NCSCM has also been engaged by MoEFCC for CRZ mapping of entire country and CZMP approval of Kutch district is in process at state government level. M/s. AEL has engaged NCSCM to superimpose proposed project boundary on the approved	-

EAC OBSERVATION NO.-20

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
		CZMP maps.	
27	Different CRZ maps are submitted in the Public Hearing for the years 1991, 2008, 2010 and 2017, which is the correct map out of those? If one map is correct out of four then this shows that the other three are false which indicates the Company has violated the rules of CRZ.	The proposed project is outside the CRZ area and project boundaries superimposed on CRZ Map prepared in 2011 by MoEF&CC authorised agency is submitted. In EIA. Further, NCSCM has also been engaged by MoEF&CC for CRZ mapping of entire country and CZMP approval of Kutch district is in process at state government level. M/s AEL has engaged NCSCM to superimpose proposed project boundary on the approved CZMP maps.	-
28	If the company comes and if there are any chances of environmental degradation, then the government authority should consider it seriously. The work should not remain only on paper.	Based on the baseline monitoring and the impact assessment modelling Environmental Management plan has been prepared to safeguard the environment. Considering possibility of worst case scenarios during plant operation disaster management plan has been prepared.	-
29	why you have selected site No. 2?	3 alternate sites were analysed and the site-2 was selected based on the following parameters; a) Distance from west port (Bulk material handling) b) Distance from Water Source c) Distance from power Source d) Closeness to Railway e) Closeness to State and National highway f) Social and R& R related issues. The details of the same has been already provided in EIA Report Chapter-5.	-

EAC OBSERVATION NO.-20

3591

Issue Related to Health & Safety

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	How you will control the dust? How many doctors will be available?	Dust will be captured at source of generation by providing suction hoods and bag filter. Dust collected will be recycled back into plant process. Dust emission outlet of the bag filter will be < 50 mg/Nm^3. Total of Rs. 639 Crores budget has been allocated for protection of Air Pollution.	CER Budget of Rs. 1.2 Crores has been allocated for the mass plantation in the 10 km radius area of the plant site.
2	Provide about the side effects, risk, etc. from the project.	M/s. NIOH; had been engaged to identify the various health hazards. NIOH had also suggested type and frequency of the various medical test to be carried out. M/s. TALEEM Foundation had been engaged to carry out the base line health index study. M/s. Safety Consultancy Services operated by former Regional Labour Institute (RLI) Director, had been engaged to carry out the HIRA and subsequent remedial measures for reduce the risks. Based on the risk assessment, disaster management plan is prepared. Worst case scenario for the following has been worked out. 1. LPG & Fuel oil Fire 2. Sulphuric Acid and Phosphoric Acid Tank Leakage 3. SO2 Gas leak 4. Furnace Metal Leak	-
3	provide the information that what diseases are possible due to the dust of copper?	Dust will be captured at source of generation by providing suction hoods and bag filter. Dust collected will be recycled back into plant process. Dust emission outlet of the bag filter will be < 50 mg/Nm^3. The PM emission will be well within the prescribed limit set by MoEF&CC. Total of Rs. 639 Crores budget has been allocated for protection of Air Pollution.	CER Budget of Rs. 1.2 Cr has been allocated for the mass plantation in the 10 km radius area of the plant site.

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EAC OBSERVATION NO.-20

'3592

Issue Related to Material Handling & Storage

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	How sludge from ETP will be disposed?	Arsenic bearing sludge will be collected from ETP in Truck/ Tractor trolley and will be stored in secured land fill. Arsenic Bearing ETP Sludge will be stored in Secured land fill with double HDPE Liner of 2 mm thick and will be constructed as per CPCB Guidelines. Chemical gypsum will be collected from ETP in Truck/ Tractor trolley and will be stored in Gypsum storage. Further, it will be sold to cement industries.	-
2	How raw material will be stored & transferred?	Raw material will be stored in covered storage paved with concrete. Raw material (Copper Ore Concentrate and Rock Phosphate) will be transported through closed conveyor system from port to plant.	-
3	How finished product will be transported?	Finished product such as Copper Cathode, Copper Rods will be transported through trucks & container, Sulphuric Acid will be transported through Acid Tankers made of SS316L and Phosphoric Acid will be transported through Rubber lined Acid Tankers.	-
4	List of waste material generating from the plant. What chemicals will be present in the waste? Will mercury come out from this waste? What is the arrangement for waste material storage?	Arsenic bearing sludge will be generated from ETP. Truck/ Tractor trolley and will be used for transporting to secured land fill for storage purpose. Chemical gypsum will be generated from ETP. Truck/ Tractor trolley will be used for transporting to gypsum storage area. Copper slag will be generated as by-product from copper smelter. The same will be transported to slag storage area through conveying system. Phospho-Gypsum will be generated from phosphoric acid plant. The same will be transported to gypsum storage area through closed conveying system. Mercury will be recovered during the manufacturing process of Sulphuric Acid as Calomel and will be sold in the market. The detailed chemical analysis for arsenic bearing sludge (ETP sludge), Phospho-Gypsum, Copper slag has been provided in Chapter-2 in the Final EIA report. Arsenic Bearing ETP Sludge will be stored in Secured land fill with double HDPE Liner of 2 mm thick and will be constructed as per CPCB Guidelines. approx. 13 ha land has been marked for construction of SLF, capacity of storage for 20 years operation. Gypsum will be stored in gypsum storage lined with 1.5 mm HDPE liner and will be constructed as per CPCB Guidelines. Chemical gypsum and phospho-gypsum will be sold for cement manufacturing. Copper slag will be sold for road construction as well as for cement manufacturing.	-

3593

EAC OBSERVATION NO.-20

Issue Related to PH

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	All our questions shall be replied to in Gujarati language. The project representative does not reply in Gujarati language and therefore this means that the local public will not receive employment. The project officer should provide his qualification and identification before giving reply in Gujarati. Company officers should make submissions in the local Gujarati language.	Project Officer has introduced himself with name, qualification and provided photo ID proof for identification. The project presentation was detailed in Gujarati language and responses were provided in Gujarati and Hindi by project proponent.	-
2	When was the report submitted to Mandvi Taluka Panchayat? Is the report provided to community leaders?	the copy of report and CD is provided to Mandvi Taluka Panchayat office on 27.03.2017.	-
3	It is our expectation that the plant will be established by considering the rules framed by the Government of Gujarat and Central Government as well as considering the public interest.	The plant will be established by considering the rules framed by the Government of Gujarat and Central Government as well as considering the public interest. Budget of Rs 1,044 has been allocated for pollution control equipment within the plant for environmental protection.	-
4	The person providing the reply on behalf of the company must provide the company photo ID card, only then he will be allowed to reply. Our boys are not permitted to enter the company without an ID-card.	ID Card was shown on the screen.	-
5	At which five places were the EIA reports placed?	As per the EIA notification of the Government of India, the draft EIA report is made available at following offices: i. District Collector office, Kutch-Bhuj ii. Office of District Development officer, Kutch-Bhuj iii. District Industrial Center, Bhuj-Kutch, iv. Office of the Taluka Development officer, Mundra v. Office of the Taluka Development officer, Mandvi	-
6	How can the public hearing be conducted for this project when the process of forest clearance is still going on?	Public Hearing was organised (Date of Public Hearing: 29th April 2017) by state pollution control board upon considering all the requisite requirement for the public hearing. During the public hearing response was provided by the project proponent that forest clearance for the forest land identified for this project has already been applied (Date of Forest diversion application:8-04/2016) before receipt of the TOR (Date of TOR received - 21st June 2016).	-

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ANNEXURE-20(A)
PUBLIC HEARING PROCEEDINGS AND RESPONSE ALONG WITH THE ACTION PLAN

Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
1	Shri Punshibhai Gadhavi Member of Taluka Panchayat, Mandvi Village: Mota Bhadiya Taluka: Mandvi	He represented that: 1) How many villages of the Mandvi and Mundra taluka are affected in this project? Provide the details about distance. I was a Sarpanch for a period of ten years and I made submissions during that time also but the company did not provide a proper reply. 2) At the time of making this report, how many numbers of villages have been visited by the company and were the local people present at that relevant point of time? 3) How does police behave with ladies of our village? The people of Nana Bhadiya, Mota Bhadiya and Kandagra village are sent back.	The representative of project proponent informed about his designation and qualification and then replied that: • The area of this project includes Siracha and Navinal villages. As per the guidelines under EIA Notification of Ministry of Environment, Forest and Climate Change, Government of India 16 villages within the 10 km radius are included. Out of this, the monitoring is done in 8 villages.	The proposed project is located at Adani Port Special Economic Zone (APSEZ) land in villages Siracha and Navinal, taluka Mundra, district Kutch, Gujarat. 1) The environmental baseline monitoring location have been decided based on the predominant upwind and down wind direction and other environmental sensitive locations and based on EIA guidelines. The study area of 10 km radial distance from the boundary of the proposed project consists of 16 villages. This includes 12 villages from Mundra Taluka (Tunda, Siracha, Navinal, Deshalpar, Khakhar Moti, Kandagara Mota, Nani Bhujpur, Jarpara, Moti Bhujpar, Borana, Pratappar and Dhrab), 4 villages from Mandvi Taluka (Nani Khakhar, Nana Bhadiya, Mota Bhadiya, and Tragadi). The list of Number and locations of monitoring stations (as per CPCB guidelines) are decided based on the nature of project, meteorological conditions, Topography, selected pollution pockets in the area and likely impact areas. 2) During environmental baseline study the list of villages visited and with demographic details are enclosed as Annexure-X in the EIA report. 3) This is not related to Environmental/ EIA studies.
2	Shri Dayabhai Viram Gadhavi Village: Mota Kandagra	He represented that:	The regional officer asked the project representative to translate the replies from	

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ANNEXURE-20(A)
PUBLIC HEARING PROCEEDINGS AND RESPONSE ALONG WITH THE ACTION PLAN

Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
	Taluka: Mundra Shri Rambhai Kanani Village: Zarpara, Taluka: Mundra	1) All our questions shall be replied to in Gujarati language. The project representative does not reply in Gujarati language and therefore this means that the local public will not receive employment. The project officer should provide his qualification and identification before giving reply in Gujarati. 2) How many villages are affected? What is the radius of affected area? How many people were met? How many villages were visited? 3) At the time of presentation the list of only 8 villages is shown. Why other villages are not included? Why is monitoring done in only 8 villages? Show us the list of 16 villages. Give the proof of 08 villages visited.	Hindi to Gujarati language. Representation of project Proponent replied that: • As per the guidelines under EIA Notification of Ministry of Environment, Forests and Climate Change, Government of India, 16 villages within 10 km radius are included. Names of villages where monitoring is carried out are mentioned in the EIA report. All the villages falling within the 10 km radius are covered as per the EIA notification. The date of lab testing report is also provided in the EIA report. The company has prepared the EIA report as per the guidelines. The EIA report was made available at five places.	1) The project presentation was detailed in Gujarati language and issues raised by public was replied by propject proponent in both Gujarati and Hindi language. The proposed project employment about 2000-3000 persons on average per day during construction phase and during operation phase, about 2000 direct employment and 5000 indirect employments will be provided. Locals will be given preference to employment based on skill set & eligibility requirement as per the job and the vacancies available. 2) The study area of 10 km radial distance from the boundary of the proposed project consists of 16 villages. This includes 12 villages from Mundra Taluka (Tunda, Siracha, Navinal, Deshalpar, Khakhar Moti, Kandagara Mota, Nani Bhujpur, Jarpara, Moti Bhujpar, Borana, Pratappar and Dhrab), 4 villages from Mandvi Taluka (Nani Khakhar, Nana Bhadiya, Mota Bhadiya and Tragadi). During environmental baseline study the list of villages visited and with demographic details are enclosed as Annexure-X in the EIA report. 3) The baseline ambient air quality, noise and soil monitoring was carried out at 8 locations. The monitoring locations were selected based on the nature of project, meteorological conditions, topography, land use conditions, existing pollution pockets in the area and the likely impact areas. Monitoring photographs along with the respective sampling locations are given Annexure-VIII in the EIA report.
		4) The laboratory reports should be provided.	• With the due permission of chairman, the	4) The baseline ambient air quality, noise and

ANNEXURE-20(A)
PUBLIC HEARING PROCEEDINGS AND RESPONSE ALONG WITH THE ACTION PLAN

Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
		How old are these reports? At which five places were the sampling done? Which organization has conducted the study? We should be provided with the analysis report of the company. Which laboratory has conducted the monitoring? Provide certificate of the same.	regional officer informed that the person is asking for monitoring reports and requested the representative of the project proponent to provide the same. Representation of project Proponent replied that: • The Chapter-3 (page no. 43) of the EIA report provides the entire information as to the analysis of air at 8 (eight) places. The monitoring was carried out by Government of India, NABET Accredited M/s. VIMTA Labs Ltd., Hyderabad. The certificate is provided in the report. • As per the EIA notification of the Government of India, the draft EIA report is made available at following offices: 1. District Collector office, Kutch-Bhuj 2. Office of District Development officer, Kutch-Bhuj 3. District Industrial Center, Bhuj-Kutch, 4. Office of the Taluka Development officer, Mundra 5. Office of the Taluka Development officer, Mandvi	soil monitoring was carried out at 8 locations, during post-monsoon and part winter season, 2016 (1st October 2016 to 31st December 2016). The monitoring locations were selected based on the nature of project, meteorological conditions, topography, land use conditions, existing pollution pockets in the area and the likely impact areas. The analysis results are already included in the EIA Report (Chapter-3). **M/s. Adani Enterprises Limited (AEL)** has retained the services of NABL/ISO 17025 Certified Laboratory, MOEF&CC and NABET accredited EIA Consultant **M/s. Vimta Labs Limited (VLL)**, Hyderabad to prepare EIA report and Environment Management Plan (EMP) for mitigating possible adverse impacts. The Consultant details (like certification and list of team member involved in the proposed project) are given as Chapter-11. The QCI issued certificate no. NABET/EIA/1720/SA 0088, Valid upto 19th November 2020. The details of consultant along with certificaties are given in Chapter-12 in the EIA report.
		5) At which five places were the EIA reports placed? We have objection to the hearing and proposed project. We have objection as there will be impacts on environment.	• The executive summary of EIA report is provided in 14 gram panchayats. The monitoring is done in 8 villages. The monitoring has been carried out as per the EIA guidelines. We have come here to provide the replies to the objections related to the information provided under the EIA report. You will be heard and a proper reply will be provided. This will be included as part of public hearing proceedings and the final EIA report will be submitted to MoEF.	5) As per the EIA notification of the Government of India, the draft EIA report is made available at following offices: i. District Collector office, Kutch-Bhuj ii. Office of District Development officer, Kutch-Bhuj iii. District Industrial Center, Bhuj-Kutch, iv. Office of the Taluka Development officer, Mundra v. Office of the Taluka Development officer,

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ANNEXURE-20(A)
PUBLIC HEARING PROCEEDINGS AND RESPONSE ALONG WITH THE ACTION PLAN

Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
			• Analysis report will be provided after public hearing is completed.	Mandvi
3	Shri Punsibhai Gadhavi, Taluka Panchayat Member – Mandvi Village: Mota Bhadiya Taluka: Mandvi	He represented that, when was the report submitted to Mandvi Taluka Panchayat? Is the report provided to community leaders? We oppose this public hearing.	The regional officer has informed that the copy of report and CD is provided to Mandvi Taluka Panchayat office on 27.03.2017.	Issue & queries raised by public was resolved by project proponent during Public Hearing.
4	Shri Vishrambhai Gadhavi, Village: Zarpara Taluka: Mundra	He represented that, 1) The photographs of place and equipment used shall be shown from where the samples were collected. 2) You are showing the photographs of your proposed project, show the photographs of the monitoring carried out.	The representative of the project proponent replied that, we have photographs of 8 locations and these will be provided.	1) The photographs of monitoring had been shown during the public hearing. 2) Monitoring photographs along with the respective sampling locations are given Annexure-VIII in the EIA report.
5	Shri Dayabhai Viram Gadhavi Village: Mota Kandagra Taluka: Mundra	He represented that the person providing the reply on behalf of the company must provide the company photo ID card, only then he will be allowed to reply. Our boys are not permitted to enter the company without an ID-card.	The representative of the project proponent showed the photo ID-card on LED screen.	Issue & queries raised by public was resolved by project proponent during Public Hearing.
6	Shri Gopalbhai Gilwa Village: Zarpara Taluka: Mundra	He represented that, 1) Give the information about how much carbon dioxide is emitted from the thermal power plant at Mundra? Provide the figure of carbon dioxide that is emitted in 24 hours. 2) At the time when I went to Mr. Mukesh Saxena for job, he stated that the recruitment of job is done from Ahmedabad. I was kept as apprentice, after a period of 4 months, for duration of 12 months. Thereafter I was given the job as supervisor at the Power Mech Company. I have not been taken on roll in the company. I was shown my social category. The people coming from outside are given direct jobs	The representative of the project proponent replied that: 1) The amount of carbon dioxide is 870 gram/kilowatt hour. 67,525 tonnes of CO_2 equivalent is emitted per day. 2) The representative of the project proponent replied that, you came directly to me and there was no recommendation for you. We kept you on training for a period of 12 months on apprentice. For this you were given a stipend of Rs. 12000 per month. During the apprentice required training is provided. The company provides you further training when you become an employee from apprentice. You were in a	1) This is not related to proposed project 2) This question is not directly connected to the proposed project. However, in the proposed project employment about 2000-3000 persons on average per day during construction phase and during operation phase, about 2000 direct employment and 5000 indirect employments will be provided. Fund of Rs. 2 Crores has been allocated for facility and infrastructure addition in existing skill development centre run by Adani

ANNEXURE-20(A)
PUBLIC HEARING PROCEEDINGS AND RESPONSE ALONG WITH THE ACTION PLAN

Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
		while, I was not kept on permanent job at any place. Therefore I left the job after 6 months and at present I run a shop.	list wherein there were 60 persons and out of which 15 were engineers. We gave you job on contract after the apprentice. You will be provided the list of the resident of Zarpara who have been given employment.	Foundation at Mundra.
		3) I did not get the job as per my studies and thus provide job. Will I be given job at the new plant?	3) One should not expect that he shall get a job as per his wish. Intention of learning is important for any job.	3) Locals will be given preference to employment based on skill set & eligibility requirement as per the job and the vacancies available.
		4) What is the duty time and salary of on roll employees?	4) The employee on contract has a service of 8 hours but the employee has to stay for longer hours when there is additional work load. No discrimination is done in the company.	4) Working works will be 8 hours per day and slaray will be based on work experience and job handling.
7	Shri Dayabhai Viram Gadhavi, Village: Mota Kandagara, Taluka: Mundra	He represented that; provide video copy of local hearing.	The local hearing video copy may be provided by presiding officer.	Issue & queries raised by public was resolved by project proponent during Public Hearing.
8	Shri Vishrambhai Gadhavi Village: Zarpara Taluka: Mundra	He represented that a person becomes an engineer by spending lacs of rupees and you give such replies to him!	-	Locals will be given preference to employment based on skill set & eligibility requirement as per the job and the vacancies available.
9	Shri Gopalbhai Gilwa Village: Zarpara Taluka: Mundra	He represented that,	The regional officer stated that,	
		1) Adani Power has obtained the permission for Phase-IV. Why have you installed FGD? The pollution load had increased in Mundra.	1) This public hearing is for the Copper Refinery project and therefore the questions related to that issue only shall be asked. Your representations shall be noted down. Your representations and objections will be included as part of the proceedings. The CD will be submitted along with the proceedings to Ministry of Environment, Forests and Climate change of Govt. of India.	1) This is not related to the proposed project.
		2) At Mundra one tonne Carbon Dioxide is produced per Megawatt. Adani Power and TATA Power emit CO_2 that is much more than the capacity of Mundra. Then, why do	2) The representative of the project proponent replied that, 0.87 Ton carbon dioxide is produced for 1 Mega Watt. The FGD system is installed as per the clearance provided by	2) This is not related to the proposed project. The proposed project is an independent greenfield copper refinery plant.

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ANNEXURE-20(A)
PUBLIC HEARING PROCEEDINGS AND RESPONSE ALONG WITH THE ACTION PLAN

Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
		you wish to bring this new plant?	Ministry of Environment, Forests and Climate change. This is installed for sulphur dioxide scrubbing. There is no statutory limit for carbon dioxide emissions.	The anticipated potential impacts analysis, cumulative impacts due to increase of pollutant and its mitigation measure are provided in Section-4.2.2 of Chapter-4 in the EIA report. The cumulative impacts of exiting power plants of Adani and Tata power have been considered and incorporated in the Section-4.2.2 of EIA Report. The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project.
10	Shri Dayabhai Gadhavi Village: Mota Kadagra Taluka: Mundra	He represented that, why are you not listening to us? Why don't you reply? Are the questions raised by us relevant or not?	-	-
11	Shri Vishrambhai Gadhavi Village: Zarpara Taluka: Mundra	He represented that the company conducted the public hearing for power plant also in this manner. The promises that were made at that time have not been fulfilled and now you wish to establish a new project.		-
12	Shri Gopalbhai Gilwa Village: Zarpara Taluka: Mundra	He represented that we have been informed to ask questions related to environment only. Should we not be provided with the platform to make representations on other questions?	-	-
13	Shri Gajendrasinh Jadeja Sarpanch Navinal Village: Navinal Taluka: Mundra	He represented that, 1) You were complained through email for cancellation of the public hearing on 11.04.2017 and a meeting was held with Mr. D R Patel. But no reply was given for	The representative of the project proponent replied that: 1) As per the circular of MoEF&CC dated 31.03.2011, if the forest land cannot be avoided, the application shall be filed by project proponent to obtain forest	1) MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
		the same. The project proponent has not complied with the terms of reference as per my complaint. How can the public hearing be conducted for this project when the process of forest clearance is still going on?	clearance. After this stage-I application, the project proponent can apply for TOR.	Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V in the EIA report.
		2) The project proponent has concealed the information in Form-1. As per the S.No. 16 and 26 of Basic Information of Form-1, with reference to the Gochar land, PIL no. 17/2011 judgment, the project proponent has mentioned that there is no pending PIL for this land. This information is not mentioned in Form-1.	2) The TOR application is filed after the Stage-I application for forest clearance is applied. Thereafter the MOEF&CC provides the TOR to project proponent. Afterwards EIA can be made. After the entire process of EIA, the MOEF&CC checks the status of the application for forest clearance and the project is approved on that basis. We have not concealed any information. The PIL has been disposed. The judgment is under review. The application is filed for the acquisition of forest land. Under the Form-1, it is stated that the non-forest land is of APSEZ and the application for forest land is under process.	2) The PFR submitted along with the Form-I application clearly shows the water stream passing through proposed project site. The same is available in the Annexure-VII of the PFR submitted along with the Form-I.
		3) In the S.No. 2 and 10 of Form-1, it is not mentioned that the Daneshwari river passes through the forest land.	3) In the EIA report, maps are provided and Daneshwari river is shown in it.	3) Dhaneshwari river also refered as Danesri Nadi (as per Topo sheet no: F42 J9 & 10) stream passing within site (west side). Dhaneshwari, a seasonal river which flows in the western part of the proposed site. The river will not be diverted but suitably trained along the boundary. The flow of the river will be maintained, as shown in the plant layout on Figure-2.1 of EIA report.
14	Shri Pravinsinh Bhurubha Chauhan Village: Siracha Taluka: Mundra	He represented that, 1) As per the EIA report, you state that no perennial river is present within the project land. There is no perennial river in whole of	-	1) Dhaneshwari, a seasonal river flows in the western part of the proposed site.

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
		Kutch. From the 2011, 2013 and the present Satellite image, it is clear that you have diverted the river. 2) Your hospital is also constructed on the river. It is clear from the Satellite image of year 1991. Show the CD of Satellite image to all. 3) I wish to show Figure No. 1 from the EIA report. The river is tampered with in the Figure.		2) The latest satellite imagery is shown as Figure-3.3.1 of Chapter-3 in the EIA report. 3) The flow of the river will be maintained, as shown in the plant layout on Figure-2.1 of Chapter-1 in the EIA report.
15	Shri Punshi Gadhavi Taluka Panchayat member, Mandvi, Village: Mota Bhadiya Taluka: Mandvi	He represented that: • What will Adani do for the education, health and fodder for cattle? A written submission is also done for this. • You have not given the reply to the previously asked question of Punshibhai Gadhavi. Provide reply to it.	The representative of the project proponent replied that Adani Foundation is already carrying out development works in areas of education, health and other social sectors on the basis of the written representation of Punshi bhai. This will also be done for this project. A budget of 8 crores rupees per year is allotted for CSR activities. Particular focus shall be given to the villages that are affected.	Various education and health program is ongoing in the area by Adani Foundation. Establishment of a full-fledged a burn care facility at Bhuj District Hospital Fodder issue will be addressed through CSR activities. It is proposed to establish a full-fledged a burn care facility at Bhuj of Rs. 9.5 Crore and Burn care unit at Mundra of Rs. 2 Crore. Establish Smart Classes and Renovation/development of primary/middle schools of Rs. 6.89 Crore.
16	Shri Asariya Lakha Gilwa Village: Zarpara Taluka: Mundra	He represented that the company officers should make submissions in the local Gujarati language.	It is noted down and replied in Guajarati language only	-
17	Shri Bharat Kalyan Sheda Village: Zarpara Taluka: Mundra	He represented that the people residing here want clean environment and we don't need any project. Why do you want to establish this project here?	-	The proposed project is an independent greenfield copper refinery plant. The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. About Rs.1044 crores will be spent for environmental pollution control measures in this project.

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
				For establishment of this project, three alternative sites have been studied. These three sites include: Site-I: near Gundala & Mokha villages; Site-II: near east side of Adani power plant; and Site-III: near near Mundra village. Among three above sites, the site-II near east side of the Adani Power Plant has been chosen based on the comparative merits and demerits of the three sites. The comparison of salient features of alternative sites done and details are presented in Table-5.1 and shown in Figure-5.1 of the EIA report.
18	Shri Gopalbhai Gilwa Village: Zarpara Taluka: Mundra Shri Vishrambhai Gadhavi Village: Zarpara Taluka: Mundra	He represented that; 1) A total 12 crore ton of CO_2 is generated daily. Why is the FGD for phase-IV installed? 2) This plant will emit 30 lakh tons of Sulphuric acid so why do you want to establish this plant?	The representative of the project proponent replied that: 1) Adani Power produces 25 million ton of CO_2 per year and around 25 million ton is produced by TATA Power. In this manner the total CO2 produced is around 50 million ton. 2) In the Adani Power Phase-IV, MoEF had stipulated a condition based on which the FGD system is fixed. 3) Sulphur Dioxide will be produced from Copper Smelter. In the sulphuric acid plant, the sulphur dioxide will be absorbed and sulphuric acid will be produced. The residual amount of sulphur dioxide from the proposed project will be within the limits stipulated by CPCB, Government of India.	1) This is not related to the proposed project. 2) This is not related to the proposed project. The SO_2 generation is a continuous process during smelting activity. Primary gas stream will be routed to sulphuric acid plant (SAP) plant and the fugitive gas stream will be routed through scrubber. Further, there is no provision in the plant/process for storage of SO_2 gases and will be processed immediately to produce sulphuric acid. • Sulphuric acid plant (SAP) will be installed with highly efficient (Double Conversion

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
				Double Absorption) DCDA process to control the SO_2 emission to less than 1 kg/t of sulphuric acid produced. • The residual amount of sulphur dioxide from the proposed project will be within the limits stipulated by CPCB, Government of India. • The process of extraction of copper metal, sulphuric acid is recovered as a by-product from the off-gases generated from the smelting and converting furnaces. A part of sulphuric acid produced is utilized for phosphoric acid production and rest will be sold in the market based on market requirement. • About Rs. 1700 crores will be invested to install sulphuric acid plant. • Regular stack emission monitoring shall be carried out at all stacks for particulate matter, HF, SO_2 and NOx for checking the compliance to emission standards by respective plant. • The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. • About Rs. 639 Crores will be spent on air pollution control system installation.
19	Shri Gopalbhai Gilwa Village: Zarpara Taluka: Mundra	He represented that, In one day, a total of 1,25,988 ton of CO_2 is emitted in the atmosphere. The average temperature of emitted CO_2 is 150 degree Celsius. Why should the new plant be approved	The representative of the project proponent replied that: 1) The average temperature is 120 to 130 degree Celsius. World level efforts are made to stop global warming. The power	• The emissions of carbon dioxide from the proposed copper refinery project will 490 tonnes per day. Further, the project will have 89.84 ha (35% of the project area) of greenbelt/green cover to absorb any gaseous emissions in the proposed project.

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
		even thereafter?	plant is based on super critical technology and produces lesser amount of CO_2 in the atmosphere. Till date it is not found that the level of CO_2 would have decreased on world level. The government of India has targeted to reduce CO_2 emissions by 30 to 35% in comparison with the year 2005. The power plant that is based on old technology produces 1 to 1.5 Ton CO_2 per Megawatts hour, while the plant based on new Super Critical technology produces a total of 0.8 ton CO_2 per Megawatt hour.	• Further, regular post project monitoring will be carried out for the gaseous emissions and the test reports will be submitted to GPCB and MoEF&CC. Regular monitoring will help to keep a check on the gaseous emissions.
20	Shri Rambhai Kanani, Village: Zarpara Taluka: Mundra	He represented that, 1) Our agriculture is adversely impacted. The characteristics of the Male Date Seeds seem to be transforming to that of Female Date Seeds. 2) We do not want this project. EIA report states that there is no living organism and only wild plants are present. No information is provided about river, vegetation and other living organisms. No ground reality is provided. 80% people of this area are dependent on agriculture. We do not want this project.	-	1) - 2) Dhaneshwari river also refered as Danesri Nadi (as per Topo sheet no: F42 J9 & 10) stream passing within site (west side). Dhaneshwari, a seasonal river which flows in the western part of the proposed site. The river will not be diverted but suitably trained along the boundary. The flow of the river will be maintained, as shown in the plant layout on Figure-2.1 of EIA report. The proposed project will implement all the control measures at the source level, which are incorporated in the Draft and Final EIA report. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project.
21	Shri Vishrambhai Gadhavi, Village: Zarpara Taluka: Mundra Shri Rambhai Kanani, Village: Zarpara Taluka: Mundra	He represented that, 1) Our agriculture is adversely impacted. The characteristics of the Male Date Seeds seem to be transforming to that of Female Date Seeds. 2) We do not want this project. EIA report states that there is no living organism and only wild plants are present. No information is provided about river, vegetation and other living organisms. No ground reality is	-	

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
		provided. 80% people of this area are dependent on agriculture. We do not want this project.		A budget of Rs. 58 crores have been allotted for CER activities for five years. In which the support for effective utilization of available water through dripping systems will be implemented with a total budget of Rs. 1.1 Crore will be spent on CER activitie (Support for Drip Irrigation for farmers in the area) in five-years period.
22	Shri Vishrambhai Gadhavi, Village: Zarpara Taluka: Mundra	He represented that; 1) Why is the chimney of Adani Power tilted? What is the height of Chimney? 2) It rains less due to this. A large amount of difference in rain is seen in Bhadiya and Zarpara village due to this. 3) Crores of tons of CO_2 is emitted daily. Is there any limit to it?	The representative of the project proponent replied that: 1) The height of chimney of power plant of Adani Power having a capacity of more than 500 megawatts is 275 m. The height of chimney is kept for the dispersion of gases in the air. There are no norms on limit of carbon dioxide emissions. 2) The pollution is diluted around 2000 times due to the height of chimney. There is no study done which suggests that due to power plant it would have rained less at any place. Rain is almost found same in both villages. 3) The estimate of CO_2 in atmosphere at world level is around 350 to 400 ppm. There is no statutory limit for this. As per the NAAQ standard for sulphur dioxide, the 24 hour average limit is 80 microgram/m^3.	1) This is not related to the proposed project. 2) The proposed project is a greenfield copper refinery project. 3) The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures under this project.
23	Shri Rambhai Kanani, Village: Zarpara Taluka: Mundra	He represented that; the wind direction is shown wrong.	The representative of the project proponent replied that the wind direction is shown as per the winter season data. It is shown from South South West (SSW) to North North East (NNE).	The wind directions given in the wind roses indicate from direction. During the study period (October-December, 2016), the predominant wind direction is from SSW to NNE. This is

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
				generally in agreement with the nearest I MD data at Kandla and represent coastal conditions.
24	Shri Bharat Kalyan Seda Village: Zarpara Taluka: Mundra	He represented that; It is submitted that the reply be given in Gujarati	Point noted and agreed.	-
25	Shri Nanji Mithubhai Maheshwari Village: Mota Kandagra Taluka: Mundra	He represented that; 1) Show on LED screen the letter with signatures and stamp of Sarpanch and Talati for the 8 affected villages that have been surveyed. 2) How will employment be provided in this plant?	-	1) It may be noted that the project area falls in two villages namely Siracha and Navinal. 2) The proposed project will provide employment to about 2000-3000 persons on average per day during construction phase and during operation phase, about 2000 direct employment and 5000 indirect employments will be provided. Locals will be given preference to employment based on skill set & eligibility requirement as per the job and the vacancies available. A budget of Rs. 58 crores have been allotted for CER activities for five years.
26	Shri Bahrat Kalyan Seda Village: Zarpara Taluka: Mundra	He represented that; Thousands of people are objecting. Show us the photographs of your visit in 16 villages.	-	The monitoring photographs and name of sampling locations are enclosed as Annexure-VIII in the EIA report.
27	Shri Dayabhai Viram Gadhavi Village: Mota Kandagra Taluka: Mundra	He represented that; 1) In the executive summary of page no. 2.1, the nearest village is shown as Mundra. Provide the list of all the affected 16 villages. Why is village Mundra included in affected villages?	The representative of the project proponent replied that: 1) Through this public hearing, all your representations will be provided to the MoEF. The company will work in a transparent way. Mundra is the closest town to the Project area. The land of Siracha and Navinal villages are covered in this project. In the EIA report, the Annexure-X contains	1) Mundra is the closest town (22 km – road distance) to the project area. The land of Siracha and Navinal villages are only covered in this project. The demographic details of the entire study area is given in Section-3.10 of Chapter-3 in the EIA report.

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
			demographic report. It contains list of 16 villages. This includes Siracha, Tunda, Mota Kandagra, Moti Khakhar, Nani Khakhar, Moti Bhujpur, Nani Bhujpur, Desalpar, Bharora, Zarpara, Pratapur, Mota Bhadiya, Dhrub, Tragadi, Nana Bhadiya and Navinal. In chapter-3 of the EIA report, details of all the villages are provided. The EIA report is made as per the MOEF guideline. The presentation contains the details of the impacts on environment. Moreover, these details are also included in the EIA report. EIA covers study of all the aspects and its management plan is also shown.	
		2) What would be the time limit of this public hearing?	2) The regional officer stated that, the public hearing will be completed after all the representations are heard.	2) The public hearing will be completed after all the representations are heard.
28	Shri Vishrambhai Gadhavi Village: Zarpara Taluka: Mundra	He represented that when any company comes, it is required that 33% green belt shall be provided and as part of the same when Sunita Narayan committee visited, the plants were grown on both sides of the road. These plants do not exist at present.	The representative of the project proponent replied that Respectable Sunita Narayan came in the year 2013. The green belt at present is much more than what was at the time of her visit. Even further plantation will be done.	This issue raised, is not related to proposed project. About 89.84 ha of the proposed copper refinery complex (35%) will be reserved for greenbelt / green cover development as per prevailing guidelines from GPCB/CPCB/MoEF&CC. The trees will be planted in several rows with a tree density of 2000-2500 trees/ha with adequate width around the plant boundary and maintained as per CPCB guidelines. Native species with rich canopy will be planted. The proposed greenbelt is already earmarked in the Layout given in Figure-2.1 of the EIA report.
29	Shri Gadhavi Kalyan Asariya Village: Zarpara Taluka: Mundra	He represented that in the past, I came for training in Adani Foundation on behalf of the KSKV University. At that time in the river and	The representative of the project proponent replied that you both have asked different questions. One relates to village and the other	This issue raised, is not related to proposed project.

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
		other places, around 60 thousand trees were planted but these are not found at present.	relates to APSEZ.	About 89.84 ha of the proposed copper smelter complex (35%) will be reserved for greenbelt / green cover development as per prevailing guidelines from GPCB/CPCB/MoEF&CC. Native species with rich canopy will be planted. The proposed greenbelt is already earmarked in the Layout given in Figure-2.1 of the EIA report.
30	Shri Gajendrasinh Jadeja, Sarpanch Navinal Gram Panchayat Village: Navinal Taluka: Mundra	He represented that; • The sr. no. 10 on page C1-4 of the draft EIA report states that, there is no archaeological place at this site. However, at a distance of around 500 to 1000 meters from the proposed project site, the site of Navinal Archaeological site is present. I have the report of the MS University which states that it relates to the Harappa civilization. • The fisheries harbour is not developed at Bhadreshwar. The access roads for the fishermen were closed and are not opened again.	The representative of the project proponent replied that: 1) There is no mention of such a site on the Archaeological Survey of India Website. You shall be provided the list of notified site. 2) There was no permission to go to the Randh bunder (Bhadreshwar) at the time of Sunita Narayan committee visit. At present Foundation provides various facilities like water, electricity, etc. at that place. 3) After the visit of Sunita Narayan committee, the fishermen access roads were developed which are open even as on date.	There is no notified archaeological site within 10 km from the proposed project site.
31	Shri Dayabhai Viram Gadhavi Village: Mota Kandagra Taluka: Mundra	He represented that: • The road to Bharadi Mata has been opened after a lot of troubles. You did not spare any effort to close down the road.	The representative of the project proponent replied that the road leading to Bharadi Mata has been kept open. As on date, not just one but two approach roads are available.	-
32	Shri Valji Bhai Tapariya Village: Zarpara Taluka: Mundra	He represented that; 1) In the production of copper plant, Sulphur is to be used and this will have acidic processes.	The representative of the project proponent replied that: 1) No addition in the capacity of the copper smelter is envisaged for the refinery after the project approval.	1) The process of extraction of copper metal, sulphuric acid will be recovered as a by-product from the off-gases generated from the smelting and converting furnaces. A part of sulphuric acid produced will be utilized for phosphoric acid production and rest will be sold in the market based on market

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ANNEXURE-20(A)
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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
				requirement.
		2) Environment will be impacted due to this. The effect of this sulphuric acid is shown in radius of around 10 km. This is around 20 to 25 km as per the opinion of experts.	2) The copper concentrate is processed in the copper smelter. Sulphur dioxide is generated from it. It is captured and sulphuric acid is produced. This sulphuric acid is converted into phosphoric acid.	2) The impacts and mitigation measures are given in Section-4.2.2.3 of Chapter-4.
		3) At a humanitarian level, the GPCB should also take interest in this considering its personal responsibility for longer terms. No one is against development. The effect of copper refinery is even more than power plant. The plant should be taken away from human population if its place can be moved. In the past, electricity was generated with atoms and this eradicated the entire lineage of people. The fishermen should also not be affected. The government should take proper care and consider that no negative effect is found.	3) The sulphuric acid will be converted to phosphoric acid in the phosphoric acid plant. It will used in fertilizer plants. Other than this, a by-product, fluoro-silicic acid will be made which will be used in the making of toothpaste.	3) The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project.
33	Shri Vishrambhai Gadhavi Village: Zarpara Taluka: Mundra	He represented that;	The representative of the project proponent replied that:	
		1) Will you make a residential place near the plant and reside at that place? If that is the situation, we do not object. We reside in the farms outside.	1) Many a times our high ranking officers reside at the guest house of power plant. Many copper plants in the entire world are present beside cities. We will also make guest house in our copper plant.	1) The employees of the proposed copper plant will be staying in the existing township of Adani at Mundra. The copper plant will have guest houses in its premises.
		2) Is there any power plant, at any other place, with such big capacity?	2) Yes, there are power plants of total 20 thousand Megawatt capacities at Singroli. Angul, Andhra Pradesh has 16 thousand Megawatts capacity power plants. Tuticorin at Tamilnadu has 12 thousand Megawatt capacity of power plants. These all are coal based power plants. Now the government of India approves all big power plants with FGD only.	2) There is no power plant in the proposed copper complex.

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34	Shri Naran Gadhavi Village: Zarpara Taluka: Mundra	He represented that, 1) The highest officer of the district was addressed and a letter was written on 27/4/17 and it was mentioned that the land on which the copper plant is proposed is subjudice matter. The collector has not taken any decision till date. 2) It is mentioned under it that after the Honorable sitting principal judge and Sunita Narayan committee, two other committees also visited. First of all the committee of the Honorable sitting judge visited. The visit report was submitted to the high court. The report of this committee is subjudice. The second report (dated 05.11.2015 and 01.04.2016) one expert was called from Goa and another from Calcutta on the basis of the order passed by the Honourable Gujarat High Court. 3) The committee recommended that the 6 thousand acres of land should be returned to the government. No decision till date has been taken in this regard. 4) As for this the contempt of court proceedings shall be held against the competent officer. The map is also shown in the EIA report. Why is the public hearing been done, even if the matter is subjudice? 5) GPCB is also a party in this matter. On the basis of our complaint, the Sunita Narayan committee provided a report on 17.09.2015 to MoEF&CC, government of India.	The representative of the project proponent replied that: 1) I give an elaborate reply to your question. With respect to the PIL no 12/2011, the committee visited APSEZ and its report was kept on record of the Honourable High Court. The matter was disposed by the Honourable Gujarat High Court on 17.04.2015. 2) As per previous proceedings the contempt petition (no. 9124) dated 12.07.2011 was filed. Thereafter on 15.10.2015, the order was passed. The matter with reference to the Sunita Narayan committee report, was disposed of in the year 2015. As per the order passed by the Honourable Gujarat High Court there is no contempt order. The report was submitted by the committee including expert from Goa and Calcutta on 08.06.2016. That particular matter is pending before the Honourable High Court of Gujarat. The committee recommended that 100 ha or more mangroves plantation should be undertaken. The project area is not part of the disputed land. All the show cause notices have been disposed. The recommendation is done in the survey by the committee. It is not an order. The company will accept the final order passed by the Honourable High Court. The land of the proposed project does not have any relation with this matter. The land under notified SEZ shall be used for this land. The MOEF will consider the matter that is pending before the High Court. The proposed project does not have any connection with this matter.	The proposed project area is not under the disputed land as claimed. All the show cause notices have been disposed. This proposed copper refinery project does not have any connection with this case pending before the Honourable Gujarat High court.

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ANNEXURE-20(A)
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Sr. No.	Name and Address of the Representative	Issues Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
		6) Two maps have been submitted to the Gujarat High Court committee. These are on the record of the high court. You submitted the map with topo sheet. These were for entire land. This includes your project. 7) As mentioned by you, the forest area is to come under the project. The High court committee has stated that, the land should be taken away from Adani and provided to the government. The 5,333 ha of forest area should be restored. 8) This matter is under consideration at the Gujarat High Court. Why is this case not mentioned in your EIA report?	3) The MOEF has provided the direction to the company and the company is working on it. The report for this is submitted to the MOEF every 6 months. The matter you have stated is about the survey of the report of the committee. It is a recommendation and not a decision. The Gujarat High Court will consider the submissions of the company along with the committee report and the company will comply to the guidelines provided by the court thereafter. 4) The government of India will decide further course of action on your matter and our reply. 5) The representative of the project proponent replied that this proposed project does not have any connection with this case pending before the Honourable Gujarat High court. This is our submission.	
35	Shri Bharubhai Ranshibhai Shankra Secretary, Kehti Vikas Seva Trust, Village: Zarpara Taluka: Mundra	• He represented that: Do thing that would be favourable for the people. Do not leave after taking money. I do not have any objection for the company to either come or not. Do all that is in the interest of people.	-	A budget of Rs. 58 crores for the period of 5 years (From day 1 of the project construction) has been allotted towards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
				(drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores
36	Shri Dayabhai Viram Gadhavi Village: Mota Kandagra Taluka: Mundra	He represented that, we will not let the permission be granted for a new plant. The regulations laid down by the GPCB, CPCB, MOEF&CC are violated by the company and the officers present at this place should inspect the matter. We do not want a new project.	-	There is no violation with respective to GPCB, CPCB, MOEF&CC by the proposed project. The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs. 1044 crores will be spent for environmental pollution control measures in this project.
37	Shri Bharat Kalyan Shetha Village: Zarpara Taluka: Mundra	He represented that, the people here do not want this project to come. The people here want clean environment. The people do not want this progress; the people do not want the long term destruction, Kindly take note of this.	-	The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project.
38	Shri Anwarbhai Ibrahimbhai Vagher, Village: Navinal Taluka: Mundra	He represented that, No damage has been done to the fishermen access roads or any other things. Our access roads are not closed. The people from Patel community and our villagers do not have any objection for the plant to be established.	-	There will be no damage to fisherman due to the proposed project. A budget of Rs. 58 crores for the period of 5 years (From day 1 of the project construction) has been allotted towards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives:

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
				• Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development (drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores
39	Shri Kadar Ismail Village: Navinal Taluka: Mundra	He represented that our roads are open and we do not have any objection.	-	-
40	Shri Gajendrasinh Jadeja Sarpanch, Navinal Gram panchayat Village: Navinal Taluka: Mundra	He represented that, • The fishermen of my village do not have proper knowledge. I can show the maps of forest department and other maps to confirm which access roads are closed down. The access road which is shown in the map belongs to forest dept. The fishermen access road to the sea passes through the project site. This is government road. It is not owned by you. I am talking about the road that has been made by the government for the fishermen.	-	There will be no damage to fisherman due to the proposed project. The roads used by fishermen will not be disturbed due to the proposed copper smelter project. Further, a total budget of Rs. 58 crores will be spent on CER activities in which fishermen welfare will also be included.
41	Shri Anwarbhai Ibrahimbhai Vagher/ Shri Kadar Ismail, Village: Navinal Taluka: Mundra	He represented that our roads are open. Kotdi Bandar and Sodawadi Creek are open. We do not have any kind of objection.	-	-
42	Shri Pravinsinh Bhurubha Chauhan Village: Siracha Taluka: Mundra	He represented that information be provided if the road from Navinal to Daneshwar, which existed, is closed down or not?	-	The existing roads will not be disturbed due to the proposed copper smelter project.
43	Shri Asariya Lakha, Village: Zarpara Taluka: Mundra	He represented that, it is the responsibility of the chairman to ascertain that no one comes for the purpose of praising someone. The proceeding should be as per instruction from chair. The purpose of this public hearing is to hear the representations of the affected people.	-	-

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
44	Shri Gandrasinh Jadeja Sarpanch, Navinal Gram Panchayat, Village: Navinal Taluka: Mundra	He represented that first of all compliance of existing environmental clearance for power and SEZ should be met and then this project should come.	-	The proposed project is an independent greenfield copper refinery plant. The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project.
45	Shri Rambhai Kanani Village: Zarpara Taluka: Mundra	He represented that the company has a strategy to bring some hired people after two hours of hearing and these people will take the entire hearing out of track.	-	-
46	Shri Gandrasinh Jadeja Sarpanch, Navinal Gram Panchayat, Village: Navinal Taluka: Mundra	He represented that 1) 102 ha of land of the forest department will be used in this project. Adani had in the year 2004 made a demand of 1576.81 ha of land but the forest department has not approved it till date. Navinal and Shiracha, both villages have claimed their rights under the Forests Rules. The people of Navinal and Shiracha graze their cattle and obtain livelihood. If this forest is given, where will the wild animals and grazing domestic animals go? And lastly when the remaining forest land, government land and Gochar land is given, where will the people, animals and birds go?	The representative of the project proponent replied that: 1) You know very well what is the land use of the 102 ha of forest land and as per the report of the forest department, no major displacement would be required. The 33% green belt will be developed at the time when plant comes. As per the report of the forest department, no major displacement would be required. The land of this area will be used by the company for the development of green belt and specific care will be taken for the animals and birds. The animals shall be provided fodder through CSR activities. 2) The forest department will take all these aspects into consideration while providing clearance. 3) Other than this, the Bharadi Mata reserve	1) The total land required for the proposed project is about 256.58 Ha (634 acres), out of which 154.19 ha (381 acres) of identified land for this project belongs to the APSEZ (an Adani Group Company) and is already designated for industrial purpose as per the local land use plan. Memorandum of Understanding (MoU) is in place between Adani Ports & Special Economic Zone Limited (APSEZL) and Adani Enterprises Ltd (AEL) for 154.19 ha (381 acres). MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V in the EIA report.

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		2) This is the last reserve forest of this area. Bharadi Mata is sand dunes. This is coastal and mangrove forest. This area is under the CRZ-1 area. There is no provision for approval of such land.	and coastal forest is situated near the project site. The animals obtain fodder from that place. The project will utilize 111 ha of Navinal land. While 102 ha of land of Shiracha will be used for development of green belt.	The conditions stipulated in the Forest Clearance and Environmental Clearance will be strictly adhered to and complied with. It is also committed that the fodder to cattle in the nearby villages such Siracha and Navinal will be provided through CER initiatives. About Rs. 40 lakhs is allocted for tentative budget for peacock conservation plan. 2) The proposed project is outside the CRZ area, the approved CRZ map with proposed project is shown in Figure-1.5 of Chapter-1 in the EIA report.
47	Shri Pravinsinh Bhurubha Chauhan, Village: Siracha Taluka: Mundra	He represented that, • The Dates, Deshi Babool, etc. trees present on the forest department land and located adjacent to the power plant have dried out due to smoke from stack and cooling tower. • Where will the animals like Nilgai, Jackal, fox and others go? They will come at our farms.	The representative of the project proponent replied that: 1) Even at present the land is under the forest department and the plants that you state are alive. No such thing has occurred. 2) This is not true and the forest department would have informed us if such a thing would have occurred.	The plants are existing in the study area. The proposed green belt/green cover will also have native plants. The proposed plant area does not have the presence of Nilgai, Jackal. However, they are present in the buffer area and all the precautions will be implemented as suggested under Forest Clearance and Environmental Clearance.
48	Shri Rambhai Kanani, Village: Zarpara Taluka: Mundra	He represented that there is a difference between the EIA report and the presentation. The details mentioned in the Gujarati report are not actually true. There is difference in the description of environment. Under the project area, only Babool and peacock are shown. But the actual situation is different. There are medicinal plants also at this place. The description of the nature is given but it is not ground reality.	The representative of the project proponent replied that, the summary of the EIA report is shown as part of the presentation. The entire EIA report is not to be shown in the public hearing. In case if you have found any discrepancy in the EIA report, you may draw attention as to the same in writing and this will be included under the public hearing proceedings and it will also be submitted to MoEF&CC, Government of India. More over EIA	As per primary ecology and biodiversity survey the details are given Section-3.9 of Chapter-3 in the EIA report. The faunal species were categorized as per conservation status of Wildlife Protection Act, 1972 and reveals that peacock is the only Sch-I species in the study area. However, it has been assessed as Least Concern bird as per the International Union for Conservation of Nature

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
			report is prepared based on the information obtained at that relevant point of time.	(IUCN). Further, the conservation plan and measures for Peacock are recommended in Section-3.9.9 of Chapter-3 in the EIA Report.
49	Shri Vishrambhai Gadhavi Village: Zarpara Taluka: Mundra	He represented that the company has shown its video during the hearing. All good things are being projected. No information is provided about the side effects, risk, etc. from the project. The video of the person submitting representation shall be shown.	The chairman stated that, Please submit your CD we will be include the same in proceedings. Note: It was tried to show the video of representation by mobile on LED screen however it could not be run due to any reasons.	-
50	Shri Pravinsinh Bhurubha Chauhan Village: Siracha Taluka: Mundra	He represented that, I wish to show the CD related to the scams committed by the Adani Power and SEZ. It is mentioned under the Form-1 that there is no mangrove at this site but as per my view there are mangroves presents.	-	There is no mangrove planation within the proposed project site.
51	Shri Rambhai Kanani Village: Zarpara Taluka: Mundra	He represented that the people are facing problems from your existing plants and therefore people do not welcome your project.	-	-
52	Shri Usman Gani H Sheraseeya Village: Vakaner Taluka: Morbi	He represented that, • How much water will be obtained for this project and from which place will it be taken? • Will you discharge salty water after desalination in the sea?	The representative of the project proponent replied that, 32800 cubic meters of water will be required for this project which will be used after desalination of the sea water by APSEZ.	The total water requirement for the project is about 32,267 KLD which will be sourced from desalination plant of APSEZ Ltd, through M/s Mundra Utility Pvt Ltd (MUPL). No ground water will be abstracted during the operation phase. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). The water requirement details are given in Section-2.2.3 of Chapter-2 of the EIA Report.
53	Shri Devendrasinh Jadeja Village: Mota Kardagra Taluka: Mundra	He represented that, we are in favour for the company to establish this plant. But what is the percentage of local public that will get employment? Provide in writing.	The representative of the project proponent replied that the company will require around 3000 persons at the time of construction. We will try that maximum unskilled labour is employed from local people.	The proposed project will employment about 2000-3000 persons on average per day during construction phase and during operation phase, about 2000 direct employment and 5000 indirect employments will be provided. Locals will be given preference to employment based on skill set & eligibility requirement as per the job and the vacancies available.
54	Shri Lakhubhai Rabari	He represented that:	The representative of the project proponent	The proposed project will employment about

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
	Village: Tunda Wandh Taluka: Mundra	• The officer present at the time of construction of the project are transferred after the starting of operation of the project and therefore proper solution to our problems are not provided. • What kind of employment will be given to the unskilled people?	replied that: • The feeling of the local public will be considered and problems will be properly solved. Efforts will be made to ensure that local public is provided employment to an extent possible. • Efforts will be made to ensure that unskilled people also get employment.	2000-3000 persons on average per day during construction phase and during operation phase, about 2000 direct employment and 5000 indirect employments will be provided. Locals will be given preference to employment based on skill set & eligibility requirement of the job. Required Skillset for the proposed project: • Mechanical Maintenance • Electrical Maintenance • HEMM Operations & Maintenance • Horticulture • C&I Unskilled people will be made capable by providing training for getting employed in services like horticulture, housekeeping and canteen etc. Under CER for proposed project, fund of Rs. 2 Crores has been allocated for facility and infrastructure addition in existing skill development centre run by Adani Foundation at Mundra.
55	Shri Vishrambhai Gadhavi Village: Zarpara Taluka: Mundra	He represented that the company wishes to bring project at this place for its own benefit not for the development of the local public.	The representative of the project proponent replied that the company can establish industry at other place also but the decision to establish project at this place is for the development of Mundra.	A budget of Rs. 58 crores for the period of 5 years (From day 1 of the project construction) has been allotted towards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
				(drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores
56	Shri Valjibhai Tapariya Village: Zarpara Taluka: Mundra	He represented that in the forthcoming projects and the existing projects, Adani and other voluntarily organizations should make an exchange centre, the record of qualified persons should be prepared and the people should be taken on service as per the requirement of the company and their qualifications.	The representative of the project proponent replied that, we are in process of making Adani Skill development centre. Efforts will be made in future to create employment opportunities. Moreover linkages will be established with the employment exchange and the registered persons having appropriate qualification shall be given priority.	As promised, Adani skill development centre will be developed at the project site. Necessary budgetary allocation will be done.
57	Shri Hussain Vasu Luhar Village: Tunda Taluka: Mundra	He represented that how many people of Tunda village serve at Adani? I was also provided employment but was terminated without providing any reason.	The representative of the project proponent replied that more than 100 persons of the Tunda village serve at Adani company. In the year 2012, a total of 35 persons were given employment on the basis of the representation of the Gram Panchayat. You were given much better salary increments as you were the resident of village. You are not terminated from service as on date.	Locals will be given preference to employment based on skill set & eligibility requirement as per the job and the vacancies available.
58	Shri Gulabsinh Babubha Jadeja Village – Mota Kandagara Taluka: Mundra	He represented that we do not have any objection towards this project. Due to company we have progressed.	-	-
59	Shri Viram Naran Shekhara On behalf of Bharatiya Kisan Sangh Village: Zarpara Taluka: Mundra	He represented that • A large number of objections are represented during public hearing. If the company comes and if there are any chances of environmental degradation, then the government authority should consider it seriously. The work should not remain only on paper. • It should be considered that the local public are not receiving employment. • If the NGT can issue notice to even Shri Ravishankar, then no one is over and above the environment.	The representative of the project proponent replied that: We undertake all kinds of work in a transparent manner. We are making efforts so that at least ten persons from each village receive employment. The suggestion of tissue culture laboratory for the development of agriculture is welcome and the relevant process will be considered for the same. We are ready to consider the requirements of the farmers through meeting with their committee, we shall do work on required issues, a 5 year plan will be undertaken with you and such opportunities will be undertaken that the employment opportunities are	The proposed project will generate employment about 2000-3000 persons on average per day during construction phase and during operation phase, about 2000 direct employment and 5000 indirect employments will be provided. Locals people will be given preference in employment based on skill set & eligibility requirement as per the job and the vacancies available. The total water requirement for the project is about 32,267 KLD which will be sourced from desalination plant of APSEZ Ltd, through M/s Mundra Utility Pvt Ltd (MUPL). No ground water will be abstracted during the operation phase.

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		• Even in the past, before the establishment of the solar plant, the number of jobs were promised but the same is not observed. • The company should work for developing new sources of water. • By ignoring agriculture and developing industries, how many days will we survive? Agriculture development should also take place. • Moreover development of education is also necessary. Also, the Adani Company should establish a laboratory at Mundra for Tissue culture development of date farming. So farmers concerns can be addressed.	created through employment exchange. The company will work towards satisfaction of local people. Efforts will be made to provide the Drip Irrigation system for Date farming. As part of CSR activities, provision of eight crores rupees every year has been done separately for this project.	The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). Pollution Control: The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project. CER Initiatives: A budget of Rs. 58 crores have been allotted for CER activities for five years. Under CER budget Rs. 1.25 Crores has been allocated for development of tissue culture laboratory in local dates palm Research Institute, Govt of Gujarat in Mundra.
60	Shri Dayabhai Gadhavi Village: Mota Kandagara Taluka: Mundra	He represented that, • As per the page no. 8 of the EIA report, the impact of sulphur dioxide on environment is negligible. How is it possible? • Why do you not operate the ESP at night in the Adani Power?	The representative of the project proponent replied that, • In order to avoid harmful impacts to environment, concentration of sulphur dioxide emissions is regulated by stipulated norms. The emissions of sulphur dioxide will be within the prescribed limits after the erection of copper plant. • At the Adani Power, the ESP is always in operation when the plant is in	The SO_2 generation is a continuous process during smelting activity. Primary gas stream will be routed to sulphuric acid plant (SAP) plant and the fugitive gas stream will be routed through scrubber. Further, there is no provision in the plant/process for storage of SO_2 gases and will be processed immediately to produce sulphuric acid. Sulphuric acid plant (SAP) will be installed with highly efficient (Double Conversion Double Absorption) DCDA process to control the SO_2

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			operation.	emission to less than 1 kg/t of sulphuric acid produced. About Rs. 1700 crores will be invested to install sulphuric acid plant. The details of episodal SO_2 stack emissions are addressed in Section-4.2.2.3 of Chapter-4 of the EIA Report. The process of extraction of copper metal, sulphuric acid is recovered as a by-product from the off-gases generated from the smelting and converting furnaces. A part of sulphuric acid produced is utilized for phosphoric acid production and rest will be sold in the market based on market requirement. • Regular stack emission monitoring shall be carried out at all stacks for particulate matter, HF, SO_2 and NOx for checking the compliance to emissionstandards by respective plant. About Rs. 639 Crores will be spent on air pollution control system installation.
61	Shri Ranjitsinh Jadeja President, Taluka Panchayat Mundra Taluka: Mundra	He represented that, I hereby submit as a political leader that due to the establishment of the company, employment opportunities will be increased and the local people, taluka, state and entire country will develop.	-	The employment of local people in primary and secondary sectors of project shall upgrade the prosperity of the region. This in-turn will improve the socio-economic and infrastructure conditions of the area. Further, a total budget of Rs. 58 crores will be spent towards CER nitiatives in the five year period, which will help the socio-economic development of the region.
62	Mrs. Devalben Gadhavi Village: Shekhadiya Taluka: Mundra	She represented that, it is submitted that by way of this project, care should be taken that the local ladies and other local public is given employment.	The representative of the project proponent replied that, as for the employment of ladies, arrangement has been made so that 120 ladies will get employment. Moreover, we will sign an	Locals will be given preference in employment in the proposed copper refinery project. As promised, about 120 ladies will get employment. Further, proper training will be imparted to the

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			MOU with Welspun Company in order to provide proper training and employment to ladies so that their condition will improve.	ladies so that their employability will increase.
63	Shri Ibrahim Turk Village: Dhurb Taluka: Mundra	He represented that you are portraying this project as a green field project. But around 103 ha of land of forest department is taken in this project. How can this project be termed as green field project?	The representative of the project proponent replied that, any new project is stated to be green field project. There is no relation of word 'green field' with vegetation. It is only an English word.	About 89.84 ha of project area (35% of the project area) will be developed with greenbelt / green cover as per prevailing guidelines from GPCB/CPCB/MoEF&CC. The proposed greenbelt is already earmarked in the Layout given in Figure-2.1 of the EIA report.
64	Shri Hirabhai Patariya Sarpanch, Deshalpar Kanthi Gram Panchayat, Village: Deshalpar Kanthi Taluka: Mundra	He represented that this project is only 5 km away from our village. Therefore it is submitted that our village should also be given priority in the manner that Navinal and Shiracha are given priority.	The representative of the project proponent replied that, as discussed earlier, attempts will be made to employ 10 persons from each village.	As promised by the project proponent, about 10 persons from each village in the study area will be employed. Necessary skills will be developed through the Skill Development Centre as proposed.
65	Shri Ibrahim Turk Village: Dhurb, Taluka – Mundra	He represented that • You are to take sea water for this project and therefore what would be the impacts of this activity on the marine ecology? Have you conducted any study in this regard? • What will be the impact of salinity ingress on agriculture? • There is increase in salinity and loss to agriculture in the Tunda, Kandagra and other such areas due to cutting of mangroves.	The representative of the project proponent replied that: 3) The NIO organization has conducted study for the Intake and Outfall channels per the rules and regulations of MoEF&CC. The 11 km long outfall channel will meet the sea near West port and will dilute the quality of outfall. Moreover it is always ensured that the water temperature does not exceed more than 5 degree higher than the sea water ambient temperature and the salinity does not exceed 57 PPT. 4) We had undertaken a study through M/s Gujarat Institute of Desert Ecology (GUIDE) for assessment salinity of underground water. The salinity in the underground water has increased not only in the project surrounding area but also in the entire Kutch area. This is due to lack of rain and over-drawl of ground water. 5) The industries of this area are not	The total water requirement for the project is about 32,267 KLD which will be sourced from desalination plant of APSEZ Ltd, through M/s Mundra Utility Pvt Ltd (MUPL). No ground water will be abstracted during the operation phase. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD).

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			dependable on ground water.	
66	Shri Natubha Jadeja Village: Shiracha, Taluka: Mundra	He represented that 100 people of my village were employed by Adani Power Company. Hence, my village has received employment. Thus it is our submission that this plant should be established so that the employment is increased and the problem of unemployment of rest of our villagers is resolved.	-	As promised by the project proponent, about 10 persons from each village in the study area will be employed. Thus local people will be given preference. Necessary skills will be developed through the Skill Development Centre as proposed. The employment of local people in primary and secondary sectors of project shall upgrade the prosperity of the region. This in-turn will improve the socio-economic and infrastructure conditions of the area.
67	Shri Bharat Kalyan Seda Village: Zarpara Taluka: Mundra	He represented that 1) The water to be sourced from sea will be through pipeline of open canal? In case if you dig a canal, the farmers will be impacted. 2) He represented that a charge of Rs. 200 is levied on trucks at entry gate by Adani Company.	The representative of the project proponent replied that 1) The water to be used in this project will be obtained from existing intake channel. Thereafter, the desalinated water from APSEZ will be transferred through pipeline to proposed project. 2) The contractor that works in the area of the company or APSEZ are provided with zero amount gate pass for their trucks and therefore no charge is levied from them.	The total water requirement for the project is about 32,267 KLD (32.3 MLD). The total desalinated water requirement for the project would be sourced from APSEZ Ltd, through M/s. Mundra Utility Pvt Ltd (MUPL). The desalinated water from the APSEZ will be transferred through the pipeline only. There will not be any open channel flow. Further, an integrated water system is proposed, the effluent from the process units is treated and reused to reduce water demand. It is also proposed to install a secondary Reverse Osmosis (RO) plant to further treat water from the effluent plant facility for effective use. Rejects from the reverse osmosis plant will be sent to Multi Effect Evaporator (MEF) for further recovery and solids generated will be sent to Secured Land Fill (SLF). This water would be utilized to meet the DM water and plant/utility water requirement of proposed project. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD).
68	Shri Valji Sumar Gadhavi Village: Zarpara	He represented that, I have been working with the Adani Company since the last 15 years. My	-	-

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Sr. No.	Name and Address of the Representative	Issuses Raised/Represented	Chronological Response given by Representative of Project Proponent	Action Plan
	Taluka: Mundra	50 trucks are working for this company. Rs. 200 charge is not charged for my trucks.		
69	Shri Kirtibhai Gor Village: Tunda, Taluka: Mundra	He represented that, There was no such public hearing conducted for the solar project. Certain boys have received employment in this project. Around 50% of people from the bio-data sent by me have received employment. The persons that have completed B.E. should receive employment after the completion of apprenticeship and thus what are the plans of the company to employ such persons? Such projects are welcome. We are 100% in favour of the development but not at the cost of environment. I had written to the GPCB officer that large amount of emission is emitted from the chimney. If the emission that is emitted today comes out regularly, then it is acceptable. The letter is written to GPCB for emission. Also received reply from GPCB. The development should be such that no one suffers due to impacts on environment.	The representative of the project proponent replied that for the protection of the environment, latest technology and equipment will be installed and operated in this project. Treatment plants for air and water both will be installed. The entire process will be as per the rules and regulations stipulated by the government so that environment will not be damaged due to this.	Pollution Control: The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. The plant will be operated on zero liquid discharge principle. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project. CER Initiatives: A budget of Rs. 58 crores has been allotted for CER activities for five years.
70	Shri Dayabhai Gadhavi Village: Mota Kandagra, Taluka: Mundra	He represented that the project is entirely chemical based, which will be spread in water, air, noise, land, etc. and it will affect the agricultural land. I feel that such kind of project should be around 20 to 25 km away from the residential area. What are the measures for protection from such kind of project?	The representative of the project proponent replied that as part of this project, manufacturing of copper from copper concentrate will be through smelting and electrochemical process, the polluted water that comes out from this project will be sent to the RO plant after treatment in ETP. Therefore, no polluted water will be released outside. Thereafter, this water will be used again in the process. The rejects will be treated through multi effect evaporation and thus the water will be removed from it. Flue gases released from the process will be captured and converted to intermediate products through chemical process. It shall be ensured that no storage	The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. The plant will be operated on zero liquid discharge principle. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project.

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			leakage is possible by performing the risk analysis and hazard identification. Thus, there will be minimal chances of water and air pollution.	
71	Shri Lakhdirbhai Gilwa Village: Zarpara, Taluka: Mundra	He represented that the farming of Chickoo and Dates have suffered a lot due to existing projects. The ground water levels have gone down after establishment of these projects. It has impacted production of Chickoo and Dates and thus the farmers have strong objection against this project.	The representative of the project proponent replied that: Adani Port and Adani Power do not use ground water. The new project will also not use ground water. Both these projects use sea water.	There is no ground water withdrawal (consumption/ utilization) for proposed project and project operates on zero discharge concept. Hence, due to proposed project there is no scope of ground water levels reduction and contamination.
72	Shri Khengar Gilva Village: Zarpara, Taluka: Mundra	He represented that the plantation from Bhadreshwar to Tunda Vandh was removed after establishment of projects. Due to this reason, the wild animals like pigs and Nilgai enter our farms. Therefore, it is our submission that please do something for the protection of the crops.	The representative of the project proponent replied that prior to this also, support for drip irrigation is provided to the farmers from many villages since last three years. Special attention will be given to provide support for drip irrigation as and when required.	The total budget of Rs. 1.1 crore will be spent on CER activitie (Support for Drip Irrigation for farmers in the area) in five-years period.
73	Ms. Shital Rajgor Village: Mota Kandagra, Taluka: Mundra	She represented that we do not have any objection for the establishment of company. Ladies like us get employment. We are in favour of the company.	-	-
74	Shri Dayabhai Gadhavi Village: Mota Kandagra, Taluka: Mundra	He represented that 1) What would be the concentration of Sulphur Dioxide and at what height it will be released? 2) How much quantity of Sulphur Dioxide will be released in air? What will be the density of Sulphur Dioxide?	The representative of the project proponent replied that: 1) Sulphur dioxide will enter the sulphuric acid plant directly from the copper smelter. Acid will be made in this plant. After making acid, it will be scrubbed in tail gas scrubber and after that the gas will be released in air which will mainly contain oxygen and nitrogen. Concentration of sulphur dioxide will be below the prescribed limits by the Government of India. 2) As per CPCB norms, 1 kilogram sulphur dioxide will be released per ton of sulphuric acid produced. The density of	1) The SO_2 generation is a continuous process during smelting activity. Primary gas stream will be routed to sulphuric acid plant (SAP) plant and the fugitive gas stream will be routed through scrubber. Further, there is no provision in the plant/process for storage of SO_2 gases and will be processed immediately to produce sulphuric acid. 2) Sulphuric acid plant (SAP) will be installed with highly efficient (Double Conversion Double Absorption) DCDA process to control the SO_2 emission to less than 1 kg/t of

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			the flue gas will be same as the air. It will contain very less amount of sulphur dioxide. The same will be around 150 to 200 ppm. We will establish a plant that would be one of the best plants in the world.	sulphuric acid produced. About Rs. 1700 crores will be invested to install sulphuric acid plant. The process of extraction of copper metal, sulphuric acid is recovered as a by-product from the off-gases generated from the smelting and converting furnaces. A part of sulphuric acid produced is utilized for phosphoric acid production and rest will be sold in the market based on market requirement.
		3) How sludge will be disposed?	3) Gypsum will be manufactured from gas scrubber using lime. This will be used in the cement industry. The flue gases will be released in atmosphere at a height of 100 m.	3) Secured Land Fill (SLF) is proposed over 12.95 ha within the project premises for disposal of ETP waste sludge and spent catalyst. Other hazardous waste will be disposed through the approved recyclers.
75	Shri Ashariya Lakha Gilwa, Village: Zarpara, Taluka: Mundra	He represented that, The average temperate keeps on increasing every year. In copper project 300 Megawatt power will be required and you will generate steam that would be capable to produce 40 Megawatt of electricity and thus will this increase the temperate?	The representative of the project proponent replied that there will be no increase in temperature due to this project. It would be preferable to use steam for production of electricity instead of releasing it in air. Fuel consumption can be reduced. The electricity will be produced using steam as per rules and regulations. Thus the temperature outside the plant will not increase.	The electricity will be produced using steam as per rules and regulations. Thus the temperature outside the plant will not increase. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project
76	Shri Naran Gadhavi, Village: Zarpara, Taluka: Mundra	He represented that the objection is done because the effect of pollution will be same for all. We are talking about the impacts that are found on the environment, ground water, human health, mangroves, fishermen, cattle rearers, Dates crop, children, etc. should be discussed. We do not object to the development. We would welcome the development if proper environmental measures are taken care of. The objection is only against pollution and randomly placed electric lines. CRZ rules have been violated. Water has turned	The representative of the project proponent replied that 4) Proper attention will be given to your representations. You have raised important points as an NGO and we have undertaken the appropriate actions as well. One should always talk as a responsible citizen. 5) We will undertake all kinds of development by following the rules and	The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. The plant will be operated on zero liquid discharge principle. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. The budget allotted for environmental protection will be about Rs. 1044 Crores, out of which for air

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		saline and its TDS has become more than 4500.	regulations and we hereby give assurance for the same. The guidelines will be considered while development of new plant.	pollution control systems is Rs. 639 Crores, water pollution control system is Rs. 360 Crores and other environmental management systems (like solid waste, greenbelt, post project monitoring, gas collection and energy conservation) is Rs. 45 crores and wildlife conservation and Mangrove Conservation Plan is about Rs.4.44 Crores. Further, a total budget of Rs. 58 crores will be spent on CER activities in five year period.
77	Shri Paresh Rajgour Village: Tunda, Taluka: Mundra	He represented that it is our expectation that the plant will be established by considering the rules framed by the Government of Gujarat and Central Government as well as considering the public interest.	The representative of the project proponent replied that the company is responsible for maintaining public interest and environment. The company will operate the plant by considering the public interest and environment.	The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC.
78	Shri Pravinsinh Bhurubha Chauhan Village: Siracha, Taluka: Mundra	He represented that TATA Power plant took Gochar land. They have entered into agreement to provide either green or dry fodder. Why you do not enter into such kind of written agreement?	The representative of the project proponent replied that: 1) In your case the Gujarat High Court has ordered to provide fodder for a particular duration and this duration is even now in effect. Thus, there is no question of entering into any kind of agreement or contract as the order is passed by the High Court. 2) We are providing the dry and wet fodder to the villages having requirement on the basis of the order passed by the Honourable High Court. We are also providing fodder voluntarily to the villages from which the people have not gone to the courts.	A budget of Rs. 58 crores has been allotted for CER activities for five years. The provision of fodder to the needy villages will be covered under CER initiatives.
79	Shri Viram Naran Sankhra (Member of Kishan Sangh) Village: Zarpara, Taluka: Mundra	He represented that the issue is not limited to fodder, it is a request to maintain positive attitude from your side on permanent basis. So that such a public hearing would not even be required in the years to come. Such kind of	-	-

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		submission is done.		
80	Shri Vishram Gadhavi, Village: Zarpara, Taluka: Mundra	He represented that, I am worried about my existence, the existence of my village, the existence of agriculture and therefore I have come to object. It is expected that you undertake your role in an unbiased manner.	-	-
81	Shri Naran Gadhavi, Village: Zarpara, Taluka: Mundra	He represented that, 1) Three reports have been found for the production of copper plant. Out of this 1) Regional Institute of technology, Jamshedpur, 2) Energy Laboratory and department of biology science Cambridge University, London and 3) Public Health report. Which reports contains the details of serious side effects of production of copper. Therefore provide the information that what diseases are possible due to the dust of copper? 2) As per the report, hair falls, stomach ache, cancer and other inhalation related diseases, etc. occur due to dust. How you will control the dust? How many teams will you have? How many doctors will be available? 3) The second question is that, how will you control the air emissions that will be released in the atmosphere? What is the facility that is done by you as for this?	The representative of the project proponent replied that: 1) The reports that you are mentioning are related to plants that are very old. The plants with latest technology are even present in developed countries. The dust from the plant is collected and used in furnace. Moreover, the dust on the road is also collected by vacuum truck. At the places where the workers are required to work in dusty area, they will be provided personal protective equipment (PPE). 2) Copper concentrate material contains 8 to 10% moisture and therefore there is very less chance of dust emissions. Even thereafter, if this dust goes into breathing, the material is inert and therefore there would not be any specific effect. The effect is just like the diseases that are caused by normal dust. 3) The sulphur dioxide will be used as intermediate product, its chemical process will be undertaken and sulphuric acid will be made from it. Therefore, there is no question of the toxic gases releasing in the atmosphere. The chemical process of these gases will be done and intermediate product will be developed. It shall be ascertained that no	The proposed project will be designed as per the latest technology with all in built pollution control measures. The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. The plant will be operated on zero liquid discharge principle. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. Dust will be captured at source of generation by providing suction hoods and bag filter. Dust collected will be recycled back into plant process. Dust emission outlet of the bag filter will be < 50 mg/Nm^3. The PM emission will be well within the prescribed limit set by MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project. Total of Rs. 639 Crores budget has been allocated for protection of Air Pollution. CER Budget of Rs. 1.2 Crores has been allocated for the mass plantation in the 10 km radius area of the plant site.

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			leakage is possible by performing the risk analysis and hazard identification. Thus, there will be minimal chances of air pollution.	
		4) The sulphur dioxide that is released in air will damage health and so what steps have been taken by the company?	4) After making sulphuric acid, it will be scrubbed in tail gas scrubber and the gas will be released in air. The lime will be used during the gas scrubbing process and gypsum will be made. This will be used in cement industry.	
82	Shri Dayabhai Gadhavi, Village: Mota Kandgara, Taluka: Mundra	He represented that what kind of storage would be done by the company for raw material and how raw material will be transferred?	The representative of the project proponent replied that the company's copper concentrate storage will be entirely covered. The pipe conveyor will be used to transfer material from port to plant.	-
83	Shri Valjibhai Tapariya, Village: Zarpara, Taluka: Mundra	He represented that with bottom of their hearts, everyone wishes that industries should come. Industries should take corrective actions when there are objections. Industries are welcome with the conservation of environment.	The representative of the project proponent replied that all points that are represented here will be taken care of. We will also consider the benefits of common public on behalf of the company. We are 100% responsible for the common public as a developer. We will consider that properly.	-
84	Shri Mayur Aatu Maheswari Village: Tunda, Taluka: Mundra	He represented that • What is number of the employment opportunities provided to the local public by the existing industries? Why are the local people sacked from their jobs? A committee should be constituted so that the local public gets employment and an open discussion / meeting should be held between the company officers and committee for the purpose of providing employment to local public. This discussion should be done openly not behind closed doors. As per the rules of the government, the local public should receive 85% of employment. • Provide the list showing how many local	The representative of the project proponent replied that the list of the local persons working in the company will be provided. We undertake the process of employing the local people in consultation with the Sarpanch and Gram panchayat. Even this process will be made further transparent. The main reason for termination of job is that the workers are irregular.	The proposed project will give employment to about 2000-3000 persons on average per day during construction phase and during operation phase, about 2000 direct employment and 5000 indirect employment will be provided. Locals will be given preference to employment based on skill set & eligibility requirement as per the job and the vacancies available. Database exchange center facility, in the exiting skill development center run by Adani Foundation; so that records of skilled people from the area will be maintained and will be made available to other industries.

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		persons have received employment / work in the existing industries.		Under CER for proposed project, fund of Rs. 2 Crores has been allocated for database exchange center facility, in the exiting skill development center run by Adani Foundation
85	Shri Mithu Jakhu Maheshwari Village: Mota Kandagara, Taluka: Mundra	He represented that • The preservation of water and environment should be made for farming. Farming gets affected due to sea water, Dates do not grow up. Water is not fit for drinking within the radius of 3 km. Therefore the company should think about this loss. • The work for 3 storage area for Cowsheds is stopped in Kandagara. The representation has been made to restart the construction work of storage area. • The representation has been made for fair work.	The representative of the project proponent replied that Considering your representation, without any pressure, the work will be done and efforts will be made to finish incomplete works.	The total water requirement for the project is about 32,267 KLD which will be sourced from desalination plant of APSEZ Ltd, through M/s Mundra Utility Pvt Ltd (MUPL). No ground water will be abstracted during the construction and operation phase. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). The work for 3 storage area for Cowsheds will be completed in a time bound schedule. Cowshed will be construction in Kandagara village as per Panchayat resolution. Under CER a budget of Rs. 20 Lakhs has been allocated for Cowshed construction in the said village.
86	Shri Salu Kumbhar, Village: Tunda, Taluka: Mundra	He represented that three Fishermen access roads towards sea have been closed, due to which we have to take 5 km long route, we do not have vehicles, therefore, the demand has been made to open three routes.	The representative of the project proponent replied that we will fully cooperate with fishermen and will make sure that no hindrance is made in the route of fishermen, if there is any obstacle, they can approach us any time.	As committed, the fishermen routes will not be disturbed during the construction and operation of the proposed green field copper plant.
87	Shri Kirtibhai Gor, Village: Tunda, Taluka: Mundra	He represented that which water will be used in the upcoming plant?	The representative of the project proponent replied that in the proposed plant, seawater will be used after removing salt (desalination).	The total water requirement for the project is about 32,267 KLD (32.3 MLD). The total desalinated water requirement for the project would be sourced from APSEZ Ltd, through M/s. Mundra Utility Pvt Ltd (MUPL).
88	Shri Dayabhai Gadhavi Village: Mota Kandagara, Taluka: Mundra	He represented that • As per the notification of Government of Gujarat / Government of India, 85% of people shall be employed from local areas, how many have you employed? • What steps have been taken to develop the	The representative of the project proponent replied that we are trying to provide employment to the local people to a great extent, but in the initial stage, due to the lack of requisite qualification, the company was facing problem to provide the employment. After the ITI has started and after the training	The proposed project will give employment about to 2000-3000 persons on average per day during construction phase and during operation phase, about 2000 direct employment and 5000 indirect employment will be provided. Locals will be given preference to employment

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		unskilled people to give them the right opportunity?	of RTG is provided, the proportion of local employment has increased and will continue to increase.	based on skill set & eligibility requirement as per the job and the vacancies available.
89	Shri Hamir Rabari Village: Wandh, Taluka: Mundra	He represented that one of my two handicapped children who cannot hear and the other one cannot speak. The representation had been made for their job.	The representative of the project proponent replied that we had employed their children, but they said that one of their boys is working in the Tata Company; and they do not want to join here now.	-
90	Shri Dosabhai Gadhavi Bhurubha Chauhan, Village: Siracha Taluka: Mundra	He represented that if the industry comes then damage will be done. We are not against the plant. You will fill the vacancy on contract basis. But, what will you do for farmers like us and our children? TDS analysis been carried out by me in the 2007 and 2012, the TDS was reached up to 2200, which is not fit for drinking. We used to get drinking water from bore well, now we have to buy water bottle. In the last 5 years 800 to 900 TDS has been increased. In fact, nothing has been done for the farmers; we demand that something is done for the farmer and farming. The fruits from our farm are not worth eating.	The representative of the project proponent replied that, we will work towards solving problems of farmers. Efforts will be made to open the Kishan School for the children of the farmers. The planning as to how the ground water level can be increased, has been made by Adani Foundation, along with Mr. Yogesh Jadeja to improve the water supply in 10 villages and for the purpose of employment, the children of farmer will be given priority for this purpose.	The issues raised will be covered under CER/CSR development program. Under this project a total budget of Rs. 58 crores will be spent on CER activities in five-year period. Out of Rs. 58 crores, Rs. 29.5 crores is allocated for Community Rural Infrastructure Development, which includes safe drinking water facilties, check dams, deeping of ponds, etc. will be carredout.
91	Shri Pravin Singh Bhurubha Chauhan, Village: Siracha Taluka: Mundra	He represented that the power plant's intake channel, the outfall channel, and the water reservoir are *Kuchcha* or *Pucca*?	The representative of the project proponent replied that, Outfall channel is Stone Masonry Lined, while the Reservoir is Clay Lined and Sheet Piling is done. This question is not about the proposed project.	-
92	Shri Khimraj Gadhavi Village: Zarpara Taluka: Mundra	He represented that the people from village used to drink the water with high TDS and the company uses Narmada water for sprinkling on coal piles.	-	CER budget (Rs. 16 Crores) for drinking water project by providing overhead tank in the project area villages (Siracha, Jarpara, Desalpar and Moti Khakhar village) has been proposed. Watershed management by check dams in upstream areas with due engineering details in consultation with Water Recourses Department under CER budget (Rs. 10.5 Crores). No ground water will be abstracted during the operation phase.

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				The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD).
93	Shri Pravin Singh Bhurubha Chauhan Village: Siracha, Taluka: Mundra	He represented that, • What does High water line, Low water line in the figure No. 1 in the E.I.A. report indicate? • Different CRZ maps are submitted in the Public Hearing for the years 1991, 2008, 2010 and 2017, which is the correct map out of those? If one map is correct out of four then this shows that the other three are false which indicates the Company has violated the rules of CRZ. • The tidal waters were reaching at a place in Siracha, now waters are not reaching there which shows that the company has violated the CRZ Act. • There is no clarification in the report about from where the Conveyor belt, Road, Railway line will pass and how they will be used in the plant. • Three sites in total were selected for the project, site number 2 is selected from that. What is your purpose behind it? • When you already own the site No. 1, why you have selected site No. 2? You have selected site No. 2 to get forest land.	The representative of the project proponent replied that 1) CRZ maps are prepared by the institution recognized by the Government of India. Project proponent has no authority over it. Projects are approved on the basis of maps prepared by the authorized institution. 2) The map of proposed project is superimposed on CRZ map of the area prepared by an institution recognized by Government of India in 2011. 3) CZMP plans are prepared by the Government of India which are not public domain. When any approval is required for CRZ by any project then the CRZ map is submitted to compare with CZMP and on that basis only approval is accorded. We do not agree with your opinion in this matter. 4) The project is proposed in notified SEZ area and part of the forest land. So the Roads, Railway line falling under APSEZ will be used. Conveyer belt will pass through the existing conveyor corridor; this matter is mentioned on Page No. C 2/6 Point No. 2.2.7 of EIA report. 5) Detailed information regarding this matter is mentioned in Chapter-5. 6) For analysis of three alternative sites for project, about 18 factors were examined.	As informed, the proposed project is outside the CRZ boundary. The map of proposed project is superimposed on CRZ map of the area prepared in 2011 by Centre for Earth Science Studies (CESS) Thiruvanantapuram, an institution recognized by Government of India. The proposed project site is outside CRZ and doesn't attract CRZ clearance. The approved CRZ layout is shown in Figure-1.5 of Chapter-1 in the EIA report.

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			The site No. 2 was found to be more suitable, so it is selected. 7) We have submitted our reasons in EIA report. We do not agree with your view.	
94	Shri Dayabhai Gadhavi Village - Mota Kandagara Taluka: Mundra	He represented that we have received report of VIMTA. This VIMTA is a Private organization which is favouring the company. We don't accept VIMTA's report.	The representative of the project proponent replied that VIMTA is a NABET accredited agency.	M/s. Vimta Labs Limited (VLL), Hyderabad is a QCI/NABET accredited and MoEF&CC recognized and NABL accredited Laboratory. The credentials of M/s. Vimta Labs Limited are given in Chapter-11 of the EIA Report.
95	Shri Vajjibhai Taparya Village – Zarpara Taluka: Mundra	He represented that what area of land will be affected during Acidic Process in the plant? Where the Acidic Water and Chemicals will be released?	The representative of the project proponent replied that the process of this copper plant is not acidic, but along with production of copper, sulphur dioxide will also be produced which will be used for making sulphuric acid. And, it will be transported through pipeline of suitable material and there is no possibility of leakage. The tail gas will be scrubbed in the scrubber by lime stone.	The proposed project will be designed as per the latest technology with all in built pollution control measures. The proposed project will implement all the control measures at the source level to keep the emissions under permissible levels. The plant will be operated on zero liquid discharge principle. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project.
96	Shri Dayabhai Gadhavi Village - Mota Kandagara Taluka: Mundra	He represented that • Will waste material be generated from the plant? • What is the arrangement for waste material? • Is there any chance of any kind of blast? • In what manner will the finished product be taken out?	The representative of the project proponent replied that: 8) Lime will be used in the scrubber process and Gypsum will be made. This will be used in the cement industry. 9) Certain part of the waste material coming out of the plant will be sent to the CPCB authorized processor and other non-recyclable hazardous waste will stored in secured land field constructed as per	The details of solid waste generation and their disposal is addressed in Section-2.4.3 of the EIA Report. A total budget of Rs.1044 crores will be spent for environment pollution control and management.

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			guidelines of CPCB. 10) The finished goods in the form of copper plate will be transported in truck or container. Sulphuric acid will be transported in tanker. Chances of blast are not possible.	
97	Shri Pravinsinh Bhurubha Chauhan, Village: Shiracha, Taluka: Mundra	He represented that, • You have mentioned that you will make road from the waste. So what will do for making road from this waste? • What would be the constituents in raw material that would be stored? • Which chemicals will be contained in the waste that comes out from the plant and will mercury come out from this waste?	The representative of the project proponent replied that: 1) We will not make roads from waste. 2) The waste material coming out of the plant will contain calcium, silica and arsenic. This waste material will be stored in secure land fill sites. 3) Mercury product is made from the waste material that contains mercury and material named calomel is produced. This material will be exported. No process for mercury will be done in this plant.	Secured Land Fill (SLF) is proposed over 12.95 ha within the project premises for disposal of ETP waste sludge and spent catalyst. Other hazardous waste will be disposed through the approved recyclers.
98	Shri Naran Gadhavi Village: Zarpara, Taluka: Mundra	He represented that, • What steps have been taken for reducing emissions and water conservation as per the gazette notification dated 07.12.2015 of MoEF&CC, Government of India? • What effect will this project produce on sea creatures that have direct connection with fishermen?	The representative of the project proponent replied that: 1) This question does not relate to this project. 2) No liquid will be discharged from this plant. 3) A total of 32,800 m^3/d of water will be used in the plant and out of that 6,448 m^3/d of polluted water will be produced. This will be treated in ETP, the water will be purified by process in RO plant and it will be again used in the plant. The rejects will be treated through the multi effect evaporation process. Therefore there is no question of discharge of any kind of liquid from this project	A total of 32,267 m^3/d of water will be used in the plant and out of that 3,925 m^3/d of polluted water will be produced. This will be treated in ETP, the water will be purified by process in RO plant and it will be again used in the plant. The rejects will be treated through the multi effect evaporation process. Therefore, there is no question of discharge of any kind of liquid from this project. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). About Rs. 360 crores will be spent for ETP design and wastewater management

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Sr. No.	Name and address of the Representative	Representations	Chronological Reply given by Representative of Project Proponent	Action Plan after PH
1	Ravilal K Maheshwari (Advocate & Notary, B.A., L.L.B.), 15, Ground Floor, Adarsh Tower, Mundra-Kutch	1. My clients are the residence of the village on which the project shall be made and the villages around the project.	1. We heartily congratulate the villages related to the project and the villages around it as they are the important participants of the project.	1. -
		2. This project will use hazardous substances and material that will be for the human health/animals/vegetation and water flow as per the rules of the MSIAC and this shall cause a serious effect to environment. What steps will be taken by the company for this and what are the solutions as for this with the company?	2. Non Saline water shall be used in this project. The ground water shall not be used. The waste that comes out of the project shall be recycled. No liquid type waste shall come out from this project. The chemicals that damage the environment and the waste hazardous for the environment shall be disposed off in such a manner that no serious effect is found on the environment.	2. No ground water will be abstracted during the operation phase. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). Secured Land Fill (SLF) is proposed over 12.95 ha within the project premises for disposal of ETP waste sludge and spent catalyst. SLF will be designed as per CPCB guidelines. Other Hazardous waste will be disposed through the approved recyclers.
		3. A serious damage shall occur to the health of humans and animals along with environment of the village around the project as there shall be emission from the plant, there shall be emission or dust from the related construction activities and other such places. What steps shall be taken as per legal in case if any damage occurs. Provide in detail the corrective step with the company so that the protection can be done.	3. In this project the chemicals like SO_2 and NOx shall be released. Sulphuric Acid shall be manufactured with the use of SO_2. In order to lessen the production of PM and NOx, scrubber shall be used. The chemical coming out at the time of the operation stage shall be restricted and NAAQ maintenance shall be undertaken ambient air quality. Therefore, no long term effect shall be found.	3. The proposed project will implement all the control measures at the source level, which are incorporated in Draft and Final EIA report. Further, it will comply with all the conditions stipulated by GPCB and MoEF&CC. About Rs.1044 crores will be spent for environmental pollution control measures in this project.
		4. What are the provisions laid down by the company for protection from blast, liquification, fire, etc. during the production? Provide the details that the company shall take. This is because (prior to this a boiler had blasted in a project of this very company and many humans/workmen had suffered serious injuries). This company has violated the rules for protection prior to this also.	4. Steps under statutory provisions shall be taken at the time of transport of hazardous chemicals. As for this the disaster management plant and risk analysis plan shall also be prepared. This has been included under the Chapter-7 of the EIA. The accident of blowing of boiler, that is point out, is an unfortunate incident that has occurred even after proper protective facilities.	4. The necessary safety measures will be provided in storage facilities and safety equipments & PPE's for staff and workmen in the proposed plant. The hazard identification, risk assessment and disaster management plan (onsite & offsite) detail are given in Chapter-7 of the EIA report.
		5. The project is planned on the land and out of this the sanction is sought from the government of	5. The construction in the forest for this project shall only be done after obtaining final	5. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of

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		India and the same is pending before the government by file no. 8-04/2016 for land totaling of 1576.81 heacter and located at the Siracha-Navinal village. This file is returned by the central government to the Gujarat government for the purpose of opinion. It is specifically mentioned in it that this company has been provided with forest land prior to this also. Therefore additional land cannot be given. In this manner the forest land can be given in rare cases and in very serious requirement, as per the forest laws. In this manner the land of the company is not approved and the representative of the common public named Mahesh Mohanlal Desai has submitted objections before the Central government and Gujarat government and it is submitted that the land should not be approved. In short, the forest land is not provided to the company yet the work for project has been started. The company should provide explanation to all points in a detailed manner.	approval. The application for conversion of this land is pending before the government of India. The company shall comply by the decision taken by the government of India.	1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only after getting all required statutory clearance from concern department.
		6. Prior to this, the environment department had issued show cause notices to other project of this company and on the basis of the report submitted by Sunita Narayan team, the company was asked to pay penalty of Rs. Two hundred crores i.e. 1% amount of project, for breach of environmental condition. Thus, what is the assurance that this company shall not violate the conditions for environment laid down by the environmental law? Moreover the company has also not paid the amount of penalty. In this manner the company has openly breached the conditions for environment. As for this the environment related approval should not be given. Further the company should give a detailed explanation as for this issue.	6. This case relates to APSEZ. The show cause notice was disposed off on the basis of certain instructions. These are to be followed by the company. In this notice it is not mentioned that the environmental approval is not provided	6. This is outside the scope of EIA report for the proposed project. About Rs.1044 crores will be spent for environmental pollution control measures in the proposed greenfield copper project.
		7. As for the other revenue land of the project, the amount of stamp duty is pending as per the land	7. This project is under notified SEZ and the forest land is not forested and therefore the	7. The total land required for the proposed project is about 256.58 ha (634 acres), out

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		approval orders. Meanwhile the company states that, they have exemption. But the fact is that as per the section 21 of the Gujarat Special Economic Zone Act 2004, the exemption on stamp duty is on transaction that is carried out, between the developer and unit owner for lease, after the development of SEZ. This has been wrongly interpreted by the company and thereby the amount of stamp duty payable based on the land approval orders, for the land on which the project is brought, has not been paid. The company should provide a detailed explanation as to this. It should provide explanation as per the provision of law.	submission was made to convert the same. The point raised here relates to land revenue. It does not connect with environment in any manner.	of which 154.18 ha (381 acres) of identified land for this project belongs to the APSEZ (an Adani Group Company) and is already designated for industrial purpose as per the local land use plan.
		8. As for the other revenue land of the project, as per the section 67(a) of the Revenue act, when the land is transferred for other purpose i.e. to non-agricultural purpose, the conversion tax at Rs. 6 lacs is to be paid per meter. The company has not paid the crores of rupees of conversation tax payable on the basis of the approvals provided for the land by the collector and taluka development officer. As for this the audit has also been conducted by the CAG being the audit department of government. The collector issues number of notices to the company for paying the above mentioned amount but the company has not paid this revenue amount. The amount of revenue is outstanding for this land and therefore project cannot be initiated. The company should provide a detailed explanation as to this.	8. This project is under notified SEZ and the forest land is not forested and therefore the submission was made to convert the same. The revenue amount, taxes, etc. shall be paid on time.	8. Memorandum of Understanding (MoU) is in place between Adani Ports & Special Economic Zone Limited (APSEZL) and Adani Enterprises Ltd (AEL) for 154.18 ha (381 acres). The APSEZ notification and land allotment to AEL is enclosed as Annexure-III and Annexure-IV. AEL will pay all relevant taxes to state government and central government on time.
		9. What arrangement will have the company undertake for the hazardous waste (as per Hazardous and Other Wastes Rules) coming from the project?	9. The administration of the hazardous waste management shall be done as per the management and movement rules.	9. Hazardous cake and scrubber cake will be stabilized and stored in secured land fill as per guidelines of MoEFCC/ CPCB/ GPCB. An area of around 12.95 ha is identified and allocated for SLF. For the initial years of copper refinery plant operation till sustained utilization/management of copper slag and phosphogypsum; in the above application

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				areas are developed, as well as for emergency purpose, copper slag storage area of around 14.97 ha and gypsum storage of around 20.63 ha would be identified and made available for intermediate/emergency storage of the same. Provision would be made to reclaim the disposed copper slag and phosphogypsum from gypsum storage at a later stage for various utilization ventures.
		10. What taxes would be paid during the duration of Copper Smelter Project scheme? What would be the approximate annual tax amount?	10. The company shall pay all the taxes that are payable for the duration of project. These taxes shall be paid on time, as per the rules of the government of India.	10. AEL will pay all relevant taxes to state government and central government on time.
		11. What kind of five thousand jobs shall be created due to Copper Smelter project? How many local persons shall be employed in these services?	11. The local public shall be given opportunities for service as per their capabilities and potential. In order to increase the potential of the local public, such workshops shall be organized.	11. The proposed project will employment about 2000-3000 persons on average per day during construction phase and during operation phase, about 2000 direct employment and 5000 indirect employment will be provided. Locals will be given preference to employment based on skill set & eligibility requirement as per the job and the vacancies available.
		12. What arrangement has the company made for the primary requirement of the community such as health services, educational facilities, roads facilities, etc? What is the preparation of the company for improvement in the social structure of the affected individuals/villages?	12. The company has kept a provision of eight crores for the proceedings of CSR. This includes education, health, cleanliness, etc.	12. A budget of Rs. 58 Crores for the period of 5 years (From day 1 of the project construction) has been allotted toards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and

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				womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development (drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores The CSR details (like CSR policy, initiatives & activities, CSR Budget expenditure data form 2010 to 2016 and CSR implemented photographs) is given in Section-8.5 of Chapter-8 in the EIA Report.
		13. How much fund would the company allot for environmental conservation and in what manner will it be used?	13. The budget of 1044 crores of rupees is for the environmental protection. The detailed information as for this is provided under the table no. 6.4 of EIA for water population control system, waste management system, green belt management, etc.	13. The budget allotted for environmental protection will be about Rs. 1044 Crores, out of which for Air pollution control systems is Rs. 639 Crores, Water pollution control system is Rs. 360 Crores and other environmental management systems (like solid waste, greenbelt, post project monitoring, gas collection and energy conservation) is Rs. 45 crores and Wildlife conservation and Mangrove Conservation Plan is Rs. 4.44 Crores.
		14. Even prior to this, the company had for another project clearly violated the conditions laid down under the environment clearance and costal regulations zone and thereby had violated the condition of not cutting mangroves and filling creek. The company has been issued show cause notices by the environmental department and penalty has also been paid. Thus even the environmental conditions laid down for this project shall also not be complied with, serious problems as to environment shall emerged around the project area and therefore our clients want that the Examination-in-Chief and NOC along with other approvals should not be provided to the company. Thus my clients have clear objections against this project.	14. No activity related to the project has been done prior to this at Mundra. The show cause issue of APSEZ has been disposed by MOFECC.	14. The construction will start after getting all required statutory clearance from concern department.
2	Shri P.C Gahavi, Ex.	Refer to the newspaper notification published by your	We thank you for raising the concerns and	

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	President, Taluka Panchayat, Lakhpat	department on the EC allocated by AEL, to establish 1 unit of Greenfield Copper Refinery Plant at Mundra in Kachchh district. Refer to this, a public hearing meeting on environment is schedule on 29-04-2017 regarding EIA report of the proposed plant. Herewith we request to arrange to take note of our objections and presentations, described point wise as under, and to respond in written.	providing us valuable suggestions for the development of the project and the area. With reference to your letter, we would like to submit point wise response as desired by you.	
		1. Project is cost of the proposed project is estimated to Rs. 10000 crores and Rs. 900 Crores is allocated towards environment maintenance? And it is very important that the proposed should be asked to allocated more amount towards Environment maintenance if the above allocation of Rs. 900 Crores (9% of the project cost) is less than the regulatory provisions.	1. Rs. 1044 crores has been allocated as capital expenditure for environment management measures for the proposed project which is more than 10% of the total project cost. We assure that world class and efficient process equipment shall be installed along with pollution control devices in all facilities of the project.	• The budget allotted for environmental protection will be about Rs. 1044 Crores, out of which for Air pollution control systems is Rs. 639 Crores, Water pollution control system is Rs. 360 Crores and other environmental management systems (like solid waste, greenbelt, post project monitoring, gas collection and energy conservation) is Rs. 45 crores and Wildlife conservation and Mangrove Conservation Plan is Rs. 4.44 Crores.
		2. The land where the project is proposed is owned by APSEZ and APSEZ acquired the land from the government for industrial use long back. President of APSEZ allocated this land to AEL, without any kind of Consideration, lease contract or sub-lease. As per the order of the honourable High Court of Gujarat, the ownership should be considered changed when any company transfers the land to other company OR its sister concern to use and stamp duty @ 1% of the market price of the land should be deposited with the superintendent of stamps office. So here (1) Has company obtained the land by taking due regulatory approvals and (2) Has it paid the stamp duty as per the norms? What actions would be taken if the company defaults in these two matters?	2. Commitment letter has been obtained by Adani Enterprises Limited (AEL) from the APSEZ for allotment of land for the proposed project. Allotment of the land and ownership transfer shall be implemented only after compliance with all regulatory requirements including statutory payments and due fee for transfer.	• The total land required for the proposed project is about 256.58 ha (634 acres), out of which 154.18 ha (381 acres) of identified land for this project belongs to the APSEZ (an Adani Group Company) and is already designated for industrial purpose as per the local land use plan. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. The APSEZ notification and land allotment to AEL is enclosed as Annexure-III and Annexure-IV.
		3. Some portion of the selected land of proposed project falls under forests. And is a residence of	3. Application for diversion of forest land has been already filed as also mentioned in TOR in	

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		list of Peacock, which are declared protected wide the regulations of the Indian Forest Act and is our national bird too. They get feed from nearby agricultural areas in daytime and come back in this sand portion in the night time as feel unsecured in nearby areas. Note of these peacocks have also been taken in EIA report of this proposed project and steps to be taken to protect peacock are also mentioned. But these steps are not much clear and need to be discussed in detail we request to clarify on these preventive steps.	MoEFCC. All compliance shall be ensured as per procedure, Forest Diversion is recommended by State Government and Approved by Central Government after ensuring all compliance by the user agency.	• Conservation Measures for Protection of Peacock are given in Section-4.2.7.3 of Chapter-4 in the EIA report. About Rs. 40 lakhs is allocated for tentstive budget for Peacock conservation plan.
		4. It is also mentioned that the daily water requirement of 32.8 MLD for the proposed plant will be supplied from the desalination plant established in APSEZ. So any desalination plant exists in APSEZ? And, if yes, what is the capacity and where this water is being used also need to be clarified.	4. APSEZ has approval for desalination plant. APSEZ has in principally agreed for augmentation of needful infrastructure and provide desalinated water for this project as clearly mentioned in the water allotment letter in Annexure-VI of EIA report.	• The total water requirement for the project is about 32,267 KLD (32.3 MLD). The total desalinated water requirement for the project would be sourced from APSEZ Ltd, through M/s. Mundra Utility Pvt Ltd (MUPL). The water requirement and breakup details are provided in Section-2.2.3 of Chapter-2.
		5. It is mentioned that the polluted water generated by proposed plant will be treated and be used to grow trees and to develop green belt, but we have doubts that hazardous chemicals mixes in treated sea water while use in plant and to using such water to grow trees and develop Greenbelt, where proposed greenbelt land is also bit saline, needs some more clarification.	5. We assure that wastewater will be treated in state of the art effluent treatment facilities to make suitable before being used for greenbelt.	• An integrated water system is proposed, the effluent from the process units is treated and reused to reduce water demand. It is also proposed to install a secondary Reverse Osmosis (RO) plant to further treat water from the effluent plant facility for effective use. Rejects from the reverse osmosis plant will be sent to Multi Effect Evaporator (MEF) for further recovery and solids generated will be sent to Secured Land Fill (SLF). This water would be utilized to meet the DM water and plant/utility water requirement of proposed project. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD).
		6. We request to provide us the map of all the lands of the proposed project and of 209 acres land kept reserved to develop greenbelt. Because we doubt that many natural springs exist in these	6. Plant layout showing the green belt is provided in the EIA report in Figure-2.1. Forest department will be consulted for choice of species for plantation.	

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		lands and as per norms land can't be level by hurdling these natural springs Greenbelt plantation is not possible in many out of this 209 acres land which is kept reserved for greenbelt plantation where trees really can be grown and greenbelt GPCB, in consultation with Forest Dept., should choose the lands for greenbelt plantation where really can be grown and greenbelt can be developed and the proposer should be asked to provide decrescent land to develop greenbelt. Because it seems that the company is allocating only those non-usable lands instead of good fertile land to develop greenbelt, like it provides land where trees cant be grown OR where land is non usable due to natural river/spring flow passes OR where old ponds, lakes located. Thus company tries to save its good land and allocating only bad land towards very important & vital issue of Environment.		• About 89.84 ha of the proposed copper refinery complex (35%) will be reserved for greenbelt / green cover development as per prevailing guidelines from GPCB/CPCB/MoEF&CC. Native species with rich canopy will be planted.
		7. It is also mention that Disaster Management system will be set up in the proposed project and high standard risk emission equipment's will be used. This point also should be dealt in detail as the oxygen plant to be established in the proposed project will also be operated automatically and possibility is that may create risk for local community resides surrounding. So, clarification is also important that as per norms how far such plant should be located from the community AND what type of safe guarantee is given by the company if any accident occurs in future AND whether the company obtained all necessary regulatory permissions to establish such plant?	7. Risk Identification and Risk Assessment (HIRA) study has been conducted for this project, including Oxygen plant, through functional area expert and former faculty of Regional Labour Institute (RLI). All regulatory permissions, as applicable will be obtained. Risk assessment and disaster management plan has been incorporated Section 7.2 of the EIA.	• The necessary safety measures will be provided for storage facilities and PPE's for staff and workers in the proposed plan. The hazard identification, risk assessment and disaster management plan (onsite & offsite) detail are in Chapter-7 of the EIA report.
		8. It is mentioned that the total 256.58 hectors land is required and be used to establish the proposed project. Currently 154.18 hector land is available with APSEZ and rest 102.38 hectors land is of	8. Regarding the Status of Forest Land, this is clearly disclosed in Form-1 for TOR and further in TOR compliance (Annexure-I, page AI-14 of EIA report) that "Forest land of 102.38 ha is	

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		forest department, will be used. For this whether the company obtained necessary permissions? Whether local regulatory offices granted NOC? Whether the permission is obtained to use forest land for industrial purpose from the authorised regulatory? And if the forest land is yet not allotted to the company, how this environment public hearing for environmental clearance is called before allocation of land?	also involved which will be converted for industrial use. State Government has recommended for the forest clearance and it is now at Central Government through File No. 8-04/2016-FC". The requirement of Office Memorandum of MoEFCC dated 31.03.2011 is "the proponent should submit the proposal for TOR, only after applying the Stage-I forestry clearance...". Hence, this requirement has also been complied as the Forest Clearance was applied much before applying for TOR. We submit that there is no deviation from EIA Notification 2006 and we understand that Public Hearing can be organised by State Pollution Control Board after TOR is obtained by the project proponent.	• The required land of 256.58 ha (634 acres) will be acquired from Adani Port Special Economic Zone Limited (APSEZL). Adani Enterprises Ltd (AEL) for 154.18 ha (381 acres) and Forest land of 102.38 ha (253 acres) is also involved which will be converted for industrial use. The APSEZ notification and land allotment to AEL is enclosed as Annexure-III and Annexure-IV. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only after getting all required statutory clearance from concern department.
		9. If the company demanded 102.18 hectors forest land, weather the forests department demanded for alternate lands for alternate forestation against allocated of above said lands and whether revenue department clearly intended to provide alternate land for alternate forestation?. If forest department has not demanded alternate land or Revenue Department has not yet responded positively on alternate forestation land demand, how Forest Department can be sinked with proposed project?. So, land portion based on anticipation of due forest land permission should be removed from the total land requirement detailed matter of the proposed project.	9. We would like to submit that compensatory afforestation is integral part of the forest diversion and we understand that Forest Clearance shall be granted by the Central Government only after compliance of all conditions by the user agency and compliance of all conditions of Stage-1 and Stage-2 forest clearance.	• MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V in the EIA report. The construction will start only after getting all required statutory clearance from concern department.
		10. APSEZ president allocated the portion of 154.18 hector of land by written statement for the proposed project. but no details of land demand proposal for the proposed project, by the proponent, is mentioned. So details of land demand proposal should be made public and also inform that why permission is not obtained from the Development Commissioner appointed by the	10. Commitment letter has been obtained from the APSEZ for allotment of land for the proposed project. Ownership of the land shall be transferred only after compliance with all regulatory requirements including statutory payments and due fee for transfer.	

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		central government for all administration purpose at APSEZ?		• The total land required for the proposed project is about 256.58 ha (634 acres), out of which 154.18 ha (381 acres) of identified land for this project belongs to the APSEZ (an Adani Group Company) and is already designated for industrial purpose as per the local land use plan. The APSEZ notification and land allotment to AEL is enclosed as Annexure-III and Annexure-IV. The land ownership will be obtained to AEL after the getting all required NOC from concern department and statutory payment due fee for transfer.
		11. Details of local road development are also mentioned in the EIA report of the proposed project. Internal & external roads for the use of company are developed by APSEZ. Tollbooth is established on the state owned highway and toll is being collected from the vehicles entering into APSEZ form this toll booth near Mokha chokdi. Its seems that nothing is being done for maintenance of internal rural, panchayat or state roads by the company. Many of these internal rural, panchayat, state roads falling under proposed project area are in very poor condition and need maintenance. It is also important to make clear that among these roads which roads company intend to maintain and what new facilities company intend to develop?	11. Project proponent, Adani Enterprises Limited (AEL), is not collecting any toll near MokhaChokdi. CSR budget of Rs 8 crore per annum has been proposed by M/s AEL for proposed copper refinery project, which is over and above the existing budget of Adani Foundation for CSR activities in the area. We also assures local community members that proposed CSR budget will be utilised in consultation with local community members in the areas of development of rural infrastructure, health care, education and livelihood as desired.	• A budget of Rs. 58 Crores for the period of 5 years (From day 1 of the project construction) has been allotted toards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development (drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores
		12. Heath service provided by APSEZ in last 10 years by adopting hospitals, health sub centres, FSW centres in local Mundra, Mandvi are, if any, should also be provided as details of providing health services in local area also dealt in the	12. Presently, Adani Foundation runs Mobile Health Care Units, Rural Clinics, Special Innovative Projects i.e Health Card to Senior Citizens and Kidney Stone Project and Variety of Health Related Camps. To increase availability of	The CSR details (like CSR policy, initiatives &

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		proposed project. Company also should clarify on health service facilities provided in these two talukas or anywhere in Kutch if any.	quality health care services to the remote villages, foundation runs mobile health care unit. These mobile units cover 36 Villages and 4 Fisherman settlements. There are 8 rural clinics in Luni, Vadala, Bhadreshwar, TundaWandh, Tunda, Siracha, Navinal and Nana Kapaya. As Rs 8 crores per annum has been proposed for CSR budget for the proposed project in addition to the existing CSR budget of the Adani Foundation, existing healthcare activities shall be augmented in the area and new activities shall be launched as per the needs of the area and consultation with local communities.	activities, CSR budget expenditure data from 2010 to 2016 and CSR implemented photographs) is given in Section-8.5 of Chapter-8 in the EIA Report. • Prefer the above point no.-11.
		13. It is informed that 5000 direct new and many indirect employment chances will be generated by the proposed project. Then separately how many skilled, semi-skilled and unskilled jobs will be created and clarify also necessary on how many unemployed will be employed from the affected local area. Weather local youths will be trained and employed permanently in the company is also important because lots of localities work in APSEZ on contract basis or through private work contracts on daily wages.	13. People from local area will be given priority based on the skill sets available. Efforts also will be made to train the local youths. Priority will be given to local youths based on the skill sets and vacancy available.	• The proposed project will give employment to about 2000-3000 persons on average per day basis during construction phase. During operation phase, about 2000 direct employment and 5000 indirect employment will be generated. Local people will be given preference to employment based on the skill set & eligibility requirement as per and vacancies available.
		14. Proposed project is intended to be completed within 30 months. Please clarify that from when these 30 months will be counted, 30 months after this environment public hearing OR 30 months after obtaining all neceassry regulatory approvals?	14. Proposed project completion is of 30-36 months from the start of the construction activity at project site. Start date of the project will be decided after obtaining all the statutory clearances and tie up of the finance for the project.	
		15. Industrial density in the area of proposed project is very high. Many large/small industries already exist in this and the nearby area. This territory traces heavy traffic of vehicles due to developed part activity and industrial pollution is high in this	15. The baseline data on environmental parameters was collected for all the ongoing activities during post monsoon season of 2016. An assessment has been done for the incremental load due to this project. It has	

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		area due to industries and transportation water & air pollution is high is expected to be very high due to addition of this proposed mega project Agricultures in the nearby territory would be also badly effect due to increase in air & water pollution by new proposed project. Chances of deterioration of public health in nearby areas cannot be overseen due to ground water pollution by this propose project. So detailed clarification is required as this proposed project carries a threat or adverse effect on environment and community of the industry. Herewith you are requested to arrange to probe on this presentation and to reply in writing, please also include out all above points in the minutes of the environment public hearing meeting.	been found that the environmental parameters will be within the statutory limits after operation of the project	• The proposed greenfield copper project will be implementation after receiving statutory clearance from concern authority. The schedule for completion will be 30-36 months from the start of the construction activity at project site. • The primary baseline monitoring data, which includes meteorology for post-monsoon and part winter season (October to December) of 2016. The ambient air quality analysis results is given in Section-3.6 of Chapter-3. The incremental and Cumulative Incremental concentration is given in Section-4.2.2 of Chapter-4 in the EIA report.
3	Shri Mahesh Pandya, Paryavaran Mitra, Ahmedabad	We have studied the draft EIA report of the above mentioned project. Following are our observation/comments /questions regarding project and draft EIA report. 1. What was the previous land use of the land for proposed project? Has industry obtained NA permission for the land? Please provide the document.	1. The previous land use of the proposed project has been converted to Industrial by APSEZ and APSEZ has consented to allot this land to AEL. Present land use of the land for proposed project is 154.18 ha (381 acres) of APSEZ land (Land allotment letter is enclosed as Annexure-III in EIA Report) and 102.38 ha (253 acres) of Forest land (Stage-I Forest clearance in	1. The total land required for the proposed project is about 256.58 ha (634 acres), out of which 154.18 ha (381 acres) of identified land for this project belongs to the APSEZ (an Adani Group Company) and is already designated for industrial purpose as per the local land use plan. The APSEZ notification and land allotment to AEL is enclosed as

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			process) which is State Govt. has recommended for Forest Clearance (FC) and is at Central Government [File number is 8-04/2016-FC].	Annexure-III and Annexure-IV. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V.
		2. How the required land for the project is acquired? Was it a government or private land?	2. Reply is as per point no. 1 above.	2. Please refer the above point no.-1
		3. When was environmental clearance for this project in Form I applied?	3. The online application for prior EC (application No: IA/GJ/IND/53004/2016: Form-1 and Pre-Feasibility Report) for the proposed project has been submitted to MoEF&CC on 21st April, 2016 and same was reviewed by the Expert Appraisal Committee (Industry I) held during 4th May 2016 in New Delhi to prescribe Terms of Reference (TORs) for the preparation of EIA/EMP report. The Environmental Clearance is under process.	3. The Form-I application (No: IA/GJ/IND/53004/2016) for prior EC on 21st April 2016 was submitted to MoEF&CC.
		4. What is the status of NOC application to GPCB for this project?	4. After receiving Environment Clearance from MOEF&CC. The necessary NOC (Consent to Establishment (CTE) or Consent to Operate (CTO) form GPCB shall be applied, as applicable.	4. After obtaining Environment Clearance from MOEF&CC, the necessary clearances such as Consent to Establishment (CTE) and Consent to Operate (CTO) from GPCB shall be obtained.
		5. What is the status of Forest & CRZ clearance for this project? Please provide a copy of both of these clearances.	5. The Forest Clearance is still under process. The details are available on the website of MoEF&CC (File No. 8-04/2016-FC). Based on the survey which was carried out by Centre for Earth Science Studies (CESS, Thiruvanantpuram), which is an authorized agency by MoEF&CC, the proposed project site is outside CRZ and doesn't attract CRZ clearance.	5. The prosed project is a Greenfield project and which is outside of the CRZ. The CRZ map is shown in Figure-1.5 of Chapter-1 in the EIA report. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V.

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		6. How many mangrove trees will be uprooted due to this project? What is exact restoration plan for mangrove trees which would be displaced due to this project?	6. Proposed project area is devoid of mangroves. There is no question of mangrove destruction.	6. There is no mangroves identified in the project site at the time of baseline studies.
		7. What are the precautionary measures are to be taken to avoid negative impact of construction activities on marine environment, water quality, inter tidal and sub tidal habitat and sediment quality?	7. The anticipated impacts and mitigation measures during construction and operation phase is given in Chapter-4 of EIA report.	7. The will no impact on the marine environment. APSEZ Ltd, through M/s. MPSEZ Utility Pvt. Limited (MUPL) has considered the project requirement and assured for supplying 2,000 m^3/day of water required during the construction phase. No ground water will be abstracted for construction purpose. The wastewater generation during the construction period will be from the sanitary units provided for the constructional workers. This wastewater will be treated in septic tanks and discharged into soak pits.
		8. Please give exact dates of ambient air quality, surface water, ground water, noise monitoring and soil quality monitoring.	8. The monitoring is conducted during 1st October, 2016 to 31st December 2016, is the study period for the Environmental Baseline data collection. The location and Ambient Air Quality and levels are given in Annexure-VI of EIA Report. All the environmental attributes such as sampling of air quality, water sampling (ground and surface), noise levels, and soil quality were carried out during the study period.	8. The baseline monitoring was conducted during 1st October 2016 to 31st December 2016 of post-monsoon and partly winter. The ambient air quality results with dates is enclosed as Annexure-IX. The monitoring (sample collection) photographs are given in Annexure-VIII.
		9. How will the project proponent plan to get coal—pet coke, met coke as a fuel in regular basis? Please provide any agreement made with the supplier.	9. The coal will be sourced from the local market and transported through trucks. Around 3000 tonnes of coal will be stored. Further details of fuel consumption quantity and source are given in Table-2.5 of Chapter-2 (Project Description).	9. The 100 TPD coal will be required for proposed project, which will be sourced from the local market and transported through trucks. Around 3000 tonnes of coal will be stored.
		10. What is the regular monitoring plan that shall be carried out for odour control by the project proponent?	10. The question is not relevant and therefore we do not offer any comment. Environmental monitoring will be carried out as mentioned in the chapter-6 of the EIA report and in line to	10. The comprehensive environmental monitoring program for construction phase and operation phase is suggested in Table-6.1 & 6.2 of Chapter-6 in the EIA report.

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			the permissions granted.	
		11. Please justify domestic water requirement.	11. Maximum domestic and service water requirement for the proposed project is 1000 KLD. The final requirement will be re-assessed during detail engineering.	11. The domestic water requirement for proposed project is 429 KLD. The water breakup details are given in Table-2.5 of Chapter-2.
		12. Please provide complete details of each ETP units.	12. The process details and schematic flow diagram of ETP is given in Figure-2.20 of Chapter-2.	12. Wastewater generated from copper smelter, sulphuric acid plant and copper refinery will be treated in state of art effluent treatment facility. The process details and schematic flow diagram of ETP is given in Section-2.4.2 and Figure-2.23 of Chapter-2 in the EIA report.
		13. Is there any cost benefit analysis carried out for proposed project benefits vs loss of eco system including flora, fauna and vegetation?	13. Flora and fauna study has been conducted as a part of EIA and management plan is also provided in the EIA report. All the conditions of Forest Clearance, once obtained, will be complied to mitigate the impact due to diversion of the forest land. The forest diversion can be recommended by the State Government after completing all the procedures and granted by MoEF&CC.	13. The baseline flora and fauna study was conducted and detail are given in Section-3.9 of Chapter-3 in the EIA report. The peacock is identified, which is a schedule-I bird species as per Wildlife Protection Act, 1972. It has been assessed as Least Concern bird as per the International Union for Conservation of Nature (IUCN). The conservation paln is given in Section-3.9.9 of Chapter-3 in the EIA report.
		14. Please give the name of registered recycler to whom nickel sludge, arsenic bearing sludge, used oil and oil sludge will be sent for disposal.	14. The solid waste generation (quantity and mode of disposal) and waste characteristic is presented in Chapter-2 of the EIA report. The Secured Land Fill (SLF) is proposed over 30 acres within the project premises for disposal of ETP waste sludge and spent catalyst. Other Hazardous waste will be disposed through the approved recyclers.	14. The Secured Land Fill (SLF) is proposed over 12.95 ha within the project premises for disposal of ETP waste sludge and spent catalyst. Other Hazardous waste will be disposed through the approved recyclers. The recycler agency names will be announced during operation phase.
		15. How many local people will get employment through this project?	15. Details on potential employment are mentioned in Chapter 2 of EIA Report. Preference will be given to local people for employment in this project based on eligibility. There is a plan to set up a Skill Development Centre to improve the employability of local	15. The proposed project will give employment to about 2000-3000 persons on average per day basis during construction phase. During operation phase, about 2000 direct employment and 5000 indirect employment will be generated. Local people will be given

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			youth.	preference to employment based on the skill set & eligibility requirement as per and vacancies available.
		16. What will be the action plan for socioeconomic of an area by project proponent?	16. Budget of Rs. 8.0 Crores per year has been provided under Corporate Social Responsibility for development of the local community through Adani Foundation. The areas of intervention will be education, health & sanitation, sustainable livelihood and rural infrastructure.	16. A budget of Rs. 58 Crores for the period of 5 years (From day 1 of the project construction) has been allotted toards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development (drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores The CSR details (like CSR policy, initiatives & activities, CSR budget expenditure data from 2010 to 2016 and CSR implemented photographs) is given in Section-8.5 of Chapter-8 in the EIA Report.
		17. What activities industry will take up as a part of CSR and what will be the budget for it?	17. Reply is as per point no. 16 above.	17. Reply is as per point no. 16 above.
		18. Please give the detail list of people who will be responsible for implementation of EMP?	18. Environment management cell structure has been provided in Chapter-9 of the EIA Report who will be responsible for implementation of EMP.	18. The organization structure of environmental management is shown in Figure-10.1 of Chapter-10 in the EIA report. 19. The proposed project is belongs to AEL and

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		19. We request you to consider inspection report of the committee handed by Ms. Sunita Narain that was constituted by MoEF for M/s. Adani Port and SEZ Ltd, Mundra which submitted its report in April 2013 before granting environmental clearance. 20. We also request you to consider all the Supreme Courts pending and disposed cases that are filed against Adani Group of companies.	19. In the matter of Sunita Narain committee report, APSEZ is complying as per directions of MoEF&CC vide their final order dated 18th Sep, 2015. 20. This is outside the scope of the EIA report for the proposed project. We assure you that all the environmental safeguards will be provided during implementation and operation of the project.	APSEZ allotted a land to AEL for proposed project. 20. This is outside the scope of the EIA report for the proposed project
4	Shri Gajendrasinh Jadeja (Sarpanch), Navinal Village, Mundra Taluka, Kutch District, Gujarat	This is with reference to public hearing or above mentioned copper refinery project scheduled for 29.04.2017 in Mundra taluka, Kutch [Attached as Annexure-1]. We would like to present to you certain facts and request you to immediately cancel the public hearing and reject on clear legal grounds. ***Non-compliance of ToR and violation of MoEFCC circular dated 31.11.2011*** • Section 5(i) of the Terms of Reference (ToR) issued for the project on 21st June 2016, clearly indicates that the project proponent has to provide a copy of the "Permission and approval for the use of forest land (forest clearance), if any and recommendations of the State Forest Department. (if applicable). "[Attached as Annexure-2]. • Further as per EDS by MoEF uploaded on the website at http://environmentclearance.nic.in/auth/FORMAPDF.asx?catid=IA/IND/53004/2016&pi=New and accessed on 8.4.2017, it is clearly indicated that "Forest Clearance under Process". The file is under process in file number 8-04/2016-FC. A copy of	With reference to the subject matter and your email, we submit that all requirements for obtaining the TOR from MoEFCC were fulfilled. After obtaining TOR, Environment Impact Assessment has been completed and all conditions of TOR has been complied with by project proponent for the purpose of public hearing. • Regarding the Status of Forest Land, this is clearly disclosed in Form-1 for TOR and further in TOR compliance (Annexure-1, page AI-14 of EIA report) that "Forest land of 253 Acres is also involved which will be converted for industrial use. State Government has recommended for the forest clearance and it is now at Central government through File No. 8-04/2016-FC". The file status is also available online at MoEFCC Forest Clearance. • As the project is proposed by M/s. Adani Enterprises Limited in APSEZ land, Forest Clearance has already been applied for this land by APSEZ (erstwhile Mundra SEZ Ltd.). The requirement of OM dated 31.03.2011 is "the proponent should submit the proposal for TOR, only after applying the Stage-I forestry	MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only after getting all required statutory clearance from concern department.

		this web page is attached with this letter. [Attached as Annexure 3]. • In the EIA report on Page No. AI-14, it has also been stated that the forest clearance is pending at level of the central government [Attached as Annexure 4] This clearly indicates the project proponent is yet to obtain forest clearance and has not complied with ToR, making the EIA report liable for rejection. In this regards we would also like to bring your attention to (attached) to an Office Memorandum of the **MoEFCC dated 31.11.2011** which clearly emphasizes the need for forest clearance prior to either appraising or granting environmental clearance. In the case of greenfield projects like the copper refinery **Section III (iii) of this circular** [Attached as Annexure 5] clearly states that: *"In case of any green field project, which involves diversion of forest land, the project proponent are advised to re-examine the requirement of forestland and submit the proposal without forestland for consideration of the EAC. Otherwise the proponent should submit the proposal for ToRs under the EIA Notification, 2006 only after applying the stage-1 forest clearance for the forestland involved in the project."* As you are aware Section **8(vi) of the EIA notification, 2006 clearly states:** *"Deliberate concealment and/or submission of false or misleading information or data which is material to screening or scoping or appraisal or decision on the application shall make the application liable for rejection, and cancellation of prior environmental clearance granted on that basis.."* *We therefore request you to take immediate by:* *1. Cancliing the public hearing schedule for 29.04.207 in Mundra*	clearance". Hence, this requirement has also been complied as the Forest Clearance was applied much before applying for TOR. • At no stage there is any concealment and/or submission of false or misleading information or data which is material to screening or scoping or appraisal or decision on the application by the project proponent. There is no deviation from the Section 8 (vi) of EIA Notification 2006 also. Hence, we submit that required process for TOR has been fulfilled by now and requirements shall also be fulfilled for EC application. We also assure that all applicable environmental legal requirements shall be complied with.	

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		2. Reject the application attracting the Section 8(vi) of the EIA notification.		
5	Shri Sanjay S. Bapat, Adarsh Tower, Mundra, taluka, Mundra, Kutch district, Gujarat	A study about the Greenfield Copper Refinery Plant of Adani Enterprise Limited was done only for the three months from October 2016 to December 2016 by M/s. Vimta Lab Limited, Hyderabad, and on the basis of it the E.I.A. has been prepared. There are mainly three seasons in a year and in every season the effect of the industrial activity on the environment, water level, and geography are different. But here the E.I.A. was prepared after the three months study only. Thus, this study of the environmental effects is incomplete/insufficient and faulty. There are already many industrial projects in this region. Moreover, these projects are close to the coastline so there are possibilities that they can have effects on the coastal environment also. There are mangroves, mudflat, rivers, Navinal Reserve Forest and Siracha forest area in this region. Thus, when a new project is coming up in such an environmentally sensitive region, this three-month study is insufficient. It seems that by completing the study on the future effects of this project, they have tried to hide the facts of the future effects. In the point no.1 of the official report it has been mentioned that 256.8 ha land is required for this project. Out of which 154.18 ha of the land is owned by the APSEZ (Adani Group) and remaining 102.38 ha is forest land. In the point no. 2.2 of the EIA report, it has been mentioned that the state government has recommended for the forest land, but this land has not been allotted to the company therefore it is clear that the procedure for obtaining the environmental clearance for this land is being done with incomplete information.	We are herewith responding para wise to the issues raised by you: EIA studies have been carried based on TOR granted by MoEF&CC. Project will be implemented after obtaining required permissions and compliance will be done based on permissions granted. The proposed project area is outside CRZ and therefore no presence of mangroves and mudflats. Land use as per the utilization has been categorized based on classification systems of National standards of National Remote Sensing Center (NRSC) and details has been provided in Chapter–3 of the EIA report. Site selection is based on suitability criteria as studied and provided in the EIA report. Regarding the Status of Forest Land, this is clearly disclosed in Form-1 for TOR and further in TOR compliance (Annexure 1, page AI-14 of EIA report) that "Forest land of 253 Acres is also involved which will be converted for industrial use. State Government has recommended for the forest clearance and it is now at Central government through File No. 8-04/2016-FC." The file status is also available online at MoEF&CC Forest Clearance. The land allocation is being granted to AEL by APSEZ, the correspondence is given in EIA report as annexure-III. We assure you that all the environmental safeguards will be provided during implementation and operation of the project.	As per MoEF&CC and CPCB guidelines (monitoring data three months except monsoon season) monitoring is conducted, the EIA studies have been carried for post-monsoon and partly winter (1st October 2016 to 31st December 2016) based on TOR granted by MoEF&CC. Project will be implemented after obtaining required permissions and compliance will be done based on permissions granted. The baseline environmental studies is given Chapter-3 in the EIA report. The Environmental settings around the 10 km radius from the proposed plant site boundary is given in Table-1.1 of Chapter-1in the EIA report. The incremental and Cumulative Incremental concentration is given in Section-4.2.2 of Chapter-4 in the EIA report. The total land required for the proposed project is about 256.58 ha (634 acres), out of which 154.18 ha (381 acres) of identified land for this project belongs to the APSEZ (an Adani Group Company) and is already designated for industrial purpose as per the local land use plan. The APSEZ notification and land allotment to AEL is enclosed as Annexure-III and Annexure-IV. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The

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		Taking the above mentioned matters in consideration, you are requested that unless and until the requirements are fulfilled, this E.I.A. should be considered incomplete and faulty and the public hearing to be held on 29/04/2017 should be cancelled. "The development that destroys the environment is the sign of the destruction not the development."		construction will start only after getting all required statutory clearance from concern department.
6	Shri Naran B. Gaghavi, (President) Keti Vikas Seva Trust.	Jaybharat, with reference to the above with due respect it is to state that M/S Adani Enterprises Ltd. (A.E.L) is going to establish Greenfield Copper Refinery in the 634.12 Acre land of villages Siracha and Navinal of Mundra Taluka. A public hearing is being held at village Tunda on next 29th April for Environmental Clearance of the proposed project. The EIA report prepared for the proposed Refinery Project of Adani and site shown in the EIA report for the proposed project are very much disputed and the whole area is covered under CRZ and no permission is obtained from the Government of India for CRZ for the same. Therefore the public hearing for the copper project should be cancelled. Honourable Sir, With reference to the reference cited at 1 above it is to inform you that we have filed a Public Interest Litigation in the year 2011 bearing No. WPPIL -12/2011 in the Hon. High Court Of Gujarat in protest against the violations of Environmental laws by Adani Port and Adani Power in the Sea area and this areas of Mundra Taluka. And it was requested there in to prevent violations of rules of Environment and Human rights by Adani Company and Hon. High Court was pleased to direct Adani to stop destruction of Mangrow forest situated in the sea region of Mundra Taluka , thereafter also Adani continuously violated this order , for that a new application bearing No. CAN -9124/2011 was filed for contempt of the court order in which Hon. Court issued various orders against Adani and formed three committees and all these issues were investigated	With respect to the above stated subject matter, please note that reply to the representation made for the proposed ship recycling project is as follows: **About High court cases:** ➢ Kheti Vikas Trust had filed alleged public interest litigation, being Writ Petition (PIL) No.12 of 2011, before Hon'ble Gujarat High Court. In the main petition, the Applicant had made various allegations against APSEZ and Adani Power Limited. One such allegation made in the main petition was in respect of the alleged "deforestation of mangrove forests which forms the main part of mangrove forest of western region". ➢ PIL alleging destruction of mangrove, filling up of creeks and violation of Environmental Laws & inaction of the State Authorities against the activities of APSEZ. It also alleged that due to construction of open intake channel, the salinity of ground water has increased and is damaging the fertility of the agricultural land. A prayer was made to appoint a committee. ➢ Subsequently, the Applicant filed the captioned Civil Application No.9124 of 2011 purportedly under the provisions of Article 215 of the Constitution of India, against APSEZ and APL, for alleged 'wilful and	

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		and Hon. Court has formed Expert Committee on the basis of orders 05.11.2015 and 01.04.2016 on our application No. CA 9124/2011. Dr. Kalod Alvaris, Environment Expert of Goa and Dr. Subroto Maiti of Calcuttaa were included in the committee. And TOR of the committee was finalized by the High Court of Gujarat itself. In which it was directed to submit the detailed report of violations of environment by Adani after observation of the site of whole ADANI SEZ. This committee had visited this area prepared its report and submitted detailed report before Hon. Gujarat High Court on 8.06.2015. Committee has proved in its report that Adani has violated the rules of environment on the sea areas of Mundra and it is informed to Adani to grow Mangrow in about area of 200 hector and that 6000 acre land allotted to the company may be taken back by Gujarat Government . And there are rampant violations of rule in allotting this land. So it is recommended that all these lands to be taken back vesting in the government and returned to the Forest Department. (Report is enclosed herewith). Hon. Collector sahib, the committee has submitted its report to the Hon. High court. The committee has recommended to vacate the land but in the same land Adani Company is going to establish its Copper Refinery Project as shown in EIA. As all the recommendations and this report being under consideration of the court (subjudice) the public hearing is illegal and interference in the working of High Court of Gujarat. Therefore, these all procedures should stop immediately and the public hearing 29.4.2017 for environmental clearance should be cancelled. In spite of that if the public hearing is held on the pecified date and time these whole matter would be considered contempt of court of Hon. Gujarat High court, it should be seriously noted that. We bring this to your kind notice with request.	deliberate contempt' of the authority of Hon'ble Gujarat High Court. It is the case of the Applicant in the present civil application that APSEZ and APL had allegedly continued their operation of cutting/destruction of thick cover of Mangrove forest existing in Mundra Taluka of Kutchch District in violation of the aforesaid order dated 12.7.2011 passed by this Hon'ble Gujarat High Court. Kheti Vikas Trust has made no other allegations in present civil application, besides the allegation of destruction of mangroves of certain area in breach of the order dated 12.7.2011. ➢ APSEZ filed its reply and refuted the allegations. It was the case of APSEZ that the activities carried out by it at Mundra is permitted by various clearances granted by the concerned authorities from time to time. The petitioner failed to prove that any of the activities of APSEZ is not permissible. ➢ During the pendency of the petition, MoEF&CC appointed a committee headed by Ms. SunitaNarain which visited the site and submitted its report to MoEF&CC on 18.4.2013. MoEF&CC thereafter issued a Show Cause Notice dated 30.9.2013 to APSEZ which was pending for adjudication. ➢ Subject PIL was dismissed on 17.4.2015. The Gujarat High Court dismissed the petition on the premise that the prayer to appoint the committee is already granted by virtue of appointment of committee by MoEF&CC. MoEF&CC has already taken action and issued the show cause notice. It is for MoEF&CC to consider the report and take appropriate action and the petition does not survive any further.	

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		Honourable Sir, With reference to the reference cited at 2 above it is to inform you that in the year 2011 for violations of Environmental laws by Adani Port and Adani Power in the Sea area and this areas of Mundra Taluka, Hon.Gujarat High Court has directed on dated 09.07.2015 to the Hon. Principal District Judge to carry out videography and photography of whole Adani Port and SEZ and to submit factual report to the Hon. High Court, and Hon. Principal District Judge has submitted CD of their report and videography/photography in the sealed cover on dated 24.07.2015 to the Hon. High Court. And in the report of Hon. Principal Judge it is proved that there are rampant violations of rules by Adani and also on the land on which Adani is going to establish its Copper Refinery Plant, is informed by Hon. Principal District Judge along with videography and Photography that, is disputed land. And the whole report is pending with (subjudice) Hon. High Court. When overall report of whole the matter is pending with Gujarat High Court all these matters are concealed by the Adani Company. These facts are informed neither to MOEF&CC nor to EAC which is a very serious matter. Therefore you being the Chairman of the Public hearing and the District Magistrate of the district on the basis of these designations it is our prayer that the public hearing may please be cancelled on immediate basis, and we are informing you with all these facts. As such as these facts are under consideration of High Court of Gujarat and if the public hearing for refinery takes place on the same land it is a very serious matter it would not only be against law but would be interference in the working of Hon. Gujarat High Court. Therefore it is our humble request that the public hearing may please be cancelled. With reference to the reference cited at 3 above it is to inform you that we have filed an application in the department of environment and forest of Government of India in the year 2011 in protest against the	➢ MoEF&CC has given final directions to APSEZ to comply with certain conditions vide their order dated 18.09.2015 thereby disposed off the pending show cause. With this, all allegations including that of destruction of mangrove are appropriately dealt with by MoEF&CC. The statutory authority has taken a considered view which has become final as the time limit to challenge the said order of MoEF&CC had expired way back. ➢ Appeal filed in Supreme Court by the petitioners against Gujarat High Court order dated 17.4.2015 which was dismissed on 18.3.2016. Upon dismissal of the matter by the Hon'ble Supreme Court, Kheti Vikas Seva Trust cannot be heard to say that there is any merit in their case against APSEZ. ➢ Thereafter, in its order dated 15.10.2015 in Civil Application No.9124 of 2011, the Gujarat High Court recorded that it would not be able to frame charges against APSEZ and APL for alleged contempt for breach of the order dated 12.7.2011. ➢ Hon'ble Gujarat High Court by its order dated 5.11.2015 proposed certain measures to be undertaken by APSEZ and appointed a committee of experts to survey the area in and around the Port/SEZ developed by the APSEZ, with a special focus on the question of mangroves in the area. Said committee of experts has already filed its report before this Hon'ble Court on 8.6.2016 and APSEZ has also filed its response to the said report on 18.07.2016. The said report and the response of the APSEZ are pending before this Hon'ble Court.	

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		violations of Environmental laws by Adani Port and Adani Power in the Sea area and this areas of Mundra Taluka and in which the permission is granted with detailed conditions to AdaniPort and Adani Power to carry out industrial activities in the areas of Mundra but as Adani is violating environmental conditions in large scale we have submitted our representation to the Government of India and has requested to prevent the damages occurring due to the project of Adani. There after a committee of five environment experts was formed by Government of India under the leadership of well-known environmentalist Sunita Narayan to investigate Adani and this committee has submitted its report to Government of India on 18 April2013 and have reported and informed in the report that large scale violence's of rules and conditions are done by Adani and various detailed recommendations are made including to cancel the Environmental license of North Port and to impose penalty of 200 crores and before giving any permission to any project in Mundra it is very necessary that study of carrying capacity of this area is undertaken and no project should be sanctioned without this study. But here public hearing for Copper Refinery is held without any such study. Therefore it is our humble request that the Public Hearing may please be cancelled. It is very necessary looking to the Public Interest at large that this public hearing may be cancelled. Hon. Sir, with reference to the reference No. 4 it is to inform that Environment and Forest Ministry of Government of India has issued instructions vide Office Memorandum No. J-11013/25/2014-IAI Government of India Ministry of Environment and Forest Dated 11th August, 2014 to ministry for EIA and according to Company's Act 2013 it is essential to have detailed report in EIA regarding management of expenses and fund of Corporate Social Responsibility. But Adani has not given any such	➢ Unfortunately however, the Committee has travelled much beyond the scope of the terms of reference delineated by this Hon'ble Court in its order dated 5.11.2015, which is demonstrated through our affidavit dated 18.07.2016 which clarifies that the contents of the report submitted by the Committee further reflects that the Committee has in fact proceeded with mala fides and with a view to pin down APSEZ and APL. In fact, one of the committee members was party to the earlier clearances granted to APSEZ and is therefore, barred from raising any objection or giving any finding contrary to his own recommendations. ➢ In view of the aforesaid it becomes evident that the only issue pending before this Hon'ble Court in Civil Application No.9124 of 2011 is as to the extent of the measures (the extent and the place where mangroves can be planted by way of compensatory plantation) to be undertaken by APSEZ. The matter pending before the Hon'ble Gujarat High Court is limited to plantation of 100 ha of mangroves or more as may be directed by the Hon'ble Court at the location identified by the Committee. No other area is subject matter of this matter. **About CRZ area:** ➢ The project will be developed using notified SEZ area and forest land. The proposed layout superimposed on authorized CRZ map is presented in the EIA report as Figure 2.1 on page C2-3. From the said figure, it is clear that the entire project area is outside CRZ. **About compliance:** ➢ APSEZ as well as APL have obtained requisite	➢ The map of proposed project is superimposed on CRZ map of the area prepared in 2011 by Centre for Earth Science Studies (CESS) Thiruvanantapuram, an institution recognized by Government of India. The proposed project site is outside CRZ and doesn't attract CRZ clearance. The prosed project and CSZ area as shown in Figure-1.5 of chapter-1 in the EIA report.

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		information in its EIA report which is violation of The Company's Act and circular dated 11th August 2014 of Government of India. And EIA notification and Section 135 of The Company's Act 2013 deal with the corporate social responsibility and Schedule –VII of the Act lists out activities which may be included by companies in their CSR policies. And this is also violation of Corporate Social Responsibility Policy Rules, 2014. As such Adani has concealed the facts in their report which are essential to be mentioned as per Law. Adani Company was knowing all these facts in spite of that has concealed all these facts. As such Adani has openly violated the law of India, therefore it is very essential that this public hearing shall be cancelled and it is very essential that facts of law are reinstated. Hon. Sir, for the copper refinery project of Adani, requirement of land is as under. Total 256.58 Hector (634 Acre) of land is necessary for the project proposed. Out of that land of 154.18 Hector (381 Acre) demarked land is in ownership of APSEZ (of Adani Group Company) and it has been allotted before in the scheme of local land use scheme for industrial purpose. Moreover, 102.38 Hector (253 Acre) forest land is also included which will be converted in to industrial use and state government has proposed for the forest land conversion (EC) and it is lying in the Central Government. (Its file No. are 8.04/2016-FC). There is no process involved for migration or rehabilitation for this scheme. In fact the public hearing is to be held on the place of proposed project, the land from forest department is not allotted to the company till now. And the land of 253 Acre of forest department which Adani has requested is not granted to them. And this land was occupied by the forest department after 1980 the object was to create green belt growing trees over there and to develop the forest and to prevent the	clearances from time to time from respective authorities and have been submitting their compliance reports twice in a year to all concerned government authorities. ➢ MoEF&CC has dealt with the SunitaNarain Committee report and subsequent submissions of APSEZ as well as APL and has finally issued an order with certain directions. One of which is to carry out Cumulative Impact Assessment study for Mundra region. APSEZ has obtained ToR from GCZMA and started studies through NABET accredited consultant. Progress has been submitted to MoEF&CC from time to time. Study is in progress and on completion final report will be submitted to concerned authorities. **About CSR activities:** ➢ Adani Foundation is the CSR wing of Adani group. Adani Foundation works in four main areas for social upliftment of communities around all project locations of the Adani Group. They are Education, Community health, Social Livelihood and Rural Infrastructure development. With reference to the mentioned Office Memorandum of MoEF&CC and companies act with respect to the Corporate Social Responsibility, details about the activities carried out and planned by Adani Foundation in and around Mundra are mentioned in chapter 8 of the EIA report. **About Forest clearance:** ➢ As per procedures of EIA notification 2006, its subsequent amendments and other related notifications / circulars / office memorandums of MoEF&CC, it is clear that Environmental Clearance procedure can be carried out once	A budget of Rs. 58 Crores for the period of 5 years (From day 1 of the project construction) has been allotted towards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development (drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores The CSR details (like CSR policy, initiatives &

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		progress of the desert and to decrease salinity by such types of activities, make available protection , shelter and grazing to the wild animals. And this whole forest is full of various herbal medicines and inland Acacia (deshi bawal) and this forest is playing an important role in keeping the Environment clean. And as such Government of Gujarat and Adani Company have violated The Forest Rights Act 2006. In the Forest Rights Act it is established that the approval of Gram Sabha is essential in spite of that approval of Gram Sabha is not taken by the company. It is violation of Forest Rights Act 2006 and also the judgment of Hon. Supreme Court delivered in Vedant Copper Project of Orissa. So, establishing very much polluting copper refinery destroying such useful forest area is very much detrimental to local people and grabbing rights of local people. Government of Gujarat has already allotted pasture land of 14 villages to Adani so the people of these areas are suffering difficulties from lack of pasture land and these cattle breeders are getting their livelihood grazing their cattle in these areas of forest. While Adani is willing to give fatal blow on cattle breeders grabbing lands from these areas. These people are indigenous people of these areas and protection must be given to the rights of indigenous people and Government of India has signed charter of UN regarding protection of rights of indigenous people and is one of the country ratifying the charter of indigenous people of United Nations. So rights of these indigenous people must be protected. It is very necessary. Therefore, it is humbly requested that, the public hearing of Copper Refinery of Adani must be cancelled. Hon. Sir, it is further submitted that the land selected for Copper Refinery Project of Adani is land included in the CRZ. And no clearance is obtained from the ministry of Environment and Forest of Government of India, and according to CRZ notification 2011 this project is coming under CRZ area. So sanction of CRZ	application has been made for forest land diversion and environment clearance can be granted to any project activities involving forest land by reviewing the status of forest clearance at respective time. Proper procedures are being followed for proposed project with respect to obtaining environment clearance as well as forest clearance. In view of the above clarifications, it is clear that the required procedures are being followed for obtaining prior environmental clearance for the proposed project activity and Public Hearing is part of the process.	activities, CSR budget expenditure data from 2010 to 2016 and CSR implemented photographs) is given in Section-8.5 of Chapter-8 in the EIA Report ➢ The total land required for the proposed project is about 256.58 ha (634 acres), out of which 154.18 ha (381 acres) of identified land for this project belongs to the APSEZ (an Adani Group Company) and is already designated for industrial purpose as per the local land use plan. Memorandum of Understanding (MoU) is in place between Adani Ports & Special Economic Zone Limited (APSEZL) and Adani Enterprises Ltd (AEL) for 154.18 ha (381 acres). The APSEZ notification and land allotment to AEL is enclosed as Annexure-III and Annexure-IV. The land use details of the proposed project is given in Section-2.2.1 of Chapter-2 in the EIA report.

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		is necessary but company has done nothing for that and directly asked for Environmental clearance. It is against the rules. Therefore, it is humbly requested that, the public hearing of Copper Refinery of Adani must be cancelled. Considering all the above facts, the public hearing of Greenfield Copper Refinery Project of Adani declared to be held on the next date 29.04.2017 at village Tunda is against Law. And the matter is subjudice in the High Court of Gujarat and hearing is to be held in that area, therefore, it is humbly requested that, the public hearing of Copper Refinery of Adani must be cancelled.		
7	Shri Debi Goenka, (Executive Trustee). Conservation Action Trust (West) Mumbai	1. Please furnish full details of the existing land use of the site proposed for the project.	1. Out of total area proposed for the project 256.58 ha area is notified SEZ and 102.38 ha is forest land for which forest clearance application is in process.	1. The total land required for the proposed project is about 256.58 ha (634 acres), out of which 154.18 ha (381 acres) of identified land for this project belongs to the APSEZ (an Adani Group Company) and is already designated for industrial purpose as per the local land use plan. The APSEZ notification and land allotment to AEL is enclosed as Annexure-III and Annexure-IV. The land use details of the proposed project is given in Section-2.2.1 of Chapter-2 in the EIA report. Remaining forest land 102.39 ha (253 acres), MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V.
		2. Please furnish the detailed land use of the proposed site as per the approved CZMP.	2. The layout has been marked on the CRZ map given in Figure-1.5 of Chapter-1 in the EIA report. The proposed project area is outside CRZ.	2. The map of proposed project is superimposed on CRZ map of the area prepared in 2011 by Centre of Earth Science Studies (CESS), Thiruvantapuram, an

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				institute recognized by Ministry of Environment and Forest & Climate Change, Government of India. The proposed project site is outside the CRZ. This map is in Figure-1.5 of EIA and also attached herewith. Further, National Centre for Sustainable Coastal Management (NCSCM), Chennai which is a nodal agency for CRZ mapping and preparation of CZMP for Gujarat has been engaged for the superimposition of the proposed Copper Refinery plant layout on authenticated CRZ map of district Kutch. NCSCM has communicated that superimposition of the proposed project Copper Refinery plant layout on CRZ Map would be done after approval of CZMP map of Kutch District as the CZMP of district Kutch is under approval process by Govt of Gujarat.
		3. Please furnish a copy of the CZMP of this area approved by MoEF.	3. GCZMA is the custodian of approved CZMP for the proposed project area. However project layout is superimposed on CRZ map prepared by authorized agency of MOEF&CC as per CRZ notification 2011 and same is provided in figure-1.5 of Chapter-1 of EIA report.	3. Refer the above point no.-2.
		4. Has the project proponent carried out mapping of the CRZ area and the HTL – LTL line, buffer area, as well as mud flats, sand dunes, and corals on 1:4000 scale on the CZMP approved by MoEF? If yes, kindly furnish a colour copy.	4. The proposed project layout has been marked on the authorized CRZ map given in Figure-1.5 of Chapter-1 in the EIA report. Same is in colour.	4. Refer the above point no.-2.
		5. Please furnish a satellite imagery of 1991 of the proposed project area.	5. The latest satellite imagery of the 21 Jan 2016/14 Feb 2016 is given in Figure-3.3.1 of Chapter 3 of EIA report	5. The latest IRS-Resourcesat-2 satellite imagery of the 21st Jan 2016/14 Feb 2016 is given in Figure-3.3.1 of Chapter 3 of EIA report

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		6. Please give full land use details and categories of the proposed project area. Please mention how much area is under CRZ I - A, CRZ I, CRZ II, CRZ III and CRZ IV.	6. The land use details of the study area are given in Figure-3.3.2 of Chapter-3 of EIA report	6. Refer the above point no.-2.
		7. Does the proposed project area falls under ecologically sensitive and or geomorphologically important area, as per the CRZ Notification 2011?	7. The proposed project area is outside CRZ.	7. Refer the above point no.-2.
		8. Please specify what are the ecologically sensitive areas and or geomorphologically important areas observed at the proposed site and in the study area, along with the area details (in has).	8. There are no ecologically sensitive areas in the proposed project area. However mangroves are present outside the project area but within the study area. The land use break-up details as per satellite image classification for the study area is given in chapter-3 of EIA report.	8. There is no ecologically sensitive area within the study area of proposed project. There are Dandedri RF (within project area), Mundra Mangrove RF (south of project area), Navinal RF (0.5 km, E), Mundra Dhoa RF (0.7 km, SE). The environmental settings 10 km radius around the project site is given in Table-1.1 of Chapter-1. The land use details of study area is given in Section-3.3 of Chapter-3 in the EIA report.
		9. Please furnish information on whether mangroves and mud flats are present at the site and the area (in has) covered by mangroves and mud flats.	9. The proposed project area is outside CRZ area therefore no presence of mangroves and mudflats.	9. There is no mangroves/ mudflats identified in the project site at the time of baseline studies
		10. Please furnish information at the distance which mangroves and mud flats are observed from the proposed project site.	10. Mangroves are present at 100 m away in the southern side of the project area.	10. The study area consists of 7.78% mudflats/ tidal flats and 3.02% mangroves. The Mundra mangroves are present at the south of the project area.
		11. Please furnish details of salt pans and aquaculture ponds within the study area, and their distances from the project site.	11. Salt pans are located at a distance of around 5 KM in WSW direction from the project area.	11. The study area consists of 0.64% salt pans. The environmental setting of 10 km radius is given in Table-1.1 of Chapter-1 in the EIA report.
		12. Please furnish details regarding the fishermen residing and/or fishing in the study area.	12. The fish species in the study area have been listed in Chapter-3 of the EIA report. Details on existing fisherman will be included in the Final EIA report.	12. The fishermen details are given in Section-3.10.6 of Chapter-3 in the EIA report.

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		13. As per the study area map, the project area not only covers mudflats, it is also falls within the Mundra mangrove reserve forests. It is also in proximity of the Danderi reserve forests, Navinal reserve forest and the Mundra Dhoa reserve forest. Please explain why such an ecologically important area has been selected for this project.	13. Proposed Project area is outside CRZ and there are no mudflats and mangroves in the project area. Alternative site analysis is done for the project and site is selected based on its suitability. Project area includes forest land for which APSEZ has applied for Forest clearance and same is under process. As a process State Government gives recommendation for diversion of forest land after completing all procedures and central government is granting the clearance.	13. Three alternate sites were identified for the proposed refinery plant based on siting criteria. The details of these three sites are as follows: Site-I: near Gundala & Mokha villages; Site-II: near east side of Adani power plant; and Site-III: near near Mundra village. The comparison salient features of alternative sites done and details are presented in following Table-5.1 and is shown in Figure-5.1 of Chapter-5 in the EIA report.
		14. As per the information submitted for "Site Alternatives" in the Form I, Site I has no forest area, whereas the proposed Site 2 has 253 acres of forest land that the project proponent has proposed for diversion. Please explain the rationale behind selecting the site which has forest area and explain why the site that does not have forests has not been selected.	14. The alternate site analysis was carried out. The alternate sites have been discussed in detail during the Terms of reference meeting and shortlisted site for the proposed project has been accepted by the Honorable EAC committee of MoEF&CC, New Delhi. Details on alternative site analysis are provided in the Chapter–5 of the EIA report. Site is selected on the basis of suitability from number of factors.	14. The Site-II in Siracha & Navinal Village adjacent to existing APL emerges as technically superior site such as availability & closeness of water and power source, land development, closeness to road and rail, etc. It is substantially advantageous in terms of environmental and technical criteria.
		15. It is also stated in Form I that mangroves are not present on the site. However, a bare perusal of the google earth images shows that the mangroves exist along the southern boundary of the proposed project. Also, the proposed conveyor belt from the port to the proposed site passes through the mangroves. This can also be observed from the "FIGURE 3.3.2 Landuse/Land Cover Map Based on Satellite Data" of the draft EIA report. Why has this been not mentioned in the Form-I? Please explain.	15. Information related to mangroves is given in sub-clause of environmental sensitivity which is part of Form-1.	15. Mundra Mangrove RF (south of project area, which is mentioned in Section-9 sub-clause (III) Environmental Sensitivity of form-1.
		16. The proposed area has been illegally reclaimed	16. The proposed project is planned over notified	16. The proposed project is planned over

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		by the APSEZ. Entire land use and land cover has been changed due to this. Please give information on the land use and cover as was during 1991 and also before the SEZ clearances were granted. Please also furnish a copy of the permissions issued by the State and Central Government agencies permitting the reclamation and destruction of mangroves.	SEZ and Forest land that applied for diversion. No reclamation is proposed as part of proposed project activity. Details on present land use are provided in Chapter-3 of the EIA report.	notified SEZ and Forest land that applied for diversion. No reclamation land involved as part of proposed project activity. Details on present land use are provided in Section-3.3 of Chapter-3 in the EIA report.
		17. Is the project proponent going to destroy the remaining mangroves of this area as well?	17. Proposed project area is devoid of mangroves. There is no question of mangrove destruction.	17. There no existing mangroves plantations in proposed site at the time of baseline study.
		18. Please explain on what basis the alternative site-1 is rejected.	18. The alternate site analysis was carried out. The site selection criteria and the study of alternate sites is detailed in chapter-5 of the EIA report.	18. Refer the above point no.-13 & 14.
		19. The Table-3.3.2 – "Land use breakup details in 10 km radius" clearly mentions presence of mudflats, mangroves and the reclaimed area in the study area. As per this table only 5.27% of the land in the study area is built-up, whereas 11% of the study area is wetland. Why is the site being selected for this proposal?	19. The proposed project area is outside CRZ and therefore no presence of mangroves and mudflats. Land use as per the utilization has been categorized based on classification systems of National standards of National Remote Sensing Center (NRSC) and details has been provided in Chapter – 3 of the EIA report. Site selection is based on suitability criteria as studied and provided in the EIA report.	19. The proposed project doesn't fall under mudfalts/wetlands and mangroves as per the landuse/ land cover map based on the satellite image is shown in Figure-3.3.2 of Chapter-3 in the EIA report.
		20. Please explain why the land with scrub vegetation has been categorised as wasteland.	20. Land use as per the utilization has been categorized based on classification systems of National standards of National Remote Sensing Center (NRSC) and details has been provided in Section-3.3 of Chapter – 3 in the EIA report.	20. The landuse/ land cover map based on the satellite image is shown in Figure-3.3.2 of Chapter-3 in the EIA report.
		21. Item 21 of Form I under Basic Information states that the proposal involves approval/clearance under the Forest (Conservation) Act, 1980. However, under point 23 "Whether any Forest Land Involved? Area of Forest land Involved (has)" it is stated as "N/A". The Draft EIA report has mentioned	21. The forest related information as asked in point no. 22 is replied properly.	21. Item 21 of Form-I related to interlink project and reply is no interlink. In item 22 of Form-I mentioned the forest clearance required and file no.8-04/2016-FC is mentioned. The item 23 of Form-I represents wildlife clearance, the proposed project doesn't attract any wildlife

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		at many instances the presence of 3 reserved forests and the Mundra mangrove forests. Please explain why such misleading information has been provided in Form-1.		clearance.
		22. In form 1, the query under point 24 is "Whether there is any litigation pending against the project and/or land in which the project is proposed to be set up?" The project proponent has replied has "No". It is important to point out here that at-least two court cases are going on the APSEZ land – SLP 28788 of 2016 in the Supreme Court and WP (PIL) 12 of 2011 in the High Court of Gujarat. Please explain why this was not disclosed in the Form 1.	22. There is no case pending against the proposed project.	22. There no court case or any legal issues regarding proposed project against AEL.
		23. What action has been taken by the APSEZ as per the recommendations of the Claude Alvares led "Committee on Mangroves" in the Civil Application 9124 of 2011 under the PIL 12 of 2011? Please furnish the details of the actions taken by the project proponent.	23. The question is not related to proposed project.	23. This is outside the scope of the EIA report for the proposed project.
		24. The Form 1, under "II Activity" states that no reclamation is envisaged. It is a well-known fact that the entire area has been reclaimed by the Adani group. This has been also stated in the Sunita Narain report. What measures have been taken to restore the area to its original state? How much mangrove plantation has been undertaken? Please furnish with the location details, along with coordinates and site photographs.	24. The question is not related to proposed project. No reclamation is proposed in the project under discussion.	24. This is outside the scope of the EIA report for the proposed project.
		25. The Form 1 also mentions "construction of new approach road". However, the document on Alternative sites state that "Widening of existing Road" would be required for this site. Why is there such discrepancy in the information being provided?	25. As a part of the requirement for the proposed project the existing roads will be strengthened by widening or upgrading and extended to approach the proposed site.	25. The existing roads will be strengthened by widening or upgrading and extended to approach the proposed site.

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		26. Where would this proposed new approach road and / or the widening of the existing road come? Please furnish details along with the map showing the proposed new approach road and or widening of the road.	26. The raw material transportation is proposed to be received from the approach road within notified SEZ which will be strengthened. The overall layout of the proposed plant is given in Figure-2.1 of EIA report.	26. The existing roads will be strengthened by widening or upgrading and extended to approach the proposed site and the proposed project layout is given in Figure-2.1 of Chapter-2 in the EIA report.
		27. Please furnish details on the impacts and mitigation measures of proposed new approach road and/or widening of the road.	27. The widening of existing road is within the notified SEZ and it is considered as part of the overall impact assessment of the proposed project. However, impact will be insignificant.	27. Refer the above point no-26. The existing roads will be strengthened during construction stage of the project. The impacts related to road development activities is temporary and insignificant. The anticipated impacts during construction phase is given in Section-4.1 of Chapter-4 in the EIA report.
		28. The Form 1 also mentions construction of new transmission lines. Please show location of the new transmission lines on coloured map. Has the area required for this mentioned in the Draft EIA report? Please mention the impact of the transmission lines and the mitigation measures for same. How much forest land is involved? Are these transmission lines passing through CRZ areas? Why. can't the existing transmission lines be upgraded?	28. Power will be sourced from existing transmission lines by extending it to the proposed project site by using existing area of APSEZ. Same will be outside CRZ.	28. The total estimated power requirement for proposed project is 300 MW out of which 40 MW would be generated from internal process steam and balance 260 MW power would be sourced from APSEZ Ltd, through M/s. Mundra Utility Pvt Ltd (MUPL). The power allocation letter is enclosed as Annexure-V.
		29. For stream crossings, the Form-1 mentions that "Natural drainage passing through the site will be suitably trained and maintained. There will not be any diversion. Further, conveyer for Copper Concentrate and Rock Phosphate and acid pipeline will cross over the existing water intake channel available for power plant. Suitable culverts will be built as required." The Adani group has already reclaimed large swathes of mudflats, mangroves and creeks in this area. Now the APSEZ wants to further "suitably train and maintain" the natural drainage. Please furnish details on the impacts of this and mitigation measures of same. Please also explain how this can be permitted	29. Natural drainage will not be disturbed due to the proposed project. The natural topography will be maintained. The proposed project location is notified SEZ and forest land for which necessary clearance is under progress.	29. Dhaneshwari river is a seasonal river which flows in the western part of the project site. The river will not be diverted but suitably trained along the boundary. The flow of the river will be maintained as shown in the plant layout on Figure-2.1 of Chapter-2 in the EIA report. Anticipated impacts and mitigation measures during construction and operation phase of project is given in Chapter-4 in the EIA report. No reclamation land involved as part of proposed project activity. The proposed

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		in view of the fact that the reclamation has been carried out illegally without valid Environmental, CRZ and Forest Clearances. Please furnish copies of these clearances, if any.		project is outside the CRZ are as shown in Figure-1.5 of Chapter-1. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V in the EIA report.
		30. Further, there is already pollution in the area due to the coal dust and fly-ash and emissions of the power plant. There have been numerous complaints regarding this from the villagers of this area. Additional conveyor for Copper Concentrate and Rock Phosphate will further deteriorate the environment. Please give details on the impact of and mitigation measures of the conveyor for Copper Concentrate and Rock Phosphate, along with the impacts of the existing power plants.	30. The copper concentrate and rock phosphate will be transported through state of art pipe conveying method. The required EMP measures will be implemented as mentioned in Chapter-6. Project will be implemented after obtaining required clearances from concerned statutory authorities and complied with.	30. The copper concentrate and rock phosphate will be transported through state of art pipe conveying method. The anticipated impacts and mitigation measures are given in Chapter-4 in the EIA report.
		31. It is mentioned in Form 1 that "Approximately 3000 persons will be employed during construction phase and about 2000 people will be employed during operation phase". Also, please mention if the employment will be given to the locals or to outsiders.	31. The locals will be given preference as per the eligibility. The skill development program will be implemented as a part of CSR program to improve employability.	31. The proposed project will give employment to about 2000-3000 persons on average per day basis during construction phase. During operation phase, about 2000 direct employment and 5000 indirect employment will be generated. Local people will be given preference to employment based on the skill set & eligibility requirement as per and vacancies available.
		32. What kind of residential and cooking facilities will be provided for the construction workers?	32. During construction phase, workers will be sourced through contractors and it will be ensured that workers get required facilities.	32. The workers from nearby will be employed through contractors in contract basics. The details will be provided in detail engineering stage.
		33. What sanitation facilities will be provided for them during the construction phase?	33. All the facilities including sanitation and others will be provided.	33. All required facilities (like drinking water, domestic toilets and shelters sheds) will be provided.

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		34. How many locals have been employed so far by the APSEZ? Please furnish details. Please furnish how many are temporary and how many with permanent jobs.	34. This is outside the scope of the EIA report for the proposed project. However, local employment will be provided for the proposed project based on eligibility.	34. This proposed project is belongs AEL. Refer the above point no.-31 for employment details.
		35. Under the "Environment Sensitivity", the Form-1 states that "Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value" are not present within 15 kms. However, mangroves are about 167 meters away from the boundary of the proposed project. Moreover, there are 3 reserved forest and the Mundra mangrove forest in the proposed project area. Mangroves are protected as per the Indian legislation. Please explain why this was not mentioned in the Form-1.	35. Information related to mangroves is given in sub-clause of environmental sensitivity which is part of Form-1.	35. The Section-9 sub-clause (III) Environmental Sensitivity of form-1.
		36. Moreover, the 15 kms area covers the villages Tragadi. As per some of the reports Tragadi is turtle nesting sites. Why this has not been mentioned in the Form 1? Please explain. Have the impacts of the proposed project and related activities been studied for the turtle nesting? What are the mitigation measures for same? Please furnish full details of same.	36. There is no notified/ declared turtle nesting site present within 15 KM of the proposed project area.	36. As per primary baseline survey, there is no notified/ declared turtle nesting site present within 15 KM of the proposed project area.
		37. Please give details on the pagadiya fishing along the APSEZ area. How many fishermen are engaged in this? How many have been impacted due to the APSEZ? Please furnish full details.	37. The details of pagadiya fishermen will be included in the final EIA report. No fishermen will be impacted due to the proposed project.	37. The fishermen details are given in Section-3.10 and Annexure-XII of Chapter-3 in the EIA report.
		38. What compensation has been provided to fishermen who earlier used to fish by this technique, but had to stop due to the APSEZ? Please furnish full details.	38. This is outside the scope of the EIA report for the proposed project.	38. The proposed project belongs to AEL. As part of CER activities the will be help/support to fishermen communities.
		39. How many fishing boats are present in the area? Please furnish full details.	39. The proposed project area is outside CRZ. We do not have any information on fishing boats in the surrounding area. However, proposed	39. This is outside the scope of the EIA report for the proposed project.

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			project activity will have no impact on fisheries.	
		40. From where would the sand be obtained for the proposed construction?	40. The sand for the proposed construction will be sourced from local available markets.	40. The required construction materials will be sourced from nearby local market.
		41. The proposed TOR document mentions under Land Use that - "The existing land use pattern in the study area of 10 km radius around the project will be established through the literature review of published Census records and latest available satellite imagery. Based on this review, the land use pattern is categorized into the following five categories: a. Forest; b. Irrigated and agricultural Land; c. Un-irrigated agricultural land; d. Culturable wasteland; and e. Land not available for cultivation, which includes built-up areas." Why are the mudflat areas and the mangroves not mentioned? Also, please demarcate the culturable wasteland and share a coloured map of the same.	41. The land use pattern of the study area covering 10 km radius is given in Figure-3.3.2, Chapter-3 of the EIA report. Same is in colour. Mudflats and mangroves are mentioned in Table-3.3.2, Chapter-3 of EIA report.	41. The land use pattern legends with colour identification of the study area covering 10 km radius is given in Figure-3.3.2 and landuse pattern area (in ha.) is given in Table-3.3.2, Chapter-3 of EIA report.
		42. The brief summary as well as the pre-feasibility report mentions that "There is no significant vegetation or habitation in the project site. The nearest significant features from the project site are 4620 MW Adani Power Plant and Tata Power (Western side of project area), and West Port of APSEZL (South – west direction from project)." Kindly explain why the mangrove vegetation or the three reserve forest areas and mangrove forest areas not significant.	42. Project area is notified SEZ and forest land for which diversion is under process. Mangroves and other RF are mentioned as part of Form-1 and EIA report. Mangroves are not present within the proposed project area.	42. Mangroves are not present within the proposed project area. Mundra Mangrove RF (south of project area, which is mentioned in Section–9 sub-clause (III) Environmental Sensitivity of From-1.
		43. The pre-feasibility report also mentions that "Land for different corridors (Power/ Road/ Raw Material Conveyor) would be additional." Please	43. All the utility corridors will be part of notified SEZ. However, they will be finalized as part of detail engineering and only after obtaining	43. The resource and requirement details are given in Section-2.2 of Chapter-2 in the EIA report. The total land required for the

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		furnish full details of the land required and the existing land use for these corridors. Please furnish the existing land use, whether any eco-sensitive areas, forest lands, mangroves, beaches, etc. exist in these corridors. Please also furnish a coloured map of the proposed corridor area.	required clearance for the proposed project.	proposed project is about 256.58 ha (634 acres), out of which 154.18 ha (381 acres) of APSEZ and 102.39 ha (253 acres) of forest land (Stage-I FC is obtained). The water and power sourced from APSEZ Ltd, through M/s. Mundra Utility Pvt Ltd (MUPL).
		44. Why has information on the above-mentioned corridors not provided in the Draft EIA? Please explain.	44. Reply is as per point no. 43.	44. Refer the above point no.-43.
		45. The pre-feasibility report mentions that "From South West to North East majority of area is of APSEZL where west port is also located. The land is having undulations and minor grading will be required." Kindly provide details on how the grading would be carried. What material would be used for this? From where would it be sourced? Please furnish full details.	45. Leveling of the land profile will be done as part of detailed engineering for the proposed project.	45. The land profile will be done as part of detailed engineering for the proposed project.
		46. How many creeks are present in the study area? Please furnish a coloured map and a satellite image showing the creeks.	46. Map showing the creek in the satellite imagery and land use map are provided in Chapter-3 of the EIA report.	46. The kotadi creek and Baradi creek are present in study area 10 km radius from the project site. The study area map is shown in Figure-1.2 of Chapter-3 in the EIA report.
		47. The pre-feasibility report states that "Since the entire land is vacant, hence no displacement and rehabilitation of local population is envisaged". What about the fishermen? How many of fishermen are engaged in fishing in this area? Please furnish full details.	47. Proposed project area is devoid of any human habitation. The fishermen in the surrounding areas will not be disturbed due the proposed project.	47. The fishermen details are given in Section-3.10 and Annexure-XII of Chapter-3 in the EIA report.
		48. How many fisher-folk/local people will be given permanent jobs in the proposed project?	48. Details on potential employment are mentioned in Chapter 2 of EIA Report. Preference will be given to local people for employment in this project based on eligibility. There is a plan to set up a Skill Development Centre to improve the employability of local youth.	48. Refer the above point no.-31 & 47.

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		49. What kind of jobs will be given?	49. Based on the eligibility and available vacancies, jobs will be provided.	49. Reply is as per point no.-31.
		50. Will they be imparted appropriate training?	50. Training will be integral part of all the employees. The skill development program will be implemented as a part of CSR program to improve employability.	50. The Trainings will organized in CER activities are given in Section-8.5 of Chapter-8 in the EIA report.
		51. Would the job be permanent or temporary?	51. Based on the eligibility and available vacancies, jobs will be provided.	51. Reply is as per point no.-31.
		52. How many salt pans exist in the study area. Please furnish full details.	52. Salt pans are present in the south west direction of the project area at a distance of around 5 KM.	52. The study area consists of 0.64% salt pans. The environmental setting of 10 km radius is given in Table-1.1 of Chapter-1 in the EIA report.
		53. From where will be the coal sourced for "addition in the concentrate for effective smelting"? What will be the ash content, Sulphur content mercury content and radioactivity of the coal proposed to be used? How will it be transported? What is the quantity of the coal envisaged to be stored? What are the ash utilization plan? Please furnish a detailed report on same. What are the mitigation measures for the SOx, particulate matter, arsenic, heavy metals, mercury, radionuclides emissions?	53. The coal will be sourced from the local market and transported through trucks. Around 3000 tonnes of coal will be stored. Coal is taking part in the smelting process and hence there is no ash generation. The details about mitigation measures have been covered as a part of EMP in the EIA report.	53. The raw material requirement and source is given in Section-2.2.2 of Chapter-2. The impacts and mitigations for construction and operation phase are given in Chapter-4 of EIA report.
		54. Are there any studies conducted on the long-term radioactivity of the ash? Kindly furnish the same if any. What are the mitigation measures proposed for the same?	54. There is no generation of ash in the process.	54. There is no generation of ash in the process copper project.
		55. Please share details of the water circulation system proposed as mentioned in the Pre-feasibility report. Please show the layout on map of this proposed water circulation system. Please also share details of the land cover of this proposed area. Why has this not been mentioned in the Draft EIA?	55. The requested details are part of detail engineering. Preliminary water balance diagram is given in Figure-2.2 of the EIA report.	55. The water requirement and breakup details are given in Section-2.2.3 and Preliminary water balance diagram is given in Figure-2.2 of Chapter-2 in the EIA report.

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		56. The very first criterion for site selection is "Away from environmentally sensitive areas". However, this project falls under the reserve forest and mangrove areas. Please explain.	56. Environmental sensitivity analysis is done for 15 km area from the project boundary and same is provided in Form-1. The alternate site analysis was carried out. The alternate sites have been discussed in detail during the Terms of reference meeting and shortlisted site for the proposed project has been accepted by the Honorable EAC committee of MoEF&CC, New Delhi. Details on alternative site analysis are provided in the Chapter-5 of the EIA report. Site is selected on the basis of suitability from number of factors.	56. The comparison salient features of alternative sites done and details are presented in following Table-5.1 and is shown in Figure-5.1 of Chapter-5 in the EIA report. The Site-II in Siracha & Navinal Village adjacent to existing APL emerges as technically superior site such as availability & closeness of water and power source, land development, closeness to road and rail, etc. It is substantially advantageous in terms of environmental and technical criteria.
		57. Under section 6.4.2 "Merits & demerits" of the pre-feasibility report why the presence of reserve forests and mangrove forest not mentioned under "Site-II (East of APL)"	57. Details on alternative site analysis are provided in the Chapter-5 of the EIA report. Site is selected on the basis of suitability from number of factors.	57. Refer above point no.-56.
		58. How much green belt plantation has been undertaken by APSEZ so far? Please provide with the total area, the co-ordinates and the photographs of same.	58. This is outside the scope of the EIA report for the proposed project.	58. This is outside the scope of the EIA report for the proposed project. AEL proposed 85.79 ha for greenbelt development for the proposed project.
		59. What plant species have been planted in the green-belt in the APSEZ?	59. This is outside the scope of the EIA report for the proposed project.	59. This is outside the scope of the EIA report for the proposed project.
		60. Are all the species proposed to be planted for the current proposal indigenous?	60. Yes, the present proposal will include the indigenous species.	60. The recommended species for greenbelt development are given in Table-4.12 of Chapter-4.
		61. Where is the sewage treatment plant proposed? Please show the location on the map.	61. STP will be part of ETP and same is shown in the layout map provided in the EIA report.	61. The generated domestic wastewater will be treated in STP will be part of ETP. The process details and schematic flow diagram of ETP is given in Section-2.4.2 and Figure-2.23 of Chapter-2.
		62. Where would the sludge from the sewage treatment plant be disposed of?	62. The sewage sludge will be utilized as manure for the greenbelt.	62. The generated sludge will be utilized as manure for the greenbelt.

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		68. Please furnish a copy of the guidelines on "utilization of Phosphogypsum".	68. Phosphogypsum is used for cement manufacturing, gypsum board manufacturing and fertilizer. The same is covered in EIA report. The "Guidelines for Management, Handling, Utilisation and Disposal of Phosphogypsum Generated from Phosphoric Acid Plants" published by CPCB is available online at: http://cpcb.nic.in/wast/hazardouswast/GuidelineforM,H,Utili&%20DisposalofPhosphogypsumfromPAPlants.pdf	68. Refer the above point no.-67.
		69. Please give full details of the location of the land fill sites for storage of Hazardous Cake and Scrubber Cake as well as a Map showing their locations.	69. An area of 30 acres has been demarcated for the SLF and shown in the plant layout in Chapter-2 of the EIA report, which takes care of the generated ETP cake and scrubber cake.	69. Secured Land Fill (SLF) is proposed over 12.95 ha within the project premises for disposal of ETP waste sludge and spent catalyst. Other Hazardous waste will be disposed through the approved recyclers.
		70. Please furnish area details and location map of ETP cake land fill.	70. Reply is as per point no. 69 above.	70. Reply is as per point no. 69 above.
		71. As per the draft EIA report almost 40% of the forest area is proposed to be converted to industrial use. Why is forest land required for this project?	71. Total area required for the plant is 256.58 ha. Three alternative sites were proposed. The alternate sites have been discussed in detail during the Terms of reference meeting and shortlisted site for the proposed project has been accepted by the Honorable EAC committee of MoEF&CC, New Delhi. The site selection criteria and the study of alternate sites are detailed in chapter-5 of EIA report.	71. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V.
		72. As per the Draft EIA section-3.9.6 - "Endemic Flora Species and Threatened Flora of Navinal Area - Important threatened plant species reported from the region are Dipcadi erythraeum, Helichrysum cutchicum, Heliotropium rariflorum, Pavonia ceratocarpa, Convolvulus stocksii, Commiphora wightii. Gujarat State Biodiversity Board proposes to declare the area as Biodiversity heritage site and as the site is close to Mundra SEZ, it deserves	72. Project area includes forest land for which APSEZ has applied for Forest clearance and same is under process. As a process State Government gives recommendation for diversion of forest land after completing all procedures and central government is granting the clearance. The proposed project site is away from biodiversity heritage site as proposed by Gujarat State Biodiversity Board. However, project will be implemented by	72. Refer the above point no. 13, 14 & 71.

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		63. Is there any facility proposed for the recycling and reuse of the sludge on site? Kindly provide the details along with the location on the map for the same if any.	63. The sewage sludge will be used within the plant itself and the particulars will be available post detail engineering.	63. The detasils will be provide in detail engineering.
		64. The pre-feasibility report states that the "rejects from the secondary RO plant will be discharged into sea through the outfall channel of APSEZ's desalination plant." Please explain the impacts and mitigation measures of same.	64. The plant will be designed for Zero Liquid Discharge. The rejects from the RO plant will be sent to multi-effect evaporator. There is no discharge of any treated water into sea. Preliminary water balance diagram is given in Figure-2.2 of the EIA report.	64. An integrated water system is proposed, the effluent from the process units is treated and reused to reduce water demand. It is also proposed to install a secondary Reverse Osmosis (RO) plant to further treat water from the effluent plant facility for effective use. Rejects from the reverse osmosis plant will be sent to Multi Effect Evaporator (MEF) for further recovery and solids generated will be sent to Secured Land Fill (SLF).
		65. What will be the composition of the rejects from the secondary RO plant? Kindly provide the detailed analysis report for the same with the concentration of each constituent.	65. Reject from secondary stage RO containing higher TDS will be sent to multi-effect evaporator where water will be separated and re-used and salts (mainly calcium) will be stored in the SLF within the project area.	65. Refer above point no.-64.
		66. What are the "latest environment technologies" that would be used to treat the gaseous emissions before they are discharged in to the atmosphere?	66. Tail gas scrubbers will be installed to scrub residual gases from Sulphuric Acid Plant to produce Gypsum used in cement industries and high efficiency gas scrubbers will be installed in Phosphoric Acid Plant to produce Hydro Fluro Silicic acid which is used in manufacturing of Aluminum Fluoride.	66. The process description is given in Section-2.3 of Chapter-2.
		67. Please furnish a copy of the guidelines on "utilization of Copper Slag".	67. Copper slag can be used as a building material (added in concrete as well as in ready mix), road construction and shot blasting. The same is covered in EIA report. As per MoEF&CC notification dated 4th April 2016, copper slag does not fall under hazardous waste category and separate guidelines on the management of copper slag will be issued by CPCB separately and same is awaited.	67. The impacts and mitigation on solid waste management is given in Section-4.2.5 of Chapter-4 in the EIA report.

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		more protection." Despite this, please explain why this site is being selected for this project?	taking all environmental safeguards.	
		73. Isn't it ironical that the project proponent proposes to build the proposed copper refinery with environment friendly technology while destroying 102.38 has of forests only for this particular project? The project proponent may please explain the logic behind doing this.	73. Total area required for the plant is 256.58 ha. Three alternative sites were proposed. The alternate sites have been discussed in detail during the Terms of reference meeting and shortlisted site for the proposed project has been accepted by the Honorable EAC committee of MoEF&CC, New Delhi. The site selection criteria and the study of alternate sites are detailed in chapter-5 of EIA report.	73. Refer the above point no. 13, 14 & 71.
		74. The area identified for securing the hazardous cake and scrubber cake has not been specified. Neither has the area identified for intermediate/emergency storage of copper slag and phosphogypsum. As mentioned in the Draft EIA, area of 30 acres and 105 acres respectively has been mentioned for the said activities. Please give the location for these. Please also give the land use category of this areas. Have the clearances for this land been obtained? Please share the Forest, CRZ and environment clearances of same.	74. ETP cake and scrubber cake will be stored in the secured land fill (SLF). An area of 30 acres has been demarcated for the SLF and shown in the plant layout in Chapter-2 of the EIA report. Storage of copper slag, phosphogypsum and SLF is proposed within the project boundary. The proposed project site is outside CRZ. Forest clearance for the forest land in the proposed project has been applied. Environment clearance is under progress.	74. The solid waste generation and management details are given in Section-2.4.3 of Chapter-2 in the EIA report.
		75. What will be the composition of the hazardous cake? Kindly provide the detailed analysis report for the same with the concentration of each constituent.	75. The preliminary composition of the waste generated such as scrubber cake and ETP cake is provided in Chapter-2 of EIA report.	75. The generated waste such as scrubber cake and ETP cake compostion details are given in Table-2.10 & 2.11 of Chapter-2 in the EIA report.
		76. As per the Table-2.9, ETP Cake contains heavy metals. What will be the impact of its disposal on the ground water table? What are the mitigation measures for the same?	76. ETP cake will be stored in SLF. Secured land fill is proposed to be developed over an area of 30 acres within the proposed project area. SLF will be constructed and operated as per the CPCB guidelines for treatment, storage and disposal facility (TSDF). The SLF, once filled to its capacity will be capped on top and soil cover will be spread and landscaping will be done. Monitoring of environmental parameters will also be carried out. Therefore, there are no	76. ETP cake will be stored in SLF. Refer the above point 74.

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			possibilities of contamination of ground water.	
		77. Also, the project proponent is proposing to do away with 253 acres of forest area and then develop 209 acres of greenbelt/green cover. Kindly explain this.	77. Total area required for the plant is 256.58 ha. Forest land requirement is part of the total land estimated for the project. Greenbelt requirement on 33% of the area is proposed and shall be complied as per EC conditions. For the compensatory afforestation for the forest land shall also done as per established procedure.	77. As per guidelines and ToR point 33% land should be allotted for greenbelt development. AEL proposing 89.84 ha (35%) land for greenbelt development.
		78. The draft EIA report states that "The proposed copper refinery project of AEL is a one of the important projects. AEL believes that the copper refinery project would add significant value to Indian economy. The project will not only help ensuring by becoming self-sufficient in terms of copper, phosphoric acid and sulphuric acid for India but will also drive macroeconomic growth." This growth driven approach of Adani has been detrimental to the environment of Mundra. Moreover, the project would be detrimental as it will lead to air pollution and will impact the health of people residing in the vicinity.	78. Pollution control measures will be implemented to achieve emissions as per the prescribed standards by CPCB. Based on studies under EIA, ambient air quality is found to be within the prescribed standards after development of the project. There will not be any significant adverse impact on the health of the people. EMP is provided in Chapter-9 of the EIA report. Rs 1044 Crores has been budgeted towards the pollution control systems.	78. The proposed project is with the state of art environment friendly technology. The Anticipated impacts during construction and operation phase is provided for proposed project. There will not be any significant adverse impact on the health of the people. The proposed project will be implemented with all environmental safeguards. EMP is provided in Chapter-10 of the EIA report. Rs. 1044 Crores has been budgeted towards the pollution control systems.
		79. The draft EIA report mentions that "The proposed project would have few adverse impacts on the environment. However, with proper and judicious implementation of the mitigation and environment management measures, the impacts can be minimized and can be maintained well within the permissible limits specified by the regulatory authorities." The approach of Adani group and the indifference towards protection and conservation of environment has been reported time and again. The proposed project will not only lead to further reclamation of mangroves and mudflats, it will also be detrimental to the mangroves and the reserve forests in this area.	79. Proposed project is outside CRZ area, therefore there is no question of reclamation of mudflats and mangroves. Project will be implemented with all environmental safeguards. EMP is provided in Chapter-9 of the EIA report. Rs 1044 Crores has been budgeted towards the pollution control systems.	79. As primary survey of EIA studies, the project outside the CRZ area, there is no reclamation of mudflats and mangroves. Refer the above point no.-78.

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		80. The draft EIA report mentions that the "Mangroves are situated about 4.5 km near Kotri creek area/ SSW direction, distributed along the networks of creek system." The Google earth imagery dated 19.11.2015 clearly shows that mangroves exist at mere 167 metres from the proposed project. Why has this not been mentioned in the Draft EIA report? Please explain. Moreover, the project also falls under the Mundra mangrove forests. This too has been not mentioned here. Please explain.	80. Map showing the study area with satellite imagery and land use map are shown in in the Chapter-3 of the EIA report. Authorized CRZ map is also provided in figure-1.5 of Chapter-1 of EIA report. Mangroves are present at 100 m away in the southern side of the project area.	80. Map showing the study area with satellite imagery and land use map are shown in in the Chapter-3 of the EIA report. Authorized CRZ map is also provided in Figure-1.5 of Chapter-1 in the EIA report. Mangroves are present at the southern side of the project area.
		81. Please furnish with the details of the APSEZ. How much area has been acquired under the APSEZ at Mundra and how much was permitted under the clearances?	81. This is outside the scope of the EIA report for the proposed project.	81. This is outside the scope of the EIA report for the proposed project.
		82. Please furnish with all the CRZ, EC, Forest and wildlife clearances of the APSEZ, Mundra.	82. The proposed project site is outside CRZ. Forest clearance for the forest land in the proposed project has been applied. Environment clearance is under progress. Wild life clearance is not applicable for the proposed project.	82. This is outside the scope of the EIA report for the proposed project. The proposed project is outside the CRZ area. The Stage-I FC is obtained and there is no wildlife clearance for proposed project. The EIA report after public hearing will be submitted for EC.
		83. Has the APSEZ undertaken any mangrove plantation? Kindly furnish details of each location wherein the mangrove plantation has been undertaken, along with the area under plantation so far, locations' latitude-longitude, site photographs prior to plantation and post plantation, agency implementing the plantation and the compliance so far. Also furnish with the pre and post plantation satellite images of all the locations.	83. This is outside the scope of the EIA report for the proposed project.	83. This is outside the scope of the EIA report for the proposed project.
		84. Please mention the area details for mangroves that have been destroyed so far for the APSEZ. Please furnish a 1991 and current satellite data.	84. This is outside the scope of the EIA report for the proposed project.	84. This is outside the scope of the EIA report for the proposed project.
		85. Please furnish with the details of much of	85. Proposed project is outside CRZ. Project is	85. The proposed project is outside the CRZ

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		mudflats, sand dunes, creek, salt pans have been reclaimed so far.	developed on notified SEZ area and forest land for which clearance is under progress. No reclamation is proposed in the proposed project activity.	area. Forest Stage-I clearance is ontained. There is no mudflats, sand dunes, creek, salt pan identified in proposed project site.
		86. Please furnish with the complaints received for the existing projects, specifically regarding to the destruction of mangroves and violation of the CRZ Notification in the APSEZ area.	86. This is outside the scope of the EIA report for the proposed project.	86. This is outside the scope of the EIA report for the proposed project.
		87. What action has been taken and what is the status and / or compliance of the show cause notices issued by the MoEF and the GPCB regarding the violation of the environmental clearances and the pollution in the APSEZ? Kindly furnish with the details and relevant documents.	87. This is outside the scope of the EIA report for the proposed project.	87. This is outside the scope of the EIA report for the proposed project.
		88. Has Cumulative impact analysis been conducted for the proposal on local livelihood? What are the findings of this study? Which all companies/projects have been undertaken under this study?	88. The impact analysis has been carried out for the proposed project as per TOR granted by MoEF&CC in which baseline conditions are monitored and prediction of impacts has been carried out with respect to proposed project activity. The details have been provided in Chapter-4 of the EIA report.	88. The anticipated potential impacts analysis, cumulative impacts due to increase of pollutant and its mitigation measure are provided in Chapter-4 in the EIA report.
		89. What is the carrying capacity of this area to undertake the proposed project with respect to already existing projects? Has any carrying capacity study been conducted? Details thereof may please be furnished.	89. EIA studies have been carried based on TOR granted by MoEF&CC. Project will be implemented after obtaining required permissions and compliance will be done based on permissions granted.	89. With the all related guidelines and standards the EIA studies has carried out. After obtaining all necessary NOC the proposed project construction will takes place.
		90. Have there been any complaints/grievances from the fishing community? Kindly furnish with same.	90. Representations received from fishing community were addressed during public hearing as well as in written responses. There are no complaints or grievances from the fishing community for the proposed project activity.	90. The fisherman and community details are given in Section-3.10.6 and Annexure-XII of Chapter-3 in the EIA report.
		91. Please furnish full details of the environmental clearance and the CRZ clearance, Environmental clearances, Forest clearances and the Wildlife	91. Project is located in notified SEZ area. APSEZ has obtained EC and CRZ clearances from MoEF&CC vide their letter dated 15th July,	91. The proposed project is located in notified SEZ are and it is outside the CRZ area. Forest Stage-I clearance is under process.

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		clearances received for the existing APSEZ, Mundra.	2014 for multi-product SEZ at Mundra. Project area also includes forest land for which APSEZ is in the process of obtaining forest clearance. Wild life clearance is not applicable.	There is no wildlife clearance is required for the proposed project.
		92. Please furnish details of the CRZ clearance, Environmental clearances, Forest clearances and the Wildlife clearances received for all the facilities existing in the APSEZ.	92. Reply is as per point no. 91 above.	92. Refer the above point no. 91.
		93. How much land was reclaimed for the existing APSEZ after 20th February 1991?	93. This is outside the scope of the EIA report for the proposed project.	93. This is outside the scope of the EIA report for the proposed project.
		94. How has the APSEZ impacted the livelihoods of local fisher folk communities?	94. This is outside the scope of the EIA report for the proposed project.	94. This is outside the scope of the EIA report for the proposed project.
		95. What will be the impact of the additional transport of raw materials and the finished products on the road, rail and the SEZ infrastructure? Please furnish with details of same.	95. The impacts due the additional traffic of the proposed project have been considered while calculating the cumulative impact and the details are available in Chapter 4 of the EIA report. There will not be any significant impact due to increase of traffic due to proposed project.	95. The traffic density study have been carried out and detail are given in Section-3.11 of Chapter-3. The cumulative impacts details are given in Section-4.2.2 of Chapter-4 in the EIA report.
		96. Please furnish details of the transportation – road, railway lines, as well sea borne, impacts and mitigations studies conducted for the proposal.	96. The impacts due the additional traffic of the proposed project have been considered while calculating the cumulative impact and the details are available in Chapter 4 of the EIA report. Existing railway lines will be used based on requirement. Existing port facility available at west port and south port of APSEZ will be utilized for transportation of materials.	96. Existing railway lines will be used based on requirement. Existing port facility available at west port and south port of APSEZ will be utilized for transportation of materials. Refer the above point no.-95.
		97. The proposed area falls under Seismic Zone V. What are the mitigations measures to handle the situation due to earthquake?	97. The plant design will be done considering seismic zone-V as per IS 1893 (part-I)-latest edition. Disaster management plan has been prepared and available in Chapter-7 of the EIA report.	97. The plant will be design by considering the latest technology and safety measure guideline for seismic zone. The DMP for onsite and offsite is given in Section-7.3 of Chapter-7 in the EIA report. The details will be given in detail engineering report.
		98. Please furnish full details of the field visits	98. Ecological study has been carried out during	98. **M/s. Adani Enterprises Limited (AEL)**

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		conducted to undertake the ecological study including copies of the field notes. Please mention full details of the team members, their qualifications, and the number of man days spent on the ecological data collection.	the study period by an EIA agency approved by QCI-NABET. The NABET certificate and personnel involved in the ecological study is available in Chapter-11 of the EIA report.	has retained the services of NABL/ISO 17025 Certified Laboratory, MOEF&CC and NABET accredited EIA Consultant **M/s. Vimta Labs Limited (VLL)**,, Hyderabad to prepare EIA report for various environmental components including air, noise, water, land and biological components along with parameters of human interest which may be affected and to prepare an Environment Management Plan (EMP) for mitigating possible adverse impacts. The Consultant details (like certification and list of team member involved in the proposed project) are given as Chapter-11. The latest QCI issued certificate no. NABET/EIA/1720/SA0088, Valid upto 19th November 2020. The details of consultant along with certificaties are given in Chapter-12 in the EIA report.
		99. Has the project proponent carried out Social impact assessment report? If yes please furnish if any.	99. EIA studies have been carried based on TOR granted by MoEF&CC. Socio economic study has been carried out as part of EIA and same is available in Chapter-3 of the EIA report.	99. The Social Impact Assessment report is enclosed as Annexure-XII.
		100. Please furnish the latitude-longitude coordinates of the corners/boundaries of the entire APSEZ, Mundra.	100. This is outside the scope of the EIA report for the proposed project. However, coordinates of the proposed project boundary are provided in Chapter-1 of the EIA report.	100. This is outside the scope of the EIA report for the proposed project.
		101. What are the existing facilities for the parking, washing, repairs and maintenance of trucks and other heavy equipment?	101. All the infrastructural facilities like parking, washing, repairs and maintenance etc will be part of detail engineering and same will be carried out after obtaining required clearances.	101. All the required infrastructure facilities detail will be given in detail engineering stage and same will be carried out after obtaining required clearances.
		102. What facilities are provided for the drivers and cleaners?	102. Separate truck parking and rest rooms will be provided to the drivers and cleaners involved in the transportation of the raw material and end products.	102. Facilities like truck parking, truck cleaning facilities, rest rooms and canteen will be provided for drivers and cleaners.

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		103. What will be the impact of the water/sewage discharged into the creeks and gulf of Kachchh on the overall salinity of the water? Has any such report been conducted?	103. The proposed plant will operate on Zero discharge concept. There is no discharge of any treated water into creeks or Gulf of Kachchh.	103. The proposed plant will operate on Zero discharge concept. There is no discharge of any treated water into creeks or Gulf of Kachchh.
		104. Please furnish No Objection Certificates, Consents, from the State Pollution Control Board for the projects involving discharge of effluents, solid wastes, and sewage waste under Environmental Protection Act 1986.	104. This is outside the scope of the EIA report for the proposed project.	104. After receiving Environment Clearance from MOEF&CC. The necessary NOC of Consent to Establishment (CTE) or Consent to Operate (CTO) form GPCB shall be applied.
		105. Has the project proponent carried out mangrove conservation plan? If yes then furnish full details with photographs and maps showing the mangrove conservation areas, along with details of the cost of mangrove conservation.	105. The proposed project is outside CRZ area and no mangroves are present at the proposed project site.	105. The proposed project is outside CRZ area and no mangroves are present at the proposed project site.
		106. What is the original plot level? What is the proposed plot level? How this will affect the land terrain? Has the proponent conducted any analysis on its impact on the environment? Please furnish details.	106. The proposed project will be implemented in notified SEZ and forest land. The land terrain is gently sloping and no major cutting and filling for leveling of land will be involved. Impact on land environment is carried out and details are in chapter-4 of the EIA report.	106. Impacts on Land use during construction and operation phase is provided in Chapter-4 in the EIA report.
		107. Please furnish the status of NABET accreditation for all EIA consultants hired with their experience in details as of the period the Draft EIA studies were conducted and published.	107. The NABET certificate of the EIA consultant (NABET/EIA/1619/RA0043 Valid upto 19 May 2019) is provided in Chapter-11 of EIA report.	107. Refer above point no.-98.
		108. Have all the ToRs been followed for the preparation of the documents?	108. TOR granted by MoEF&CC vide their letter dated 21st June, 2016 has been followed for preparation of draft EIA report.	108. The entire EIA study is carried out on basics of the issued TOR by MoEF&CC vide their letter dated 21st June, 2016.
		109. Has authenticated English translation of all material in Regional languages been provided, as stated in the EAC minutes dated 3th – 4th May 2016?	109. All documents have been provided in English. The representations received in local language will be translated into English and same will be authenticated.	109. Complied and incorporated.
		110. It has been reported that the coastal areas of Mundra harbour mangroves and have mudflats,	110. This is outside the scope of the EIA report for the proposed project.	110. Refer the above point no.-56.

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		sand dunes, creek network etc. ecologically important areas. Despite this, projects are being allowed to set-up in this area. Why does Adani group always have to either reclaim the mangroves and mudflats or use a site which they have already reclaimed without proper clearance? Please explain.	We assure you that all the environmental safeguards will be provided during implementation and operation of the project.	
8	Shri Dharmesh Mistri, Block no: 14, house no. 1340, Narmada Apartment, Opp. Mamlatdar office, Bharuch	1. It is requested to take copy of QCI-NABET approved company consultant's functional area experts' names, the details of their area of functioning, their time limits along with their signature and stamp, within the MOM.	1. The environmental consultants engaged are QCI NABET approved and the certificate of the EIA consultant (NABET/EIA/1619/RA0043 Valid upto 19th May 2019) is provided in Chapter-11 of EIA report. Names and Qualifications of the team of functional area experts engaged by M/s. Vimta Labs will be provided in the final EIA report.	1. **M/s. Adani Enterprises Limited (AEL)** has retained the services of NABET accredited EIA Consultant **M/s. Vimta Labs Limited (VLL)**, Hyderabad to prepare EIA report. The Consultant details (like certification and list of team member involved in the proposed project) are given as Chapter-11. The latest QCI issued certificate no. NABET/EIA/1720/SA0088, Valid upto 19th November 2020.
		2. The details showing whether QCI-NABET approved company consultant's functional area expert is an officer on regular pay or not?	2. Details are as per point no. 1 above.	2. Refer the above point no.-1.
		3. It is requested to take along with the MOM, the copy of agreement that is held between the federation area expert and consultant, in case if the QCI-NABET approved functional area for the company consultant is enrolled from external source.	3. This is outside the scope of EIA report for the proposed project.	3. This is outside the scope of EIA report for the proposed project.
		4. It is requested to take details of work undertaken by them with the names of the companies for which they have signed for the EIA report during environmental public hearing, in case if the QCI-NABET approved functional area for the company consultant is enrolled from external source.	4. This is outside the scope of EIA report for the proposed project.	4. This is outside the scope of EIA report for the proposed project.
		5. Provide the information of the fees paid, in case if the QCI-NABET approved functional area for the company consultant is enrolled from external source.	5. This is outside the scope of EIA report for the proposed project.	5. This is outside the scope of EIA report for the proposed project.

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		6. The details of the responsibilities decided for the consultant for environmental public hearing and as for this project.	6. The draft EIA report has been prepared by NABET accredited consultant and same was submitted for public hearing. The public hearing is conducted based on the EIA notification 2006 and its subsequent amendments. The concerns of public have been addressed during public hearing and same will be incorporated in the final EIA report which will also be prepared by NABET accredited consultant.	6. The NABET accredited EIA Consultant **M/s. Vimta Labs Limited (VLL)**, Hyderabad to prepare draft EIA report for public hearing by considering various environmental components including air, noise, water, land and biological components along with parameters of human interest which may be affected and to prepare an Environment Management Plan (EMP) for mitigating possible adverse impacts. The public hearing concerns and its action plan will be incorporated in final EIA report, which will be submitted to MoEF&CC for EC.
		7. The details of the fees paid by the company to the consultant and the agreement between the consultant and company to be kept in the MOM.	7. This is outside the scope of EIA report for the proposed project.	7. This is outside the scope of EIA report for the proposed project.
		8. It is requested to place under the MOM, the copy of the document provided under the EIA report as accreditation certificate by the company consultant along with the signature and stamp of the competent office in the hard copy.	8. Details are as per point no. 1 above.	8. Refer above point no.-1.
		9. The accreditation certificate considered valid by NABET-QCI shall be taken in MOM.	9. Details are as per point no. 1 above.	9. Refer the above point no.-1.
		10. The name, designation, organization's name and address of the individual providing presentation of the EIA report shall have to be provided along with photocopy copy of identification proof to be kept along with the MOM.	10. EIA report has been prepared as per EIA notification 2006 and subsequent amendments. During public hearing the identification of representatives from project proponent has been made and it is not required to include them as part of the MOM.	10. During public hearing the identification of representatives from project proponent has been made and it is not required to include them as part of the MOM.
		11. The list of the names of companies for which the consultant has prepared draft EIA report. (From 01.01.2015 to 10.05.2017)	11. This is outside the scope of EIA report for the proposed project.	11. This is outside the scope of EIA report for the proposed project.
		12. The show cause notices and closer notice issued by the Gujarat Pollution control board to the	12. No show cause notice and closure notice issued by GPCB for proposed project.	12. The proposed project is a greenfield, there is no show cause notice and closure notice

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		company, to be placed in the MOM.		issued by GPCB for proposed project
		13. In case if the company has a unit outside the state of Gujarat and the show cause notice is issued by the Pollution control board, the copy of the same to be kept in the MOM.	13. This is outside the scope of EIA report for the proposed project.	13. This is outside the scope of EIA report for the proposed project.
		14. Provide the names of the Hazardous chemicals that are harmful for environment and humans and are to be used, provide the type of damage that such Hazardous chemicals shall do to the environment and inform what kind of diseases are possible to the humans.	14. Risk analysis has been carried out for identified representative hazardous chemicals as part of the manufacturing process. Same has been provided in Annexure-XIV and Preliminary Hazard Analysis is provided in Chapter-7 of the EIA report. Mitigation measures have also been suggested in the EIA report and same will be strictly implemented. Disaster management plan is also proposed as part of the EIA report.	14. Risk Assessment and Disaster Management Plan is provided in Section 7.2 & 7.3 of Chapter-7 in the EIA report.
		15. If the QCI-NABET payment is made, place the copy of the payment receipt in MOM, along with signature and stamp upon it.	15. This is outside the scope of EIA report for the proposed project.	15. This is outside the scope of EIA report for the proposed project.
		16. As per the rules of QCI-NABET, how many EIA reports can be signed within one year by the ad-hoc functional area expert appointed by the consultant?	16. This is outside the scope of EIA report for the proposed project.	16. This is outside the scope of EIA report for the proposed project.
		17. Provide the details of the trees plated as per the demand of the GIDC. Provide the details of source of water used for the purpose of plantation of trees. If the water is purchased, provide the bills in MOM. Take into MOM the digital photographs of the trees planted till date.	17. As part of the proposed project, greenbelt will be developed in 33% area. Details of type of plantation are given Chapter-4 of the EIA report. Plantation activity will be carried out during the implementation phase of the project.	17. Details of type of plantation are given Chapter-4 of the EIA report.
		18. Specify if 100% truthful compliance is undertaken of the TOR provided by SLEAC to the company?	18. Terms of Reference (TOR) granted by EAC, MOEF&CC has been complied and compliance is provided in Annexure-I of the EIA report.	18. Terms of Reference (TOR) granted by EAC, MOEF&CC has been complied and compliance is provided in Annexure-I of the EIA report
		19. The company should provide a written assurance that 100% truthful compliance is undertaken of	19. Details are as per point no. 18 above.	19. Refer the above point no.-18.

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		the TOR provided by SLEAC to the company.		
		20. The names and addresses of the Land Losers to be taken under MOM and the certificate for Land Losers provided by the GIDC to be placed in MOM.	20. No private land acquisition is planned as part of the proposed project.	20. Memorandum of Understanding (MoU) is in place between Adani Ports & Special Economic Zone Limited (APSEZL) and Adani Enterprises Ltd (AEL) for 154.18 ha (381 acres). Land allotment letter is enclosed as Annexure-III.
		21. It is instructed that from the initiation of the company, the names of the employees to be published in the notice board outside the gate and 85% of local public to be provided employment.	21. Local employment will be provided for proposed project based on eligibility.	21. The proposed project will give employment to about 2000-3000 persons on average per day basis during construction phase. During operation phase, about 2000 direct employment and 5000 indirect employment will be generated. Local people will be given preference to employment based on the skill set & eligibility requirement as per and vacancies available.
		22. From the initiation of the company, if any fire accident, gas accident or other kind of accident has taken place at company units in other areas, the names & details of the workmen or other persons as well as compensation provided to be placed in the MOM. It is requested to place the closer notice under point 40(2) by the Industrial Safety and Health office and the entire set of proceedings carried out as for the same to be placed in the MOM. Moreover the details of the penalty inflicted on the company to be placed under MOM.	22. There are no cases pending against the proposed project. The points raised are outside the scope of EIA report for the proposed project.	22. AEL is proposing a greenfield copper refinery project. There are no accident occurred, no damages to surrounding areas and no cases pending against the proposed project. The points raised are outside the scope of EIA report for the proposed project.
		23. After the indication of the company, if the GPCB has issued closed notice to the Ankleshwar and other units of the company, provide the information that how did the company obtain revoke of the notice. Moreover place all documents in the MOM for the proceedings held for obtaining revoke. Moreover place in the MOM, the amount deposited at government office or receipt of penalty.	23. The points raised in your letter are not relevant to the proposed project. This is outside the scope of EIA report for the proposed project.	23. This is outside the scope of EIA report for the proposed project.

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		24. Place in the MOM the application filed by the consultant for obtaining accreditation certification from the QCI-NABET and the proofs placed along with the same.	24. This is outside the scope of EIA report for the proposed project.	24. This is outside the scope of EIA report for the proposed project.
		25. Provide details as to the date, month and year of joining the organization by the individual that undertakes the presentation of the EIA report.	25. This is outside the scope of EIA report for the proposed project.	25. This is outside the scope of EIA report for the proposed project.
		26. Provide information as to the responsibility of the individual that is to undertake the projection of the EIA report during the environmental public hearing and project.	26. The public hearing is conducted based on the EIA notification 2006 and its subsequent amendments.	26. The EIA report for public hearing is pepared as per grant TOR from MoEF&CC and public hearing is conducted based on the EIA notification 2006 and its subsequent amendments.
		27. Provide the information that how many people are affected area have knowledge of English language.	27. Demographic details based on census data 2011 for the study area are provided in Chapter-3 of the EIA report; however it is not possible to know exactly how many people are able to understand English.	27. Its not possible to know the how many people knows English language. The literacy rate and demographic details based on census data 2011 for the study area are provided in Section-3.10 of Chapter-3 of the EIA report. The Social Impact Assessment (SIA) report is enclosed as Annexure-XI.
		28. Provide village wise figurative information of the individuals residing within affected area.	28. Demographic details based on census data 2011 for the study area are provided in Chapter-3 of the EIA report.	28. Refer the above point no.-27.
		29. Provide village wise figurative information of the educational qualifications of individuals residing within affected area.	29. Demographic details based on census data 2011 for the study area are provided in Chapter-3 of the EIA report.	29. Refer the above point no.-27.
		30. Take into the MOM the affidavit for assurance signed by company or competent officer of the company, while remaining present before a notary, signifying that the individuals of affect area and company employees shall not suffer any kind of damage due to the pollution, fire accident or toxic gas generated due to the project.	30. Risk analysis has been carried out for the proposed project. Same has been provided in Annexure-XIV and Preliminary Hazard Analysis is provided in Chapter-7 of the EIA report. Mitigation measures have also been suggested in the EIA report and same will be strictly implemented. Disaster management plan is also proposed as part of the EIA report.	30. The necessary safety measures will be provided in storage facilities and safety equipments & PPE's for staff and workmen in the proposed plant. The hazard identification, risk assessment and disaster management plan (onsite & offsite) detail are given in Chapter-7 of the EIA report.

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		31. Take into the MOM the affidavit for assurance signed by company or competent officer of the company, while remaining present before a notary, signifying that the individuals other than that of affect area and company employees shall not suffer any kind of damage due to the pollution, fire accident or toxic gas generated due to the project. 32. Is the consultant responsible or not, in case if individuals and company employees suffer any kind of damage due to the pollution, fire accident or toxic gas generated due to the project.	31. Details are as per point no. 30 above. 32. Consultant's responsibility is to prepare EIA report as per TOR granted by MOEF&CC. We assure you that all the environmental safeguards will be provided during implementation and operation of the project.	31. Refer the above point no.-30. 32. Consultant's is not responsibility for any kind of damage due to the pollution, fire accident or toxic gas generated due to the proposed project activities. The role of M/s. Vimta Labs Ltd. is only to prepare EIA report as per TOR granted by MOEF&CC for Environmental Clearance.
9	Shri Nagshi Maunshi Gadhvi (On Behalf Of Sonbaiben Munshi Gadhvi), Sarpanch, Mota Bhadiya, Taluka-Mandvi.	This is to inform that in all surrounding villages falling within 15 km radius from the existing project of the company, till date no support if provided for the employment, jobs, fodder for cattle, drinking water, problems relating to agriculture, roads, and public health facilities etc. Further, one more hazardous project which can seriously harm the public health and agricultural corps etc is proposed here which we strongly object.	We acknowledge the receipt of your representation and have noted your concerns. We assure you that all the environmental safeguards will be put into place before operation of the project. There are many such projects operating in the world, including the developed countries. We will also be adopting the latest technology for pollution control. We are confident of operating this plant with all the safeguards to mitigate the pollution. Preference will be given to local people for employment in this project based on eligibility. There is a plan to set up a Skill Development Centre to improve the employability of local youth. For development of the local community a budget of Rs. 8.0 Crores per year has been provided under Corporate Social Responsibility. The areas of intervention will be education, health & sanitation, sustainable livelihood and rural infrastructure. We assure you that all the environmental standards will be complied during plant implementation and operation.	-
10	Shri Abdbdreman Jusab Turk, Drub	With respect to the subject mentioned above we would like to state that as part of corporate social	We acknowledge the receipt of your representation and have noted your appreciation to the efforts of	-

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	Village Sarpanch	responsibility in Mundra, the Adani Group has carried out many activities in the field of education, healthcare, infrastructure development, agriculture, animal husbandry and after existence of this company many business and employment opportunities have been generated and due to establishment of proposed Greenfield copper Refinery Project many job and business opportunities will be created. We have no objection if you observe the environment preservation rules and corporate responsibility are observed for the development of our area, we are always with you on this ground.	Adani Group for development of the area. We assure you that we will continue to comply with environmental standards set by state pollution control board/ central pollution control board for proposed copper refinery project. As part of improving employability within local youth, there is a plan to set up a Skill Development Centre through Adani Foundation. Budget of Rs. 8.0 Crores per year has been provided under Corporate Social Responsibilityfor development of the local community through Adani Foundation. The areas of intervention will be education, health & sanitation, sustainable livelihood and rural infrastructure. The project will also provide various business opportunities as mentioned by you. We will be happy to support the same. We thank you for your support and would like to continue our engagement with the community for development of the area.	
11	Siracha Gram Panchayat Village: Siracha Tal. Mundra-Kachchh	With respect to the subject mentioned above we would like to state that there is new Copper refinery Project is going to be established between the village Siracha and Navinal we have no objection if the poor and untrodden people of Siracha and Navinal will be uplifted , if unemployed get employment, agriculture and animal husbandry industry are not damaged but developed, and if the environment is taken care of, and the fodder in adequate quantity supplied to cows and supplied regularly and supplied accordingly to season such as dry or wet fodder if such types of activities are undertaken by the company then we welcome such project.	Refer Sl. No.-10	-
12	Shri Punshi Khetshi Turiya, Gadhavi. Membershri, Taluka Panchayat Mandvi	It may be noted that the various development projects has been implemented in our area with the good cooperation of companies like Adani Foundation situated in our area and still for the employment of	Refer Sl. No.-10	-

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	Kachchh, Post Bhadiya, Tal. Mandvi, Kutch	youth, health facilities for the people, structural primary facilities for public like housing, education, roads and fodder for animals and many matters and you have a lion share for the overall development of this area, we whole heartedly welcome your new project, we hope you will accept our feelings by continuously carrying out developmental activities as you have been doing in the past.		
13	Shri Punshi Khetshi Turiya, Gadhavi. Membershri, Taluka Panchayat Mandvi Kachchh, Post Bhadiya, Tal. Mandvi, Kutch	It may be noted that the various development projects has been implemented in our area with the good cooperation of companies like Adani Ports & SEZ ltd. situated in our area and still for the employment of youth, health facilities for the people, structural primary facilities for public like housing, education, roads and fodder for animals and many matters and you have a lion share for the overall development of this area, we whole heartedly welcome your new project, we hope you will accept our feelings by continuously carrying out developmental activities as you have been doing in the past.	Refer Sl. No.-10	-
14	Shri Valbai Shamji, Sarpanch, Nana Kapaya Juth Gram Panchyat Cluster Villages: Nana Kapaya, Borana Tal. Mundra - Kachchh	It may be noted that the Copper Refinery Project which is going to take place between Siracha and Navinal is beneficial for the local people as far as generation of employment and their development likewise we hope that it will help in development of village and nation and we welcome the Adani Copper Refinery Project.	Refer Sl. No.-10	-
15	Shri Bairajba Lakhubha Jadeja, Sarpanch, Tragadi, mandvi. Kachchh	It may be noted that the Greenfield Copper Refinery Project has been scheduled to come in this area. We welcome the said project on behalf of Tragadi Gram Panchayat and by this project the employment opportunities in this area will be increased and we hope that surrounding area will be developed and we hope that this project will come on priority.	Refer Sl. No.-10	-
16	Shri Atul Pandya, President, Rotary Club Of Mundra, Kutch	It is utmost respectfully said that due to the Copper Refinery Project going to be established by Adani Group in Mundra Taluka, the unemployed youth will get employment and contractors and laborers will get more opportunities to get work and standard of living of the people of the area will rise and from the	Refer Sl. No.-10	-

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		presentation and video watched by us we can say that it is not harmful to agriculture and health of the people and environment. If this project will be established than other projects will also come, by which the people of Mundra will get more opportunities for employment and professional opportunities. On establishment of this industry the people will get more opportunities in their profession and business. And we expecting this plant to be established as soon as possible and people get benefited. We welcome this copper refinery plant.		
17	Shri Karvan-E-Mustafa, Medical and Educational Trust, Near Jama Masjid, Mundra	It may be noted that the social development activities carried out by Adani Group is really praise worthy. By Adani group, education, health and income generation related activities are being undertaken which is very much beneficial and industry houses established by them has increased the business and employment in Mundra Taluka and in the near future the new copper refinery project will increase the business and employment, we welcome such developmental activities.	Refer Sl. No.-10	-
18	Letter from Lions Club Of Mundra, Poonam Arcade, 1st Floor, Baroi Road, Mundra, Kutch	It may be noted that the Adani Group is going to establish copper refinery project by which the people of this Taluka will get employment and laborers will get their labor work which will uplift the standard of living of local people. There is no threat for damage to environment by this project, and many ancillary industrial units will also come with this project which will increase the employment opportunities in villages of our Taluka. Due to the copper refinery project the people will get more business opportunities and we wish that this project will be established as soon as possible and people will get benefited out of this project. We welcome this copper refinery project.	Refer Sl. No.-10	-
19	Shri R.M.Sama, Mystical Corporation, All Type Of Civil Works	It may be noted that the Adani Foundation is doing social development activities in Mundra Taluka very efficiently including educational, health and income	Refer Sl. No.-10	-

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	And Material Supply, Add: 5, Rajiv Complex, Baroi Road, Mundra	generation activities. We hope the same will be continued in future as well. Thanks		
20	K.G.N. Construction, R.C.C. Construction – R.C.C. Alivation Load Bearing, Village Tragadi, Tal. Mandvi, Kutch	We would like to state that the various activities done by Adani Group are useful to the people and the activities undertaken by Adani Foundation are praiseworthy like electricity, water and access road facilities in fishermen settlements as well as education and health facilities are also provided which is going to be very useful to the community and its future generation. We hope that Adani Foundation and Adani Group will do such type of social works continuously. Thank you.	Refer Sl. No.-10	-
21	Shri Daya Ranshi Gadhvi, Civil Contractor And Supplier, Village-Zarpara, Ta. Mundra (Kutch)	On the subject mentioned above we would like to state that after Arrival of Adani Group in this area the level of economic stability has been increased in this area. Opportunity and employment has been provided to the needy people and most of the contracts have been given by Adani Group to the local contractors and we are thankful for this and express our gratitude that in future they will keep up this good work.	Refer Sl. No.-10	-
22	Shri Gadhvi Kalyan, President/ Secretary, Mota Bhadiya Tal. Mandvi – Kachchh	With respect to the subject mentioned above we welcome the copper plant proposed by Adani Port and Special Economic Zone Ltd. by which the employment in surrounding villages will be increased and Business/professional activities will also increase. The surrounding areas will also develop and since the company will develop,the facilities provided by company like education and health will also increase. We hope that company will provide contracts, labor work, development of agriculture, development of animal husbandry, health and education related facilities to surrounding villages. We hope that company will give more attention to agricultural development. We hope that your company will provide much assistance to surrounding agriculture and animal husbandry. We hope that your plant will become more useful to local people, animal rearing	Refer Sl. No.-10	-

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		people, farmers and labor class and also in the development of nation with our collective support.		
23	Mithani Enterprise, Civil Contractor And Manpower Supply	With respect to the subject mentioned above we would like to respectfully state that the social responsibility conducted by Adani Foundation of Adani Group has been very efficient. Adani Foundation is doing many activities like education, health and income generation in our area and due to this the level of education has been improved and many activities are undertaken in the field of health. We are very thankful to Adani Group.	Refer Sl. No.-10	-
24	Shri M. L. Baraiya (Director) Vivekanand Rural Development Institute, N.H.No.8a, Near Jain Ashram, Mandvi, Kutch	With respect to the subject mentioned above, we have experienced in Kachchh that the industry houses as a part of their corporate responsibilities are providing training to rural women and skill development to youth for giving stability to their income generation. In this regard, your industry house is working in a very responsible way. In Kachchh the preservation of environment is also an important thing. You shall be a role model in this field in Kachchh. We welcome your new project proposal. Furthermore we are expecting you to do more and more work in the field of rural development.	Refer Sl. No.-10	-
25	Shri Salim Mamad (President), Ekta Machhimar Seva Vikas Samiti Tragadi Bundar, Gundiyali, Tal. Mandvi, Kutch	On the subject mentioned above Our Ekta Machhimar Seva Samiti whole heartedly welcome your new venture by Adani Port and Special Economic Zone Ltd. for establishing copper refinery plant near Mundra-Mandvi Area. The unemployed persons of the surroundings area will get employment in your plant and we are agreeable for the development of area. We, Ekta Machhimar Seva Vikas Samiti welcome your new venture.	Refer Sl. No.-10	-
26	Shri Dahyabhai Gadhvi, Kandagara, Kutch	It is cordially informed that I, Gadhvi Dahyabhai Virambhai Gadhvi, resi. Mota Kandagara, Wadi Area, Mundra Kutch. I hereby expect your favor that the	We acknowledge the receipt of your representation and have noted your concerns. We assure you that all the environmental safeguards will be put into	All anticipated impacts are identified and mitigation measure for the proposed project is presented in Chapter-4. The EMP budget of Rs.

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		projects established and yet to be established do not take any care of the people from health as well as economic point of view. I hereby oppose the hearing for the plant held here today and aver that this project should not come here at any cost. The health and agriculture whatsoever left in this area will be ruined totally. The agriculture and cattle rearing are affected seriously by dust and polluted air due to establishment of coal based industries. The agriculture production and milk production are reduced to a great extent due it. The air will be polluted due to such industries, The poisonous chemicals such as sulphur dioxide, Hydrogen fluoride, will be mixed in the air and will pollute the air heavily. There is high probability of spreading of disease such as cancer, asthma, T.B., and other disease of lungs and skin, blindness and many other diseases due to air pollution. So, this project endangering health and livelihood should not be established here. There will be water pollution. Lead, chromium, sulphuric acid will be leached to ground water and will come out through irrigation. The cattle rearing and agriculturist class will be affected heavily due to polluted water. It is not possible to use such water for farming. The cultivable land will be affected due to such chemical rich water and consequently cattle rearing will be reduced resulting into reduction in economic activity based on food products based on milk, buttermilk and ghee. So, this project shall not come here. Such projects should be established in the area having no population in surrounding of 50 kilometer. This is residential area within 2-3 kilometer only where thousands of people are living. It is to be specifically noted that the industries	place before operation of the project. There are many such projects in the world, including the developed countries. The apprehensions mentioned by you have never happened at any of the plants. We are confident of operating this plant with all the safeguards to mitigate the pollution. We will also be adopting the latest technology for pollution control. We are herewith responding para wise to the issues raised by you: 1. All measures for mitigating the air & water pollution will be adopted. Impact Assessment has been carried out and the incremental impacts have been superimposed on the baseline data to assess the ground level concentrations after the project is operational. The predicted ground level concentration after the operation of the project will also be within the National Ambient Air Quality Standards and thus not expected to have any long term impact on the surrounding ecosystem. 2. The SO2 gases produced during the process is an input raw material for Sulphuric Acid Plant and will be converted to Sulphuric Acid in the respective plant within the project area. The residual gases from the Sulphuric Acid Plant will be released through Chimney after tail-gas scrubbing. High efficiency gas scrubbers will be installed in Phosphoric Acid plant to scrub Hydrogen Fluoride to produce Hydro Fluro Silicic Acid before releasing the residual gases through the stack. The emissions leaving the various stacks/ vents proposed as part of this project will be meeting the prescribed norms of Central Pollution Control Board (CPCB). Impact Assessment has been carried out and the incremental impacts have been superimposed on the baseline data to assess	1044 Crores is proposed. As part of improving employability within local youth, there is a plan to set up a Skill Development Centre through Adani Foundation. A budget of Rs. 58 Crores for the period of 5 years (From day 1 of the project construction) has been allotted towards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development (drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores The CSR details (like CSR policy, initiatives & activities, CSR budget expenditure data from 2010 to 2016 and CSR implemented photographs) is given in Section-8.5 of Chapter-8 in the EIA Report. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). The water requirement details is given in Section-2.2.3 of Chapter-2. Secured Land Fill (SLF) is proposed over 13.35 ha within the project premises for disposal of ETP waste sludge and spent catalyst. Other Hazardous waste will be disposed through the approved recyclers. The environmental monitoring will be conducted construction and operation phase is given in

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		established here earlier have not at all taken care of the health and employment of the economic scarce local people. The business opportunities are given to only 4-5 selected persons only based on commission. So, we oppose this project.	the ground level concentrations after the project is operational. The predicted ground level concentration after the operation of the project will also be within the National Ambient Air Quality Standards and thus not expected to have any long term impact on the surrounding ecosystem. Details are provided in Chapter 4 of the EIA Report. 3. The project will be implemented with Zero Liquid Discharge. Waste produced from the proposed plant will be stored in Secured Land Fill (SLF) which will be developed over the area of 30 Acres within the proposed project area. SLF will be constructed and operated as per the CPCB guideline for Treatment, Storage & Disposal Facility (TSDF). The SLF, once filled to its capacity will be capped on top and soil cover will be spread and landscaping will be done. Monitoring of environmental parameters will also be carried out. The Environmental Impact Assessment has been carried out and all the environmental parameters will be within the statutory limits. 4. Preference will be given to local people for employment in this project based on eligibility. There is a plan to set up a Skill Development Centre to improve the employability of local youth. For development of the local community a budget of Rs. 8.0 Crores per year has been provided under Corporate Social Responsibility. The areas of intervention will be education, health & sanitation, sustainable livelihood and rural infrastructure.	Chapter-6.
27	Shri Ashariya Lakha Gelva, Kapuriya Wadi, Village: Zarpara, Mundra Kutch	1. It is cordially informed that there are flowing streams of water falling within the project area of Greenfield copper refinery project area, which will be closed. So, it is requested not to give permission to this project.	1. Dhaneshwari, a seasonal river flows in the western part of the proposed site. The flow of the river will be maintained, as shown in the Plant Layout on Page C2-3 of EIA Report. No streams will be closed or blocked by the project.	1. The Dhaneshwari river will not be diverted but suitably trained along the boundary. The flow of the river will be maintained, as shown in the Plant Layout on Figure-2.1 of EIA Report

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		2. There is environment area in surrounding of this project. There is a Bharadima dune on the south of this project. There are various types of vegetation in it. It is a stay for animals and birds. There is Siracha forest on the west of the project site. There are birds and animals in it. It is requested not to give permission to this project as the project will adversely impact the environment heavily.	2. Flora and fauna study has been conducted as a part of EIA and management plan is also provided in the EIA report. All the conditions of Forest Clearance, once obtained, will be complied to mitigate the impact due to diversion of the forest land. The forest diversion can be recommended by the State Government after completing all the procedures and granted by MoEF&CC.	2. The baseline ecological study conducted and details are given in Section-3.9 of Chapter-3. The ecological anticipated impacts are identified and mitigation measure for the proposed project is presented in Section-4.1.6 (construction phase) & 4.2.7 (operation phase) of Chapter-4 in the EIA report.
		3. The agriculture in surrounding of the project will be affected. There are already existing industries like power plants. Horticulture is heavily impacted due to that. The fertile agriculture such as dates, chickoo, pomegranate, coconut is damaged. The damage will be increased due to this project. So, it is requested not to give permission to this project.	3. All measures for mitigating the air & water pollution will be adopted. Impact Assessment has been carried out and the incremental impacts have been superimposed on the baseline data to assess the ground level concentrations after the project is operational. The predicted ground level concentration after the operation of the project will also be within the National Ambient Air Quality Standards and thus not expected to have any long term impact on the surrounding ecosystem.	3. The EMP budget of Rs. 1044 Crores is proposed. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). The water requirement details is given in Section-2.2.3 of Chapter-2. Secured Land Fill (SLF) is proposed over 13.35 ha within the project premises for disposal of ETP waste sludge and spent catalyst. Other Hazardous waste will be disposed through the approved recyclers. The anticipated impacts on air quality and mitigation measure to control pollution during construction and operation phase are provided in Section-4.1.3 and 4.2.2 of Chapter-4 in the
		4. There will be increase in temperature due to copper refinery and it will cause damage to the livestock and environment. The temperature increases every year and temperature will increase further due to this project. So, it is requested not to give permission to this project.	4. The project is estimated to emit 0.53 Million Tons of CO2 equivalent of GHG per year from proposed project which is insignificant in the context of Local or Global Warming. Heat available from the plant process will be converted to produce power with the waste heat recovery boiler as well as hot water for plant process requirements.	4. Refer the above point no.-3.
		5. There are villages such as Shiracha, Navinal, Kandagara, Zarpara, Dhrub etc. in surrounding of this project. So, the mankind in the area will be terribly impacted due to pollution. So, it is requested not to give permission to this project.	5. All measures for mitigating the air & water pollution will be adopted. Impact Assessment has been carried out and the incremental impacts have been superimposed on the baseline data to assess the ground level	5. The environmental monitoring will be conducted during construction and operation phase is given in Chapter-6. The baseline monitoring was conducted in 8 locations as part of EIA studies. The monitoring

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			concentrations after the project is operational. The predicted ground level concentration after the operation of the project will also be within the National Ambient Air Quality Standards and thus not expected to have any long term impact on the surrounding ecosystem.	conducted in different location (like industrial, commercial and residential areas) within the 10 km of study area. Refer the above point no.-3.
28	Shri Girish D. Nagda (C.E.O), Bhagwan Mahavir Pashu Raksha Kendra, Pragpur Road Junction, Tal. Mundra 370415, Kutch, Gujarat	The Indian ARYA public is spending their lives on the life cycle of DHARMA – ARTHA – KARM - MOKSHA but development is necessary according to time. In Mundra Taluka of Kachchh District the local public has got a golden opportunity for earning income after entry of Adani Group. The people are witness to the improved facilities in the employment, education, health etc. like routine life necessities due to fine arrangements done by Adani Group. We must accept where there is development; we must support the promoters. One Greenfield copper Refinery Project is proposed in A.P.S.E.Z. by Adani Group, the above mentioned organization does many inspirational work of humanity and environmental preservation. When this organization is doing the project work as per rules it is most welcome and we will support the same.	We acknowledge the receipt of your representation and have noted your appreciation to the efforts of Adani Group for development of the area. We assure you that we will continue to comply with environmental standards set by state pollution control board/ central pollution control board for proposed copper refinery project. As part of improving employability within local youth, there is a plan to set up a Skill Development Centre through Adani Foundation. Budget of Rs. 8.0 Crores per year has been provided under Corporate Social Responsibilityfor development of the local community through Adani Foundation. The areas of intervention will be education, health & sanitation, sustainable livelihood and rural infrastructure. We thank you for your support and would like to continue our engagement with the community for development of the area.	-
29	Shri Naran B. Gaghavi, (President), Keti Vikas Seva Trust, Village Zarpara, Tal: Mundra, Dist- Kutch.	Mundra taluka was rich in its unique environment and biodiversity. Fishermen, farmers and cattel herders would run their business and occupation here. But the adani company has ruined huge paches of mangroves forest that existed here. The mangroves forest was a kind of blessing for the people of the surrounding area as in times of famine. Cattle and camels would survive on mangroves during advers times. Fishermen and local community used mangroves wood to build their small houses, ships and other implements. Fish breeding would take place in mangrove trunks. Mangroves would save the surrounding area from being flooded, tsunami or	1. Information related to mangroves is given in sub-clause of environmental sensitivity which is part of Form-1. Proposed project area is devoid of mangroves. There is no question of mangrove destruction. 2. Impact Assessment has been carried out covering 10 km area surrounding the project site and it includes water bodies (if any), local residents and villages. There is no proposal of closing any creeks. 3. There are no sand dunes in the proposed	As primary survey of EIA studies, the prosed project site outside the CRZ area, there is no reclamation of mudflats and mangroves. There is no sand dunes in the project site. The proposed project is with the state of art environment friendly technology. The Anticipated impacts during construction and operation phase is provided for proposed project. There will not be any significant adverse impact on the health of the people. The proposed project will be implemented with all

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		earthquake, and acted as a natural protecting wall. Such useful mangroves forest has been destroyed in order to build Mudra Port and SEZ. The surrounding area has been severely affected. In case the M/s. Adani Enterprise Limited has the proposed Greenfild Copper Refinery Project if allowed, even the remaining patches of mangroves forest will be dangerously Impacted. The company has deliberately not mentioned anything about the mangroves forest and the probable impact on it in its Environmental Impact Assessment Report (EIA Report) prepared for the Greenfild Copper Refinery Project. The EIA Notification 2006 has been violated. The marine and ecology of the area have not been studied. **Filling up of Creeks:** The creeks of mundra were filled by up by MPSEZ in order to reclaim land. Which has been cited in the report of the Sunita Narain Committee of Ministry of Environment forest and climate change (MOEF&CC) Government of India. It has brought harmful impact of the surrounding area. The Adani SEZ has filled uo Koyla vadi creek, Navinal Creek, Dhaja vadi creek, Bhradimata creek, Sonaper vadi creek, the creek near old port, kotadi creek land kotadi creek. These were all natural creeks and the fishermen of the surrounding 15 villages used thses creeks as a path to enter into the sea, Va liable fish catches were available in these creeks. The area was full of mangroves. The EIA has not mentioned what would be the impact on these creeks due to Copper Refinery Project? **Demolition of Sand Dunes:** In the coastal area of Mundra there were sand dunes as high as 40 to 60 meters. High quality frss would grow on thes sand dunes. Cattel herders of the area	project site. Hence, there is no question of demolition of sand dunes. 4. No fishermen will be impacted due to proposed project and will have no impact on fisheries. Project will be implemented with all the environmental safeguards. EMP is provided in Chapter-9 of the EIA report. Rs 1044 Crores has been budgeted towards the pollution control systems. 5. Project will be implemented with all the environmental safeguards. There is no proposal of using groundwater for the proposed project. Water requirement for the proposed project will be supplied through desalination plant of APSEZ. The impacts due to proposed Copper project have been superimposed on the baseline data to show the cumulative impacts. The predicted impacts after operation of the project are found to be within the prescribed standards for Air and Water and hence not expected to have any significant impact on health, agriculture and animal husbandry. Details are available in Chapter 4 of the EIA Report. 6. Budget of Rs. 8.0 Crores per year has been provided under Corporate Social Responsibility for development of the local community through Adani Foundation. The areas of intervention will be education, health & sanitation, sustainable livelihood and rural infrastructure. 7. Proposed project will directly source the copper concentrate from outside which will be transported through state of art pipe conveying method. Thus, the process in this plant will directly start from smelting and will not involve mining, commination operation,	environmental safeguards. EMP is provided in Chapter-9 of the EIA report. Rs 1044 Crores has been budgeted towards the pollution control systems. The proposed project is with the state of art environment friendly technology. A budget of Rs. 58 Crores for the period of 5 years (From day 1 of the project construction) has been allotted towards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development (drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores The CSR details (like CSR policy, initiatives & activities, CSR budget expenditure data from 2010 to 2016 and CSR implemented photographs) is given in Section-8.5 of Chapter-8 in the EIA Report During construction phase of the project, this project will provide temporary employment to many unskilled and semi-skilled laborers in nearby villages. During operational phase, considerable number of people will be benefited by provision of various services, such as transportation, technical services, skilled & semi-skilled services and indirectly it will flourish various business activities.

		used to graze their cattel in this grass land for six to eight months. The land on which the company wants to build the Copper Refinery contained high grass land and forestry land. These have been demolished by the Adani Company. Such sand dunes would help against natural calamities. The Copper Refinery project may lead to further destruction of sand dunes, accelerating the danger of natural calamity, severely damaging the environment as also human and animal population of the area. Nothing has been mentioned in the EAI report about this. **Impact on fishermen community:** The Importance of Mundra taluka for fishing community and their village is next only to the jakhau fisheries Port. The sea shore along the taluka was used by fishermen from Mandvi and Gandhidham for fishing. Fishermen would get huge quantity of fish here, but due to the activities of the Adani Port &SEZ and Adani Power, the fisheries business has been severely affected. The fisheries production has decreased considerably. Due to this, major challenges have risen in front of the fishing community regarding their livelihood and economy of the area. With the Adani Copper Refinery Project, the area will be further adversely affected. Fishery activity will come to an end due to chemicals and poisonous, materials released from the Copper Refinery. This will create crisis for human being. **Impact on Agriculture and Horticulture:** The land between Mundra and Mandviis rich in horticultural crops and green farms. The stretch is known as its greenbelt, including rich green farms. Water of this area is sweeter than any other part of kutch. The crop of dry dates is found only here in the entire India. This area has remained a green field due to dry date crop. But after 2005, due to the activities of Adani Port &SEZ and Adani Power, the dry date	floatation, etc. Project will be implemented with all environmental safeguards. EMP is provided in Chapter-9 of the EIA report. Rs 1044 Crores has been budgeted towards the pollution control systems. The proposed project is based on Zero liquid discharge system and hence there will be no discharge of any effluent outside the proposed project boundary. We assure you that all the environmental safeguards will be provided during implementation and operation of the project.	The fishermen details are given in Section-3.10.6.1 and Annexure-XII of Chapter-3 in the EIA report.

		crop has been affected. The ash form the Adani Power Plant spreads over farms of dry dates which spoil fruits, and the raw fruits fall without becoming ripe. More, the dry dates are not as sweet as they used to be earlier. This has adversely affected the livelihood of those who lived on agriculture. The saline water of the ocean now invades the land, contamination sweet water, adversely affecting ground water. Agriculture cannot be done in saline water. Thus, the area is already facing problems, and if the Copper Refinery Is built here, the entire area will be further impacted. The rich farms and agriculture will be destroyed, and this will trouble the farmer's community. **Impact on Animal Husbandry:** In the whole of India, only kutch is the only district where animal population is more than human population. Mundra taluka has been a leader in animal husbandry and related business. Sweet water, vast gaucher land, forest,etc. which are requirement for animal husbandry, are found here. The business of milk and items made from milk flourished in this area. But as the Adani Group has acquired most of the gauchar land and government waste land, no land is left for cattle breeders and animal husbandry, Milk amd milk production has decreased. Cattle breeders have lost their economy. Above and above this Adani Port &SEZ and Adani Power has acquired gauchar land of 10 village from the government of Gujarat. The details have been given In the table below: **Sources of Pollution in Copper Industry:** Copper industries is a mineral based industry. Copper bearing materials in the form of oxides or sulphides occur below the earth surface. The copper mineral is		

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		axtracted by various methods of mining. During mining large quantity of waste materials are generated. After the ore is taken out, it is crushed and milled. In crushing and grinding enormous amounts of dusts are generated. The ground ore is subjected to flotation for separation of copper rich mineral known as concentrate is then smelted in smelter to produce blister copper. The copper so produced is impure and is called anode copper. Copper production all of them contribute as sources of pollution in the copper industry. Thus the main sources of pollution in copper industries are (i) mining (2) comminution operation, (3) flotation, (4) roasting and smelting, (5) fire refining and electro refining stages, (6) sulphuric acid plant and (7) water treatment plants etc. So we are request to you and MoEF&CC New Delhi government of India cancelation of Adanis TOR and not given environment clearance.		
30	Shri Mahesh Pandya, Paryavaran Mitra, 502, Raj Avenue, Bhaikaka Nagar Road, Nr. Thaltej Cross Road, Thaltej, Ahmedabad	Refer Sr.no 3	Refer Sr.no 3	Refer Sr.no 3
31	Shri Ibrahim Abdulkar Turk, Jamadarwadi, Post Dhrab Ta Mundra Dist, Kutch	As local journalist I welcome the project of the proposed copper refinery project would produce 10 LTPA of copper cathode; 5 LTPA of copper rod; 30 LTPA of sulphuric acid; 5 LTPA of phosphoric acid (as 100% P205); 30.000 TPA of aluminum fluoride, 288 TPA of selenium, 50 TPA of gold; 500 TPA of silver etc with the state of art environment friendly technology in Kutch district. The huge development will be based on sustainable development principal and not with devastation of ecology and environment. The precautionary principle applies to the project and on this principal I would like to prevent possible huge pollution. I humbly request MOEFCC and Project proponent Adani Enterprise Ltd to kindly consider the below discussed queries for the abatement of pollution.		

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		There is need to modify some of the points/subject matter shown in draft Environmental Impact Assessment report and respective changes should be there in the EMP to achieve the aims and objective of the sustainable development of the region along with business interest. Suggestions 1.....The EIA report says *1.2.4 ... Location of the Project " The proposed project site is located in Siracha and Navinal villages at APSEZ Mundra taluka, Kutch district in the state of Gujarat. The total area earmarked for the proposed project is 256.58 ha (634 acres), in which 381 acres (154.18 ha) of land belongs to* APSEZ *area and 102,38 ha (253 acres) of land belongs to forest area for promoting industrial development.* The question arises here is that when the proposed forest land which is yet not cleared by the MOEFCC stage I or Stage II and pending for consideration how proponent can ask EC over the land??? Es MOEFCC not obeying the own OM? We demand that, the forest land must not be converted as the SEZ has more land available for this project. Why the Adani Enterprise Ltd is asking the Reserve Forest??? We demand detail investigation of the balance land available in SEZ or private land availability in the vicinity. The RF should not be disturbed at all. We demand from proponent that they must have sustainable solution for land availability than the diversion of Reserve forest of 102.38 hector. The entire coastline is going to be industrialised in next few years and there will be no green cover in the semi arid zone. The present forest has the trees and shrubs so it must not be disturbed when the project is going to increase the Sox and other air pollutants in larger quantity. I suggest the project authorities to shift the project if possible at deep in northern side of coast line where the unfertilized land available in huge quantity. *The image on EIA Page C3-16 is showing the project site is in the Shiracha Reserve Forest and Danderi*	1. Alternate site analysis was carried out. The alternate sites have been discussed in detail during the Terms of reference meeting and shortlisted site for the proposed project has been accepted by the Honorable EAC committee of MoEF&CC, New Delhi. Details on alternative site analysis are provided in the Chapter – 5 of the EIA report. Site is selected on the basis of suitability from number of factors. Project area includes forest land also for which APSEZ has applied for Forest clearance and same is under process. As a process, State Government gives recommendation for diversion of forest land after completing all procedures and central government is granting the clearance. As per OM of MoEF&CC, after making an application for forest land project proponent can apply for obtaining ToR for the proposed project and proceed with the procedures as per EIA notification 2006 and subsequent amendments. Same is complied fully.	1. The comparison of salient features of alternative sites done and details are presented in Table-5.1 and is shown in Figure-5.1 of Chapter-5 in the EIA report.

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		Reserve Forest. So the project site should be out of this two RE. The Annexure-4 land allotment letter is meaningless if the SEZ president is not clear about the land to be given to this project. The letter is not showing clear piece of land with area and its possession with the SEZ authority it is talking about planning. This issue should be addressed by the AEL authority before taking EC. If The land belong to the government and SEZ does not own it at present than how it can assure the land transfer to AEL.		
		2.The diversion of forest land wide file number is 8-04/2016-FC has taken valid consent from gram or not? Under Forest Right Act 2006 settlement of rights of local grazers and people are settled or not? I suggest not to divert the forest land but in any circumstances 5 times more land should be developed as forest in 25 kms of the project site with state forest department. MOEFCC should force the company to develop forest in this 25 kms radius only to balance the forest cover.	2. As a process, State Government gives recommendation for diversion of forest land after completing all procedures and central government is granting the clearance. Compliance will be done as per forest clearance and Compensatory afforestation for the forest land will be done as per established procedure.	2. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only after getting all required statutory clearance from concern department.
		3.Provide the date of the issuance of the CRZ map by NI() to AEL.	3. Proposed project layout is superimposed on CRZ map of the area prepared by authorized agency of MOEF&CC as per CRZ notification 2011 and same is provided in Chapter-1 of the EIA report. CRZ map is prepared by NCESS in June 2011.	3. The prosed project is a Greenfield project and which is outside of the CRZ. The CRZ map is shown in Figure-1.5 of Chapter-1 in the EIA report.
		4.Provide the factual details on the distance of various streams/rivers/coast/creek. The EIA report has shown the point 14 in Form 1 (which shown below). The distances of the natural river/creek/estuary/water body needs to be corrected. As per my knowledge the information is given by mistake and I request to verify the same and introduce the fact in Final EIA report also provide the copy to me. • Streams/Rivers Kotri creek (0.5 km, 5) • Khari Nadi (1.9 km, W) • Gulf of Kachchh (3.9 km, S)	4. The details provided with respect to distance of various streams/rivers/coasts/creeks in Form-1 and EIA report are factual in nature. We will again verify the details and same will be reported in the final EIA report.	4. There is no change in data and all data which is provided in EIA report is relevant.

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		• Nagavanti Nadi (4.7 km, E) • Phot Nadi (8.7 km, ENE) 5. Please provide the details of TSDF as described in the project for Hazardous waste disposal. There is no design shown in EIA report for TSDF site. i. No technical details regarding the TSDF site shown. ii. No Cell details and its capacity defined and no closer plan shown, iii. No details regarding the waste characterisation shown. iv. No details regarding heavy metal encapsulation shown which is to be disposed off in to TSDF, v. The compliance of the Hazardous and Other Waste (Management and Trans boundary Movement) rules 2016 for the smelter base waste not shown. vi. This project component must be shown differently in the said area of 12.14 Hectors. SLF cell is shown just adjacent to the public road which is not suitable. vii. The criteria for site selection is not studied and followed as defined by MOEFCC/CPCB. viii. The ground water geology, hydrology and contour maps of the area are not studied. ix. The flow pattern of ground water is not studied. x. The ground water table is not studied. (only 2-5 meter as shown on page C3-10) How TSDF is possible in such type of ground water area. So this component is illegally inserted in the Draft EIA report as per my belief. The Form I do not have such details and the TOR also, The site specific TOR should be given for such kind of huge 12 hector secure land fill site for disposal of the highly toxic heavy metal baring waste which needs stabilization first. In absence of the waste characterisation the	5. SLF will be constructed and operated as per the CPCB guidelines for treatment, storage and disposal facility (TSDF). All required approvals will be taken from concerned authorities. The SLF, once filled to its capacity will be capped on top and soil cover will be spread and landscaping will be done. This was disclosed in Form-1; Aspects related to ground water has been studied and relevant information has been provided. Regular monitoring will be carried out as per Environment monitoring programme. Further detailing is part of detail engineering. The proposed project is outside CRZ area.	5. Hazardous cake and scrubber cake will be stabilized and stored in secured land fill as per guidelines of MoEFCC/ CPCB/ GPCB. An area of around 12.95 ha is identified and allocated. For the initial years of copper refinery plant operation till sustained utilization/management of copper slag and phosphogypsum; in the above application areas are developed, as well as for emergency purpose, copper slag storage area and gypsum storage of around 105 acres would be identified and made available for intermediate/emergency storage of the same. Provision would be made to reclaim the disposed copper slag and phosphogypsum from gypsum storage at a later stage for various utilization ventures. The solid waste generation, waste characterisation and mode of disposal is given in Section-2.4.3 of Chapter-2

		secured LF/TSDF for the hazardous heavy metal baring waste could not be the part of this copper smelter. This component should be taken EC separately along with the phosphogypsum and copper slag storage yard. This plant is very near to coastal area also. Keeping in mind the coastal hazard this site should be out of the coastal zone. I demand the MOEFCC EAC to look in to the matter and ask the proponent to obtain fresh EC as separate project with proper EMP and EIA report or dispose the toxic metal baring waste of Cr, Cd, Ni, As, Pb, and some types of active radioactive metals in common TSDF available. The MOEFCC and CPCB always ask for common disposal of Hazardous waste in country. Gujarat has more than 20 Captive TSDF sites and there are problems started in it. Such kind of captive landfill site will not be sustainable for future.		
		6. The copper slag and phosphogypsurn reuse plan is not shown in the EIA report. There will be mountains of the two type of waste if not disposed or used properly. There are problems of this waste having some hazardous characteristics due to traces of heavy metals. The haphazard disposal of these two waste can be hazardous for the environment if disposed without assessing the toxic nature of metals. As all over India all the copper smelter are facing critical problems of disposal. I request the AEL to make a plan for Zero Dump of these two types of waste at site. There should be detailed utilization plan from day 1st and according to plan it should be immediately used. MOEFCC should not permit the proposed dumping in open to avoid the mountains of these two types of waste near the Kutch coast.	6. Details on production quantity of copper slag and phosphogypsum are provided in the EIA report. The uses of copper slag and phosphogypsum are also mentioned in the EIA report. Both the materials will be handled with all precautions as they are valuable raw materials for several applications.	6. Refer the above point.no-5.
		7. The premise of this project has the gypsum storage. Please provide the details on gypsum	7. Gypsum storage area will be constructed as per the "Guidelines for Management, Handling,	7. The process description is given in Section-2.3 of Chapter-2. The impacts and

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		storage and its liner system to avoid leaching in to ground water and coastal sandy soil of the project site. The site is reclaimed with soil where the gypsum storage is proposed and it is located near the CRZ area. This pond can lead ground water pollution. Detailed engineering of the pond should be given to MOEFCC in final EIA report along with its handling mechanism, We demand to shift the gypsum storage to northern portion of the project where the soil is stable and having some more load baring capacity than the sandy part.	Utilisation and Disposal of Phosphogypsum Generated from Phosphoric Acid Plants" published by CPCB and which is available online at: http://cpcb.nic.in/wast/hazardouswast/GuidelinefforM,H,Utili&%20DisposalofPhosphogypsumfromPAPlants.pdf. Compliance will be done as per permissions granted from statutory authorities. There will not be any impact on soil and ground water due to operation of gypsum storage area.	mitigation on solid waste management is given in Section-4.2.5 of Chapter-4 in the EIA report.
		8. The project will have the water from Mundra Utility Pvt Ltd (MUPL). The water allocation letter is enclosed as Annexure-VII. What will be balance capacity of MUPL after allocating the 32.8 MLD. What will be source of water of MUPL.	8. MUPL will be supplying water for the proposed project from its approved desalination plant capacity. Approved capacity is 300 MLD.	8. The water requirement for proposed project meet from approved 300 MLD capacity desalination plant of MUPL.
		9. The ETP will have 1.2 MLD of water but where will be the treated water go? Please provide the justification of the water balance diagram shown on page C2-5.	9. The proposed project is based on Zero Liquid Discharge (ZLD) system. Preliminary water balance diagram is given in figure-2.2 of the EIA report. The treated water from ETP will be further treated into the RO plant. The purified water from the RO plant will be reused in the proposed project and rejects will be sent to multi-effect evaporator to achieve zero discharge. There is no discharge of any treated water into the sea.	9. The treated water will be reuse in process and for horticulture. The detail water balance for proposed project is shown in Figure-2.2 of Chapter-2 in the EIA report.
		10. Approximately 3 LTPA copper scrap and electronic scrap is also used as input to proposed copper smelting plant and copper scrap melting facility. Will all the 3 LPTA copper waste imported by AEL? Is such e-waste import or scrap permitted to refine in India? Provide the details from where such huge copper waste will be procured for this proposed plant.	10. Copper scrap and E-scrap will be sourced domestically as well as from import market based on availability. All the applicable rules and regulations will be complied with.	10. The detail will be provide in detail engineering.
		11. Is the technology selection process based on the	11. Environment friendly technology will be	11. The project description details is given in

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		environmental friendly technology with special consideration of semiarid atmosphere? The EIA has shown the Outotec Mercury Removal Process with selection of chloride scrubber Please provide the technological justification of the selection of technology with considering the temperature and humidity of the Kutch region. Will this project manufacture high purity metallic mercury at the site?	selected and pollution control measures will be implemented to achieve emissions as per the prescribed standards by CPCB. EMP is provided in Chapter-9 of the EIA report. Rs 1044 Crores has been budgeted towards the pollution control systems. The list of products manufactured from the proposed project facility is mentioned in Chapter-1 of the EIA report.	Section-2.3 of Chapter-2 in the EIA report.
		12. What will be level of radioactivity in the copper slag and other metal waste? EIA does not have touched up the issue. Please provide the details with proper justification.	12. EIA has been conducted as per the TOR granted by MoEF&CC and all conditions of the same have been complied with. Project will be implemented in line with the permissions granted and all the conditions will be complied as per permissions.	12. The detail will be provide in detail engineering.
		13. What will be the pollution load of water/ electrolyte / hazardous waste from the Kaldo Furnace and PMR Plant? There are no word written on it and no details are given in EMP. Please provide the information. What will be done of the solvent used in it will it be recycled or disposed off.	13. Effluent from PMR plant will be treated in the state of art ETP as shown in Chapter-2 of the EIA report. The waste generated from Kaldo furnace will be recycled in the proposed plant.	13. The preliminary composition of the waste generated such as scrubber cake and ETP cake details are given in Table-2.10 & 2.11 of Chapter-2 in the EIA report.
		14. Table 2.6 exhibit the emission of the all vents from the whole smelter and allied plants. The SO_2 will be from H_2SO_4 Plant will be 3 Lac NM^3/Hr which will be 1 Kg/Ton H_2SO_4 produced. Is it not the huge quantity of SO_2? Is the coastal region have that much capacity to take the load of SO_2 in 25-30 kms area in ambient environmental situation? Can the AEL reduce the emission of SO_2 below 0.75 kg or more less / ton of H_2SO_4? I sincerely request the AEL management to reduce SO_2 emission from the H_2SO_4 plant. This is the critical gas which can deteriorate the health of people and animals and affect the environment seriously. I suggest MOEFCC to give the condition of 0.75 kg	14. The SO_2 gases produced during the process is an input raw material for Sulphuric Acid Plant and will be converted to Sulphuric Acid in the respective plant within the project area. The residual gases from the Sulphuric Acid Plant will be released through Chimney after tail-gas scrubbing, meeting the prescribed norms of Central Pollution Control Board (CPCB). Impact Assessment has been carried out and the incremental impacts have been superimposed on the baseline data to assess the ground level concentrations after the project is operational. The predicted ground level concentration after the operation of the project will also be within the National Ambient Air Quality Standards and thus not expected to have any long term impact	14. The sources of pollution from the proposed project activities is given in Section-2.4 of Chapter-2 and Impacts & its mitigation measures are given in Chapter-4 in the EIA report.

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		emission/ton of $H2SO_4$ produced. The SO_2 Level in ambient air is ranging between 20-35 micro-gram/m^3. After the proposed smelter it may cross the ambient air quality limit. So I am suggesting for decrease of SO_2 emission at the time of planning,	on the surrounding ecosystem. Details are provided in Chapter 4 of the EIA Report.	
		15. I suggest assessing the cumulative emission from all stakes shown in the EIA report for SO_2. The dispersion modelling should be carried out on the cumulative emission study. I believe that the cumulative study will show shocking result and the stake height can go above 150 -180 meters. The MOEFCC should increase the height of stake of Main Stack Secondary Gas Scrubber-18z II (Bi flue) Sr. no 10 and of H_2SO_4 no 12. The southern portion of the project site shows the presence of mangrove and it is inter tidal zone falling under CRZ 1A as per the CRZ map attached in EIA report. The southern portion is reclaimed land with sand. So I suggest that AEL should restore the mangrove in 1000 hector in Gujarat coastline to protect the coastal environment and balance the nature.	15. The impact analysis has been carried out for the proposed project as per TOR granted by MoEF&CC in which baseline conditions are monitored and prediction of impacts has been carried out with respect to proposed project activity. The details have been provided in Chapter-4 of the EIA report. Proposed project is outside CRZ area and there will not be any impact on marine ecology.	15. The air quality modelling with incremental and cumulative is given in Section-4.2.2 of Chapter-4 in the EIA report.
		16. The air quality sampling point is carried out at 5 points between 0-5 kips of project site. There are only 3 location selected between 5 to 10 krns why? To complete the air quality monitoring as per procedure I suggest to carryout air quality analysis at new 5 points between 5 to 10 lams radius of study area and the data should be submitted in final EIA. Necessary changes in air modelling should also be done to minimise the impact of air pollution.	16. Air quality monitoring is done based on ToR granted and is as per CPCB and MoEF&CC guidelines. Details are provided in the EIA report.	16. Refer the above point no.-15.
		17. Please provide the air pollutants dispersion modelling based on sensitive receptors like habitat, village etc which is not done in draft	17. Impact Assessment has been carried out and the incremental impacts have been superimposed on the baseline data to assess	17. Refer the above point no.-15.

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		HA report and is asked under TOR 10 (i) point	the ground level concentrations after the project is operational. The predicted ground level concentration after the operation of the project will also be within the National Ambient Air Quality Standards and thus not expected to have any long term impact on the surrounding ecosystem. Details are provided in Chapter 4 of the EIA Report.	
		18. I suggest online stake monitoring system for all major stakes emitting SO_2, with showing cumulative emission data online at main gate. There should be display board showing the parameters with permissible limits.	18. Standards laid down by CPCB and SPCB will be complied.	18. AEL will complied
		19. Figure-9.1 page C9-6 EIA report has shown the organisational structure of Environment Management Cell. Excluding 5 safety engineer there are only 8 person staff shown which i feel highly inadequate to handle the most important pollution control system and manage the environment. I suggest there should be more Environmental Scientist, Chemist and Engineer needed for the pollution control components of such kind of big smelter. The environmental cell should have employee strength of 25 or more.	19. Proposed Environment management cell is as per requirements. Apart from the employees in environment management cell, line managers in Operations & Maintenance will also be well trained for environment protection.	19. The budget allotted for environmental protection will be about Rs. 1044 Crores, out of which for Air pollution control systems is Rs. 639 Crores, Water pollution control system is Rs. 360 Crores and other environmental management systems (like solid waste, greenbelt, post project monitoring, gas collection and energy conservation) is Rs. 45 crores and wildlife conservation and mangrove conservation paln is Rs. 4.44 crores. The EMP budget is given in Table-6.4 of Chapter-6.
		20. Adani group is working in the region having ports, power plants and SEZ from 2008. The female literacy rate in the study area of 10 KMS is only 23.58% which is highly unacceptable. I suggest the company should share and increase its CSR budget towards female literacy in the area.	20. Budget of Rs. 8.0 Crores per year has been provided under Corporate Social Responsibility for development of the local community through Adani Foundation. The areas of intervention will be education, health & sanitation, sustainable livelihood and rural infrastructure.	20. A budget of Rs. 58 Crores for the period of 5 years (From day 1 of the project construction) has been allotted toards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores

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				• Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development (drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores The CSR details (like CSR policy, initiatives & activities, CSR budget expenditure data from 2010 to 2016 and CSR implemented photographs) is given in Section-8.5 of Chapter-8 in the EIA Report
		21. I also suggest the utilization of 3% of the project cost not the profit share for the benefits of the local people and their health from the date of the start of project. MOEFCC has in past given these conditions to various high pollution potential projects.	21. Reply is as per point no. 20 above	21. Refer the above point no.20.
		22. As per TOR point IV no plan regarding Arsenic baring sludge is submitted in draft EIA report. Please provide the report for arsenic and mercury baring sludge. I suggest to provide a detailed plan of haz waste disposal in proper way with detailed information,	22. Arsenic bearing sludge will be stabilized and stored in the secured land fill (SLF). Mercury will be recovered as Calomel as well as mercury metal and will be sold in the market. SLF will be constructed and operated as per the CPCB guidelines for treatment, storage and disposal facility (TSDF). The SLF, once filled to its capacity will be capped on top and soil cover will be spread and landscaping will be done.	22. Refer the above point no.5.
		23. As per Model TOR the point no x is not complied with. There are no data shown for the flood and river discharge near by the Greenfield project. I request to provide the same from governmental department in final EIA report along with mitigation measures if any.	23. Profile of the area has been provided in the EIA report. Suitable information will be obtained from Government authorities and if available same will be incorporated in the final EIA report.	23. Dhaneshwari, a seasonal river flows in the western part of the proposed site. The flow of the river will be maintained, as shown in the Plant Layout is shown in Figure-2.1. The river steam will not be disturbed.
		24. How the zero discharge status will be achieved by	24. Reply is as per point no. 9 above.	24. Refer the above point no.9

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		this plant is not shown in water table diagram and in draft EIA report. Please furnish details of all the components of ETP and stage wise pollution reduction to achieve the zero discharge status in final EIA.		
		25. I suggest during construction phase a 2 Nos of high capacity truck mounted dust collector should be used round o clock for controlling dusting in the construction area and introduction of coal tar temporary roads in the whole construction area.	25. Good housekeeping will be maintained in the plant premises; road sweeping machine will be used to clean roads.	25. Anticipated impacts and mitigations during operation phase is given in Section-4.1 & 4.2 of Chaper-4 in the EIA report.
		26. As per the map submitted in draft EIA there is no 33% area left for the plantation. So from where the land will be taken for this 33 % plantation area? Please provide the breakup of the land.	26. The break-up of land has been provided in the PFR. However, the same will be included as a part of final EIA report. 33% of the project area is proposed for green belt.	26. The greenbelt development design and recommended species details are provided in Section-4.3 of Chapter-4 in the EIA report.
		27. On Model Tor point 9- CEP..,Point No -- iii- iv no answer is given in ETA report. I suggest that any violation or any environmental issue the highest authorities should be informed and they should address the problem/grievance/violation with spirit. These grievance redressal mechanism and details must be shared with public also in any such issue and publish on web site.	27. Project will be implemented in line with the permissions granted and same will be complied fully.	27. The construction will starts after getting all required statutory clearance from concern department.
		28. If share holders and board of directors are not aware about the issues/problems of pollution then the management will not work effectively. I suggest that the environmental issues/problems should be addressed in the grievance redressal mechanism and it should be online in local language on web site of proponent.	28. Our reply same as per point 27 above.	28. AEL will compile
		29. I suggest online complaint redressal mechanism for greater transparency and accountability of pollution control facilities in such huge industry like this. I demand that company should initiate the online complaint redressal mechanism and display all the respective answers of company to avoid	29. Our reply same as per point 27 above. We assure you that all the environmental safeguards will be provided during implementation	29. AEL will compile

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		misunderstanding and confusion among the citizens/environmental groups/media. The *MOEFCC should give the condition in Environmental Clearance for this demand.* This move will lead smooth industrial development of the area avoiding litigations in court and public protest.	and operation of the project.	
32	Shri Debi Goenka, (Executive Trustee), Conservation Action Trust, 5 Sahakar Bhavan, 1st Floor Lbs Marg, Narayan Nagar, Ghatkopar (West) Mumbai	Refer Sr.No 7	Refer Sr.No 7	Refer Sr.No 7
33	Shri Chauhan Pravinsinh Bhurubha, Village: Siraya, Tal. Mundra, Dis. Kutch	1. What kind of forest area is 102.38 has?	1. Forest land involved in the project is a terrestrial forest as mentioned in Chapter-4 of the EIA report. As mentioned in Chapter-2 of EIA report, State Government has recommended for the forest clearance and it is now at Central government through File No. 8-04/2016-FC".	1. Forest land involved in the project is a terrestrial forest
		2. The site is located in the seismic zone-V, what is the vulnerability of the site due to its seismic sensitivity	2. The plant design will be done considering seismic zone-V as per IS 1893 (part-I)- latest edition. Disaster management plan has been prepared and available in Chapter-7 of the EIA report.	2. The plant design by considering sesmic zone-V and details will be given in detail engineering report.
		3. Figure-1.2 is illegible. Please provide a better of the same map	3. Study area map on a larger size paper will be provided in final EIA report.	3. Noted and will be incorporated in final EIA report.
		4. Please provide list of all the raw a materials that are required for the purpose of proposed project	4. Raw materials requirement and sources has been provided in Chapter-2 of the EIA report.	4. The raw material and source details are presented in Section-2.2.2 and the proposed project layout is given in Figure-2.1 of Chapter-2 in the EIA report
		5. Please provide name of the sources, along with distance from the plant, from which raw material would be brought to the project site?	5. Reply is as per point no. 4 above.	5. Refer the above point no.-4.
		6. What are all the different air pollution which will be added to the Ambient Air Quality (AQQ) because of the transportation of raw material to the project	6. The copper concentrate and rock phosphate will be transported through state of art pipe conveying method. The required EMP measures	6. The anticipated impacts on air quality and mitigation measure to control pollution during construction and operation phase are

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		site?	will be implemented as mentioned in Chapter-6. Project will be implemented after obtaining required clearances from concerned statutory authorities and complied with.	provided in Section-4.1.3 and 4.2.2 of Chapter-4 in the EIA report. The comprehensive environmental monitoring program for construction phase and operation phase is suggested in Table-6.1& 6.2 of Chapter-6 in the EIA report.
		7. What is the incremental concentration (in µg/m3) of each of air pollution which will be added to the AAQ because of the transportation of the raw material to the project site?	7. Reply is as per point no. 6 above.	7. Refer the above point no.-6.
		8. Give us a fully list of all the industries within APSEZ area, along with there production capacities.	8. As per TOR, the study area is 10 km around the proposed site and major industries and ports within 10KM radius study area of the proposed project have been given in chapter-1 of the EIA report. Full list of industries in study area, as desired, will be given in final EIA report.	8. As per TOR, the environmental settings 10 km radius around the project site is given in Table-1.1 of Chapter-1 in the EIA report.
		9. Give us a full list of the all the industries within 15 kilometers radius of APSEZ area, along with their production capacities.	9. As per TOR, details of 10KM radius study area are covered.	9. Refer the above point no.-8.
		10. Give us a full list of all Air Pollutants which are discharged by each and every industry within APSEZ area, along with the quantum of discharge per hour.	10. The impact analysis has been carried out for the proposed project as per TOR granted by MoEF&CC in which baseline conditions, which reflect emissions from existing industries, are monitored and prediction of impacts has been carried out with respect to proposed project activity. The details have been provided in Chapter- 4 of the EIA report.	10. Refer the above point no.-6.
		11. Give us a full list of all Air Pollutants which are discharged by each and every industry within 15 kilometers of the APSEZ area, along with the quantum of discharge per hour.	11. As per TOR, details of 10 KM radius study area are covered. Environmental sensitivity is identified for 15KM radius area as per TOR.	11. Refer the above point no.-6 & 8.
		12. What is the maximum baseline concentration of $PM_{2.5}$ within 15 kilometers radius of the project site?	12. The maximum baseline concentration of $PM_{2.5}$ in ambient air, in the study area, is given in Chapter-3 of the EIA report.	12. The baseline AAQ monitoring location and results are given in Section-3.6 of Chapter-3 in the EIA report.

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		13. What is the incremental $PM_{2.5}$ pollution which will be added by the project?	13. Incremental concentrations for PM_{10}, SO_2, and NO_2 have been given in Chapter-4 of the EIA report.	13. The Air modeling and incremental concentrations for PM_{10}, SO_2 and NO_2 is given in Chapter-4 in the EIA report.
		14. What is the impact of water withdrawal from the Sea on marine ecology?	14. There is no separate desalination plant proposed for the project. APSEZ will be supplying water for the proposed project from its approved desalination plant capacity. Therefore there will not be additional impact due to proposed project.	14. The impacts and mitigation measures on water quality is given in Section-4.2.4 of Chapter-4 in the EIA report.
		15. The EIA Report is completely silent on feasibility of Zero Liquid Discharge (ZLD). The typical style of Vimta Labs, which is the consultant for the EIA Report, is that they provide Water balance diagram in the EIA Reports and say that it is there is no waste water discharge from the plant. Is water balance diagram sufficient to evaluate the feasibility of ZLD? Therefore, give us scientific explanation about the feasibility of ZLD for the proposed project.	15. Besides the water balance diagram, technical scheme to achieve Zero Liquid Discharge (ZLD) is also given in Chapter-2 of the EIA report. The rejects from the RO plant will be sent to multi-effect evaporator to achieve zero discharge and salts (mainly calcium) will be stored in the SLF within the project area. There is no discharge of any treated water into the sea.	15. The treated water will be reused in process operation. The water requirement and breakup details are provided in Section-2.2.3 of Chapter-2.
		16. Have you obtained prior Forest Clearance for the project?	16. Project area includes forest land for which APSEZ has applied for Forest clearance and same is under process. As a process State Government gives recommendation for diversion of forest land after completing all procedures and central government is granting the clearance. As per procedure, EC shall be obtained from MoEF&CC after compliance of applicable requirements.	16. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only after getting all required statutory clearance from concern department.
		17. What is the total amount of Forest which has been diverted/cleared so far for the purposes of different project within APSEZ area?	17. As per TOR, forest land involved for the proposed project has been mentioned in Chapter-1 and in Land Use for the proposed project is given in Chapter-2 of the EIA report.	17. Refer the above point no.16. The land use breakup is given in Table-2.2 of Chaper-2 in the EIA report.
		18. What has been the environmental damage which has happened as result of the Forest diversion so	18. As per TOR, baseline environment of the study area and environmental impacts of the proposed	18. The baseline studies, impacts & mitigation measures and EMP for proposed project have

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		far? 19. How much money does the company owe to different banks? 20. How much money does the company owed to public sector banks? 21. What is the source of money for this project? 22. Why should we have a project promoted by a company which is deeply into debt? 23. Have you paid the 2000 crores money imposed as fine/penalty for damaging the Environment? 24. If not, when will the company pay penalty imported? 25. The environmental damage which has already been caused by your company is punishable under Section 15 of the Environmental (Protection) Act, 1986 and you are liable to be imprisoned for the same. Why has the criminal action not been taken against you?	project have already been studied and provided in EIA report. 19. This is outside the scope of the EIA report for the proposed project. 20. This is outside the scope of the EIA report for the proposed project. 21. This is outside the scope of the EIA report for the proposed project. 22. This is outside the scope of the EIA report for the proposed project. 23. This is outside the scope of the EIA report for the proposed project. 24. This is outside the scope of the EIA report for the proposed project. 25. Adani Enterprises Limited has not violated any provision of Environment (Protection) Act, 1986. We assure you that all the environmental safeguards will be provided during implementation and operation of the project.	already been studied and provided in EIA report. 19. This is outside the scope of the EIA report for the proposed project. 20. This is outside the scope of the EIA report for the proposed project. 21. This is outside the scope of the EIA report for the proposed project. 22. This is outside the scope of the EIA report for the proposed project. 23. This is outside the scope of the EIA report for the proposed project. 24. This is outside the scope of the EIA report for the proposed project. 25. There is no court cases, litigations and violation take place on the proposed project.
34	Shri Chauhan Pravinsinh Bhurubha, Village: Siraya, Tal. Mundra, Dis. Kutch	1. **Non compliance of Terms of Reference and Breach of Circular dt. 31-03-2011 of the Government of India (Encl.: 1)** a) A T.O.R. (Terms of Reference) was issued for this project of dt. 21st June, 2016, in which it was clearly stated in Section 5(I) that clearance for forest land of 102 ha should be submitted. i) It is declared in Form No.1 (MoEF&CC uploaded by them on their website) to obtain Environment Clearance by Adani Enterprise that forest clearance is under the process.	1. We submit that all requirements for obtaining the TOR from MoEF&CC were fulfilled. After obtaining TOR, Environment Impact Assessment has been completed and all conditions of TOR has been complied with by project proponent for the purpose of public hearing. Regarding the Status of Forest Land, this is clearly disclosed in Form-1 for TOR and further in TOR compliance (Annexure-I, page AI-14 of EIA report) that "Forest land of 253 Acres is also involved which will be converted for industrial use. State Government has recommended for the forest clearance and it is now at Central government through File No. 8-	1. As per TOR obtained from MoEF&CC and point are addressed in the EIA report along with TOR compliance. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only after getting all required statutory clearance from concern department.

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		ii) It is declared on draft E.I.A. report on page no. AI 14 that (T.O.R. is not compliance by Adani) but forest clearance is pending. Thus, considering the abovementioned issued it is clear that T.O.R. is not compliance by Adani Enterprise. So, Environmental Public Hearing is not valid until the T.O.R. compliance is not made. b) According to Circular dt. 31-03-2011 of MoEFCC (Encl:4) that forest clearance should be obtained first for any new project, in which the land of forest department is to be utilized and the environmental clearance process should be made thereafter. The land of 102 Ha is of Forest in this project of Adani Enterprise and Forest Clearance is pending. It is proved by Encl: 2 and Encl:3. Thus, any environment clearance process made before forest clearance is illegal and Public Hearing may also be treated illegal. c) As per Section 8(iv) of E.I.A. Notification, 2006 if any information is concealed deliberately, the application should be cancelled. Thus, the abovementioned information pertaining to forest clearance is concealed by Adani Enterprise deliberately to misguide. Hence, their application for environment clearance must be cancelled. d) Why any action is not taken in spite of the complaint (encl.:5) regarding abovementioned point no. 1 is made by me by e-mail on 11/04/2017 to (1) K. C. Mistry, Member Secretary, Gujarat Pollution Control Board, Gandhinagar and (2) Arvind Agrawal, Chairman, Gujarat Pollution Control Board, Gandhinagar, (3) Regional Officer, Gujarat Pollution Control Board, Gandhidham, (4) M. A. Gandhi, Collector, Kutch, (5) M. K. Sing, Joint Secretary, MOEFCC., New Delhi?. Why the process pertaining to Environment Clearance is not stopped? On what	04/2016-FC". The file status is also available online at MoEFCC Forest Clearance. APSEZ has in principally agreed to allot the land for the project to AEL, as per APSEZ letter dated 15th April 2016 which is enclosed in EIA report. As the project is proposed by M/s Adani Enterprises Limited in APSEZ land, Forest Clearance has already been applied for this land by APSEZ (erstwhile Mundra SEZ Ltd.). The requirement of OM dated 31.03.2011 is "the proponent should submit the proposal for TOR, only after applying the Stage-I forestry clearance". Hence, this requirement has also been complied as the Forest Clearance was applied much before applying for TOR. At no stage there is any concealment and/or submission of false or misleading information or data which is material to screening or scoping or appraisal or decision on the application by the project proponent. There is no deviation from the Section 8 (vi) of EIA Notification 2006 also. We do not offer any comment related to point 1(d) of your letter.	There is no litigations and court case related to the proposed project.

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		basis Public Hearing is arranged? 2. **Information concealed in Form-1** a) Review Petition is filed on judgment of P.I.L. No.17 of 2011 of the grazing land of Navinal on the land proposed in point no. 16 and 26 of basic information. It is concealed that it is under proceeding. b) The information of Daneshwari River is concealed by Adani in point nos. 2 and 10. But, this river passes through the proposed project. Thus, the information is concealed. Thus, as per Section 8(iv) of E.I.A. Notification, 2006 if any information is concealed deliberately, the application should be cancelled. The abovementioned information is deliberately concealed in Form No.1 by Adani Greenfield Copper refinery. Hence, their application deserves to be cancelled. 3. **Deficiencies in E.I.A. report** a) It is declared by Adani in point no. 10 on page Nos. 1-4 of E.I.A. report that there is no archaeologically important place within the radius of 10 km. But, an archeologically place is situated in Navinal Reserve Forest, about 1 km. from the proposed project area. Accordingly, survey of this area is made by archaeologically department of M. S. University. The primary report is attached herewith. Thus, this information is concealed. 4. **Violation of Sunita Narayan Committee** a) It is mentioned on page no. 69 of Sunita Narayan Committee Report that fishing port should be made at Bhadreshwar so that people of	2. A) The PIL 17 of 2011 has been disposed by the High Court. The judgment is under review. B) Dhaneshwari, a seasonal river flows in the western part of the proposed site. The flow of the river will be maintained, as shown in the Plant Layout on Page C2-3 of EIA Report. Google Map is provided in EIA Report (Schedule –C 1-6). 3. A complete list of archaeological monuments in the state of Gujarat is available at http://asi.nic.in/asi_monu_alphalist_gujarat.asp. Further, a complete list of excavations is available at http://asi.nic.in/asi_excavations.asp. As on date, there is no Notified Archeological Site located within 10 km from the proposed project site. 4. The Committee and its report pertain to APSEZ. The points mentioned are not related to the proposed project activity therefore we do not offer any comment.	2. B) Dhaneshwari, a seasonal river flows in the western part of the proposed site. The flow of the river will be maintained, as shown in the Plant Layout is shown in Figure-2.1. The river steam will not be disturbed. 3. There is no notified archaeologically site within 10 km from the proposed project site. 4. This is outside the scope of the EIA report for the proposed project.

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		surrounding villages may make fishing activity there. But nothing such is made there. b) It is mentioned on page no. 69 of Sunita Narayan Committee Report that arrangement of coming and going should be made so that fishermen may move on coast. But nothing such is made there by Adani. c) It is mentioned on page no. 75 of Sunita Narayan Committee Report that collective grazing land should be given back voluntarily so that people may graze their animals. But nothing such is made there. d) It is mentioned on page no. 75 of Sunita Narayan Committee Report that studied till now. So permission for new project should not be granted. e) The committee has mentioned in recommendation no. 7.2.2 that environment permission for north port should be cancelled, because Bocha Island is situated there and mangrove is caused heavy damage there. In spite of that permission is not withdrawn. f) As per the Sunita Narayan Committee report maping of HTL AND LTL should be made and kept in public domain, which is not placed till date. 5. **Issue of land of forest department** a) A demand of land of reserve forest of 8 villages aggregating to 1576.81 ha is made by Adani on dt. 19th July, 2004. Its forest clearance is under process. Out of 1576.81 ha of demanded land to be used for project, 102.38 Ha of land is of Shiracha Danderi Rakhal (reserve forest).	5. APSEZ has applied for diversion of forest land for industrial purpose. The forest diversion is under process. All the rules will be complied for forest diversion, as applicable. Forest clearance is recommended by State Government after completion of established process and finally approved by MoEF&CC.	5. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only

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		b) According to Forest Privilege Act, 2006 the villagers making use of the land have prior right on it and it cannot be allotted for industrial or other use without permission of the village meeting. c) According to Forest Privilege Act, any community in use of the land for last three generations or earning livelihood from it may have right on it. d) The villagers of surrounding are making use of this forest land of 1576.81 Ha. So this land cannot be allotted for industrial purpose according to Forest Privilege Act. e) Shiracha Gram Panchayat has put it claim before Prant Stariya Van Adhikar Samiti to settle its community rights on the forest land to be used for proposed project. f) Out of the 1576.81 ha of land under demand, 89 ha of land is of Navinal village and Navinal Village Committee has put collective claim on it. g) According to Forest Privilege Act, the villagers have prior right on it. So, its forest clearance cannot be availed and it cannot be used for the project. h) It is the last reserve forest in the area. If it is allotted for industrial purpose, the area will remain without forest and more forest are essential for industrial area. 6. **Noncompliance of Environment Clearance of Adani Port and Special Economic Zone** a) As per condition (2) conservation of creeks, rivers mangroves coming within the area is to be made. It can be seen from the photographs of different years taken from satellite annexed herewith that the creeks, rivers mangroves	6. The issues raised are for APSEZ and are not related to the proposed project activity therefore we do not offer any comment.	after getting all required statutory clearance from concern department. 6. This is outside the scope of the EIA report for the proposed project.

		coming within the area are exterminated by Adani. Thus, the condition is violated. b) As per condition of every creek should be kept in comparison with the satellite image, 2005.But, the condition is not followed by the Adani Port and S.E.Z. c) It is directed in Specific Condition (5) that a recent satellite map should be submitted once a year so that it can be compared with the Satellite map of year 2005 and confirmed whether there is any change in creeks, rivers, mangrove and mouth of creek. No such map is submitted by A.P.S.E.Z. till date. Thus, condition compliance is not followed. d) As per condition (6) A.P.S.E.Z. must observe order passed by the Ministry of Environment and Forest considering the report submitted by Sunita Narayan Committee. But, it is not followed by A.P.S.E.Z. e) As directed in condition (12) and (13) NCSCM/NIOT will control and verify the implementation as per action plan approved by Ministry of Environment and Forest. Execution Report of Action Plan will be required to be submitted with six monthly monitoring reports. This condition is not complied till date. a) As per condition (15) no change should be made in flow of river. But, The route of river of Kandagara passing through Adani Power is changed.The Kamandwala flow between Navinal and Shiracha is changed. The mouth of Nagmati River is closed. O.C.C.L. Company is established on river of Dhrab. Construction of Adani Hospital is made on Kevdi River. Thus, breach of this condition is made.		

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		f) As per condition (18) no development should be made up to 50 meter from mangrove area. But, many constructions are erected by project proponent such as construction of Adani House building. Thus, breach of this condition is made. 7. **Report of Gujarat Ecology Commission.** a) A report is prepared by Gujarat Ecology Commission upon study of effect on mangrove and its ecology due to coal handling. Mundra Port is a part of it. b) According to the report growth of mangrove is affected by coal dust. c) As per the report BOD (Biological Oxygen Demand) was 9.52 in 2010/11 which has reached to 27 in 2012/13 which is the highest in the areas under survey. d) COD (Chemical Oxygen Demand) was also 38 in 2010/11 which reached to 92.65 in 012-13. e) DO (Dissolved Oxygen) has reached to 4.92 from 4.8. which is CPCB is higher than permissible line. f) SO (Suspended Solid, blirness in water) has reached to 162 from 56 which is CPCB is higher than permissible line. g) Nitrate 0.313 in 2010-11 has reached to 1.154 in 2012-13.	7. The Report on Coal Handling and its impacts are not relevant to the proposed project activity therefore we do not offer any comment.	7. This is outside the scope of the EIA report for the proposed project.
		8. The grazing land of Navinal village will be used for Copper Refinery Project of Adani Enterprise Ltd. The matter of land is sub-juiced. No judgment is passed in favor of any party.	8. The PIL 17 of 2011 has been disposed by the High Court. The judgment is under review.	8. The PIL 17 of 2011 has been disposed by the High Court. The judgment is under review.
		9. In spite of having so many industries, nothing is made for the employment to local people. I.e.	9. Details on potential employment is mentioned in Chapter-2 of EIA Report. Preference will be	9. Employment requirement details during Construction and operation phases is given in

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		connected with the company. But no study of its effect is made.	its approved desalination plant capacity. Therefore there will not be additional impact due to proposed project.	
		12. There are two power projects and biggest coal handling port in Asia is situated here but it is not mentioned in E.I.A. report.	12. References of Adani and Tata Power Plants as well as west & south ports of APSEZ are mentioned in Table 1.1 of Chapter 1 of the EIA Report.	12. The list of industries within the 10 km radius from the project site is given in Table-1.1 of Chapter-1 in the EIA report.
		13. Environment Clearance Compliance of other projects of Adani is not made. So, people in surrounding should not be caused damage by giving permission to new project.	13. Comment being general in nature, we do not offer comment.	13. This is outside the scope of the EIA report for the proposed project.
		14. The livestock of our villages were grazing on the grazing land of the proposed project. The livelihood is ruined by snatching it. Now there will be no grazing land by giving remaining forest land to new project.	14. As established procedure, forest clearance is recommended by State Government and approved by MoEF&CC only after completion of all requirements and compliance by user agency. Adani foundation is working for Sustainable Livelihood in the surrounding villages through CSR projects.	14. The CSR details (like CSR policy, initiatives & activities, CSR Budget expenditure data from 2010 to 2016, Proposed CSR budget plan for next 5 years and CSR implemented photographs) is given in Section-8.5 of Chapter-8 in the EIA Report.
		15. The hazardous chemical such as sulphuric acid will come out due to copper refinery. The possibility of pollution and acid rain will increase. So, this project should be cancelled.	15. The SO2 gases produced during the process is an input raw material for Sulphuric Acid Plant and will be converted to Sulphuric Acid in the respective plant within the project area. Sulphuric Acid is a saleable product from this project. The residual gases from the Sulphuric Acid Plant will be released through Chimney after tail-gas scrubbing, meeting the prescribed norms of Central Pollution Control Board (CPCB). Therefore no significant adverse impacts are envisaged.	15. The process of extraction of copper metal, sulphuric acid is recovered as a byproduct from the off-gases generated from the smelting and converting furnaces. A part of sulphuric acid produced is utilized for phosphoric acid production and rest will be sold in the market based on market requirement. The process description of SAP is given in Section-2.3.8 of Chapter-2.
		16. The land in surrounding will be washed out due to closure of the river and danger of flood will increase in surrounding villages.	16. No closure of river is envisaged in the proposed project.	16. Dhaneshwari, a seasonal river flows in the western part of the proposed site. The flow of the river will be maintained, as shown in the Plant Layout is shown in Figure-2.1. The river steam will not be disturbed.
		17. Old roads will be closed. One of which from	17. Proposed project will not affect the access	17. The existing roads will be strengthened by

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		400 Ha of land of surrounding villages is given to Adani Power and fishermen, farmers, cattle breeders are left unemployed. In reward thereof only 500 out of 7000 laborers and 15 out of 1500 employees are local. Consequently, nothing but unemployment and pollution will be available from this project.	given to local people for employment in this project based on eligibility. There is a plan to set up a Skill Development Centre to improve the employability of local youth.	Section-8.4 of Chapter-8 in the EIA report. A budget of Rs. 58 Crores for the period of 5 years (From day 1 of the project construction) has been allotted toards Corporate Environmental Responsibility-CER activities (1st May, 2018 Office Memorandum of MoEF & CC). Based on the needs identified during SIA study in the study area. The CER fund is distributed in the following development initiatives: • Education Initiatives – Rs. 6.9 crores • Community Health Initiatives - Rs. 11.5 crores • Sustainable livelihoods and womenempowerment - Rs. 5.7 crores • Community Rural Infrastructure Development (drinking water facilitie, check dam, etc.) – Rs. 29.5 crores • Bio-Diversity – Rs. 4.4 crores The CSR details (like CSR policy, initiatives & activities, CSR budget expenditure data from 2010 to 2016 and CSR implemented photographs) is given in Section-8.5 of Chapter-8 in the EIA Report.
		10. This is a coastal area. So, C.R.Z. clearance is required so as to make action plan for salvage against earthquake or tsunami.	10. The proposed site is outside CRZ and hence there is no requirement of Clearance under the CRZ Notification. The same is shown in Fig. 1.5 of EIA Report. Risk Analysis and Disaster Management Plan has been prepared to identify and address the natural disasters, which is covered in EIA Report.	10. The prosed project is a Greenfield project and which is outside of the CRZ. The CRZ map is shown in Figure-1.5 of Chapter-1 in the EIA report. Disaster management plan has been prepared and available in Chapter-7 of the EIA report.
		11. 32800 K.L.D. will be utilized by the company and desalination plant will be used for it, which will affect the sea-life adversely. This desalination is	11. There is no separate desalination plant proposed for the project. APSEZ will be supplying water for the proposed project from	11. The water requirement for proposed project meet from approved 300 MLD capacity desalination plant of MUPL.

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		Navinal to Kotdi creek will be closed. 18. Wild animals are living in this area, what about their restoration?	from Navinal to Kotdi Creek. 18. Flora and Fauna study has been conducted as part of the EIA and details are provided in the Chapter 3 and management plan is also provided in Chapter 4.	widening or upgrading and extended to approach the proposed site. 18. There is no wild animal in the project site. Conservation Plan for Protection of Peacock is provided in Section-3.3.9 of Chapter-3 in the EIA report.
35	Shri Vijay U. Gadhavi, President, Kutch Charan Sabha, Mandvi Naliya Road, Mandvi – Kutch	It is humbly submitted that, due to Copper Refinery Project of Adani Enterprise Limited (AEL) proposed to be established in the district of Kutch in the villages of Navinal and Siracha is a serious danger to the local public, local community depending on the forest, fishermen, and environment and coastal ecology. There are many discrepancies, mistakes and wrong information in the draft EIA report. It transpires from the study report that if such a big project is established on the sea shore human health, animal – birds, and coastal life as a whole will be jeopardized seriously and permanently that cannot be compensated. This is such a dangerous pollution emanating project that, the future generations of locals residing in the surrounding villages may be crippled , lame and impotent. Therefore we are objecting establishment of the project at this location. We are submitting our written objection on the basis of the points mentioned below. And we demand to prevent establishment of this project at this location as it is not suitable here.	We acknowledge the receipt of your representation and have noted your concerns. We assure you that all the environmental safeguards will be put into place before operation of the project. We will also be adopting the latest technology for pollution control and environmental protection. The project will be implemented with Zero Liquid Discharge. The Environmental Impact Assessment has been carried out and all the environmental parameters will be within the statutory limits. We are herewith responding para wise to the issues raised by you:	
		1. We object selection of land of reserved forest as project site by Adani Enterprise Limited (AEL). The options selected for the project site are wrong. This project shall be established away from the sea shore. As close pipeline conveyor system for transportation of raw material is already in existence it is possible to establish this project away from sea shore in spite of that the company management has decided to establish it near sea shore. It is not fair. Water and electricity also can be supplied there easily and water disposal being zero there is no problem of	1. The Copper Project is based on the import of Copper Concentrate, which is not available in our country in required quantity. Also, most of the finished products will be dispatched through sea route. These factors were considered as site selection criteria. The site is advantageous in terms of proximity to the port. With all the pollution control measures proposed, the environmental risks and impacts will be mitigated. The project is also based on zero liquid discharge. There are many such plants on coastal locations and have been	1. The prosed project details are given in Chapter-2 in the EIA report.

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		water discharge. It is dangerous to establish such an industry on the sea shore. Damaging the environment of the sea and creating land by reclamation using sand and establishing such project on it is harmful. So we object the project under Forest Rights Act 2006 as livelihood of people of village who are dependent on the forest is under risk. Forest lands are reducing so the land of Danderi and Shiracha forest should not be given to the company for other industrial purpose. Cattle of the village graze in this forest. So we are taking strong objection against the use of the forest for the company.	operating without any significant impact on the coastal ecology. Part of the project site is forest land, which will be used only after obtaining final approval for diversion of forest land. The entire process and conditions of forest clearance will be complied, once obtained.	
		2. Adani Company has done permanent damage by cutting the Mangrove trees and filling up the creeks. Sand dune available in the forest on the sea shore of Navinal has been used for development of port. So the whole geography of the coastal area has changed. And as on date our case is pending with Hon. Supreme Court in the matter. During development of APSEZ the damage has been done to the environment, the sea shore and livelihood of the people, so we object the company and the proposed project. The matter has been proved in the court and the government that the company is establishing industries by damaging environment and coastal life. Therefore considering the company being disputed and its spoiled past this project deserves to be rejected.	2. The para has alleged Adani Group of violations that have not been substantiated. There have been such allegations and legal suits in the past which have been dismissed by the Hon'ble Courts. The points raised do not pertain to proposed project and therefore we do not offer any comments. However, project will be implemented in line with the permissions granted and by implementing environmental safeguards.	2. The budget allotted for environmental protection will be about Rs. 1044 Crores, out of which for Air pollution control systems is Rs. 639 Crores, Water pollution control system is Rs. 360 Crores and other environmental management systems (like solid waste, greenbelt, post project monitoring, gas collection and energy conservation) is Rs. 45 crores and wildlife conservation and mangrove conservation plan is Rs.4.44 Crores. The EMP budget is given in Table-6.4 of Chapter-6.
		3. Why the details of all survey numbers of land in which the said project is proposed to come up is not mentioned in the report. Please provide the entire detail about the area including the respective villages.	3. The proposed project is located partly in notified SEZ and partly in forest land applied for diversion. The Survey Numbers for notified SEZ have been incorporated in the Form-1 application and its details are: *APSEZ area in Siracha and Navinal villages. Siracha village 125/1, 125/2, 126, 129, 135, 137, 138/1, 140, 141/P, 142/P, 143, 144/1, 144/2, 147/P, 295/1 part, 295/2 (forest land), unsurveyed land, old*	3. The survey numbers of proposed project is given in Table-1.1 of Chapter-1 in the EIA report.

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			ACL and diverted Mundra forest land part. Navinal Village 223/P, 224/P, 225/P and old ACL. Same will also be included in the final EIA Report.	
		4. Please mention plot numbers and its area in respect of APSEZ land given to AEL for the project and also provide plot wise details of land ownership in writing.	4. APSEZ has given in principle approval to transfer/ allot the land in favour of AEL after obtaining due permissions. A copy of letter is provided in the Annexure-III of the EIA report.	4. Memorandum of Understanding (MoU) is in place between Adani Ports & Special Economic Zone Limited (APSEZL) and Adani Enterprises Ltd (AEL) for 154.18 ha (381 acres). Land allotment letter is enclosed as Annexure-III.
		5. Furnish area wise details of all the plots which are with APSEZ at present. Also furnish details of plots sold out and unsold.	5. The land details related to proposed project are provided in the Point No. 3 above.	5. Refer the above point no.-3.
		6. Is the land proposed for the project and owned by the APSEZ, a notified SEZ? Provide the copy of the notification.	6. Part of the proposed project land, 154.18 ha is within the Notified SEZ. A copy of notification is enclosed as Annexure-? And same will be included in the final EIA Report.	6. Refer the above point no.-4.
		7. Is the area of the project that shall be given by APSEZ to AEL, to be considered under the SEZ? Provide the relevant details as per the Government record and status.	7. Part of the proposed project land, 154.18 ha is within the Notified SEZ.	7. Refer the above point no.-4.
		8. Provide the government documents showing the ownership of APSEZ for the land where the project is to be established.	8. Proposed project includes notified SEZ area and the forest land. A copy of notified SEZ area is as per point no. 6 above. APSEZ has applied for forest land diversion and same is under progress. Details of land are provided in the chapter-2 of EIA the report.	8. Refer the above point no.-4.
		9. Provide the details of the land that is illegally encroached by MPSEZ at Shiracha, Danderi forest. Provide the details of the land that is not denotified by the Government of India but has been taken into possession by the company.	9. We do not agree with your observation. AEL has not started any activity at the site and there is no encroachment on any land.	9. The construction will starts after getting all required statutory clearance from concern department.
		10. Provide the date of the submission in case if the APSEZ would have sought approval of SEZ	10. At the moment, there is no requirement of SEZ denotification for the proposed project area.	10. Refer the above point no.-4.

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		denotification (for AEL project area) from the Government of India.		
		11. Provide the planning and logic for undertaking project for AEL copper plant while obtaining the land at Shiracha, Daderi forest.	11. Alternative site analysis was carried out. The site selection criteria and the study of alternative sites is detailed in Chapter-5 of the EIA Report.	11. The comparison salient features of alternative sites done and details are presented in following Table-5.1 and is shown in Figure-5.1 of Chapter-5 in the EIA report.
		12. Provide the copy of the permission for reclamation provided by the Government of India, if any, to the MPSEZ for forest land and other land.	12. There is no proposal of reclamation in Forest Land. The proposal for diversion of forest land is under process. Other land under the proposed project is notified SEZ area.	12. There is no reclamation in the proposed project. Forest land of 102.38 ha (253 acres) is also involved which will be converted for industrial use. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only after getting all required statutory clearance from concern department.
		13. The reserved forest is not mentioned in Form 1 of the project but it is shown in map and EIA report. Why such contradictory information is provided?	13. The details of Forest Land are also shown in Form-I (Basic Information, Sl. Nos. 9, 12, 21 and 23).	13. The details regarding reserved forest have been mentioned in Section-9 (III) Environmental Settings of Form-I and Table-1.1 of Chapter-1 in the EIA report.
		14. The company has to make 30% green belt compulsorily. Therefore 157 hector comes as 30% of green belt of 526 hector. Out of the 526 hector does the company wish to obtain 102 hector of reserve forest and show it as green belt? If yes, from where will the company bring the rest of the 55 hector of reserve forest? Thus, this company wants to encroach the forest illegally.	14. Company has proposed 33% area for Green Belt. The 102.38 ha forest land, once diverted and allotted, will be part of the project area. The Green Belt will be developed in 33% of the total project area of 256.58 ha. There is no illegal encroachment of forest area.	14. As per guidelines and ToR point 33% land should be allotted for greenbelt development. AEL proposing 89.84 (35%) land for greenbelt development.
		15. As shown under the EIA report page no. C-3 16, most part of the project falls in Shiracha, Dedari	15. As per the map on Page C3-16, the project site also includes part of the Siracha Reserve	15. The details which are incorporated in the EIA report is correct and relevant to the

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		forest land. Is this map false? If so, provide a correct map.	Forest. Correct map is provided in the EIA report.	proposed project.
		16. Provide the forest clearance copy that was received by the APSEZ for the above mentioned point.	16. The Forest Clearance is still under process. The details are available on the website of MoEF&CC (File No. 8-04/2016-FC).	16. Forest land of 102.38 ha (253 acres) is also involved which will be converted for industrial use. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only after getting all required statutory clearance from concern department.
		17. If the forest land proposed to be denotified for other industrial use, then provide the copy of no objection certificates given by local Panchayats in this regard.	17. The Forest Land diversion is under process and all the conditions of the forest clearance will be complied once granted.	17. Refer the above Point no.-16.
		18. Please provide a copy of the certificate given by the district collector under the Forest Rights Act, 2006, stating that private or Government land is not available in this area other than the forest in this area.	18. The Forest Land diversion is under process and the requirements of Forest Rights Act, as applicable, will be complied with.	18. Refer the above Point no.-16.
		19. Provide the information about what is the dispute under the SLP 28788/2016 being heard in the Supreme court and WP (PIL) 12/2011 being heard in the Gujarat High Court against MPSEZ.	19. SLP28788/2016 in the Supreme Court and WP (PIL) 12/2011 at Gujarat High Court are dismissed vide respective orders dated - and -. Therefore, there is no dispute.	19. There no dispute regarding the proposed project.
		20. What is the amount of penalty paid by the company to the Government on the basis of the recommendation provided by Sunita Narayan committee to the Forest and Environment ministry? Provide the current status of the penalty and provide the legal information about the same.	20. In the matter of SunitaNarain committee report, APSEZ is complying as per directions of MoEF&CC vide their final order dated 18th Sep, 2015.	20. This is outside the scope of EIA report for the proposed project.

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		21. Apart from the EIA report, please provide the additional details about how many natural rivers, drains are located in the land selected for Project Site and forest land, so that no river, drains would be left to be mentioned in the final EIA report out of knowledge. Our demand is to re-study with more accuracy and the demand is made to make re investigation about possible effects that may incur to village and villagers. Our demand is to reopen all closed canals, bays and creeks again. We will take legal actions against the company on any new closer of water flow.	21. Dhaneshwari, a seasonal river flows in the western part of the proposed site. The flow of the river will be maintained, as shown in the Plant Layout on Page C2-3 of EIA Report. Impact Assessment has been carried out covering 10 km area surrounding the project site and it includes water bodies (if any), local residents and villages. There is no proposal of closing any creeks.	21. Dhaneshwari, a seasonal river flows in the western part of the proposed site. The river steam will not be disturbed.
		22. Please provide copy of GCZMA approved CZMP for of the seaside area near the AEL project.	22. Gujarat Coastal Zone Management Authority is the custodian of approved Coastal Zone Management Plan. However, authorized CRZ map superimposing project area prepared by authorized agency of MoEF&CC is provided in the Chapter-3 of the EIA report.	22. The prosed project is a Greenfield project and which is outside of the CRZ. Based on the survey which was carried out by Centre for Earth Science Studies (CESS, Thiruvanantpuram), which is an authorized agency by MoEF&CC, the proposed project site is outside CRZ and doesn't attract CRZ clearance. The CRZ map is shown in Figure-1.5 of Chapter-1 in the EIA report.
		23. Please provide a readable and understandable hard color copy of the CRZ map prepared by NIO.	23. The CRZ Map enclosed is prepared by National Centre for Earth Science Studies and enclosed on Page C3-17 of EIA Report. More clear copy will be included in the final EIA report.	23. Noted and will be incorporated in the final EIA report.
		24. Mention the shortest distance of mangrove area which fall in CRZ 1A from the proposed project. And provide a copy of the records for it.	24. The proposed site is outside CRZ and the minimum distance from existing Mangrove in southern direction is more than 100 m.	24. The Study area and CRZ map are shown as Figure-1.2 and 1.5 of Chapter-1 in the EIA report.
		25. Provide information about the number of fishermen residing in the coastal area and about their existing business.	25. The occupational structure of the people in the area is detailed on Page C3-65 of the EIA Report. The main workers account for 90.57% of the total workers. The Work Participation Rate is 56.36%. Fishing is one of the activities.Details on number of fishermen in the study area will be included in the final EIA report.	25. The demography and socio-economic details are given in Section-3.10 of Chapter-3 in the EIA report. Social Imapct Assessment report is enclosed as Annexure-XII

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		26. Provide the number of fishermen who have become unemployed due to MPSEZ project	26. No fishermen will be impacted due to proposed project.	26. Refer the above point no.-25.
		27. Provide the number of fishermen who do Pagadiya fishing near the project.	27. The details on pagadiya fisherfolk will be included in the final EIA Report.	27. Refer the above point no.-25.
		28. How many access roads used by fisherfolks for commuting will be closed due to this project? or have been closed in the past?	28. Project will be developed over notified SEZ area and forest land applied for diversion. APSEZ has created dedicated approach road for fishermen of Navinal and Siracha. Fishermen access roads will not be closed due to proposed project.	28. Refer the above point no.-25.
		29. What type of impacts will be there on animals and people collectively relying on forests and how people and animals will be affected due to this project. And provide the copy of procedures followed under FRA 2006.	29. There is no resettlement involved in the diversion of 102.38 ha of forest land. Flora and fauna study has been conducted as a part of EIA and management plan is also provided in the EIA report. All the conditions of Forest Clearance, once obtained, will be complied to mitigate the impact due to diversion of the forest land. The forest diversion can be recommended by the State Government after completing all the procedures and granted by MoEF&CC.	29. The anticipated impacts and mitigation measure to control pollution during construction and operation phase are provided in Section-4.1 and 4.2 of Chapter-4 in the EIA report.
		30. Provide the consumption plan of Copper Slag and Phospho gypsum.	30. Details on production quantity of copper slag and phosphogypsum is provided in the EIA report. Copper Slag can be used as a building material (Added in Concrete as well as in ready mix), Road Construction & shot blasting and Phosphogypsum is used for Cement manufacturing, gypsum board manufacturing and fertilizer. Both the materials will be sold in domestic and overseas market.	30. Hazardous cake and scrubber cake will be stabilized and stored in secured land fill as per guidelines of MoEFCC/ CPCB/ GPCB. An area of around 12.95 ha is identified and allocated. For the initial years of copper refinery plant operation till sustained utilization/management of copper slag and phosphogypsum; in the above application areas are developed, as well as for emergency purpose, copper slag storage area and gypsum storage of around 105 acres would be identified and made available for intermediate/emergency storage of the same. Provision would be

				made to reclaim the disposed copper slag and phosphogypsum from gypsum storage at a later stage for various utilization ventures. The solid waste generation, waste characterisation and mode of disposal is given in **Section-2.4.3** of **Chapter-2** in the EIA report.
		31. Provide the detail as to whether the Navinal forest has been declared as biodiversity heritage place by the Gujarat State Biodiversity Board, or it is being under proposal.	31. There is no notification on Navinal Forest being notified as Biodiversity Area.	31. There is no notification on Navinal Forest being notified as Biodiversity Area.
		32. Whether a study has been conducted to identify carrying capacity of the Navinal- Shiracha coastal area? Provide information if the study is undertaken. Provide information on how much capacity will be left after AEL's project.	32. Carrying Capacity Studies are undertaken by Statutory Authorities. We are not aware of any Carrying Capacity Studies carried out for this area. EIA studies have been conducted for the study area as per TOR granted by MoEF&CC.	32. EIA studies have been conducted for the study area as per TOR granted by MoEF&CC.
		33. Provide the information on whether the comparison is made on EIA reports of both projects for the combined impact of air- water pollution caused due to the power plant of Adani and Tata Power, air, water pollution and after AEL's Copper plant.	33. The impacts due to proposed Copper project have been superimposed on the baseline data to show the cumulative impacts. The predicted impacts after operation of the project are found to be within the prescribed standards for Air and Water and hence not expected to have any significant impact on health, agriculture and animal husbandry. Details are available in Chapter 4 of the EIA Report.	33. Refer the above point no. 29.
		34. Provide the information about where the copies of the environmental literature of this project were kept which were translated from English to Gujarati according to the EAC meeting minutes.	34. The Gujarati Summary was placed at all the Gram Panchayats within 10 km of the proposed site in addition to the 7 places- The District Collector, Bhuj, District Kutch, District Development Office, Bhuj, District Kutch, District Industry Centre, Bhuj, District Kutch, Taluka Development Office, Mundra, District Kutch, Taluka Development Office, Mandvi, District Kutch, The Chief Conservator of Forest, Ministry of Environment, Forests and Climate Change Government of India, Regional Office (West Zone), Kendriya Paryavaran Bhavan, E-	34. The public hearing proceeding details is given in Chapter-7 in the EIA report.

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			5, Arera Colony, Link Road -3, Ravishankar Nagar, Bhopal 462016 and Regional Office, Kutch (East), Gujarat Pollution Control Board, Room No. 215-216, Second Floor, Kandla Port Trust, Admn Building, Sector 08, Gandhidham, Kutch.	
		35. So far, how many ha of Mangrove afforestation is carried out by Adani Group and where is plantation done? Provide the detailed information.	35. This is outside the scope of the EIA Report for the proposed project.	35. This is outside the scope of the EIA Report for the proposed project.
		36. Will the power transmissions line of APSEZ be moved due to AEL's project? Provide more details.	36. Power Transmission Lines will be retained with some deviation.	36. The details will be given in detail engineering.
		37. The staff required (8 persons) for the Environmental Management Plan of highly polluted Copper Refinery Plant is proper as shown in the EIA report? This is a best example of how serious the Adani group is to the pollution issues.	37. 8 persons are proposed as a part of Environment Cell alone. The Environment Management is not only limited to these 8 persons, but it includes the operations carried out by various departments for the management of environment.	37. The environmental monitoring cell is shown in Figure-10.1 of Chapter-10 in the EIA report.
		38. Will Adani Port staff also look into environmental and pollution issues in this AEL project? Currently, how many staff are there who serves in the Adani Group and also have contributions in all the projects of the group (port, SEZ, power plant etc.)? Is it appropriate to perform such jobs. Is it legally allowed?.	38. Adani Enterprises Limited will have its own Environment Management Team headed by an environmentalist, capable of handling all the environmental and pollution issues of the Copper Project. Other issues are outside the scope of the EIA Report for the proposed project.	38. Refer the above point no.-37.
		39. Why no information is given in TOR or any other place about the 30 acres of SLF? Is this plan possible Without TOR?.	39. The area under SLF is provided in the Pre-feasibility Report, which is a part of the TOR Application.	39. Secured Land Fill (SLF) is proposed over 12.95 ha within the project premises for disposal of ETP waste sludge and spent catalyst. Other Hazardous waste will be disposed through the approved recyclers.
		40. Who will be responsible for destroying surrounding villages located in wind direction by spreading sulfuric acid and other toxic gases and other tons of sulfur dioxide gas from more than	40. The SO_2 gases produced during the process is an input raw material for Sulphuric Acid Plant and will be converted to Sulphuric Acid in the respective plant within the project area. The	40. The SO_2 generation is a continuous process during smelting activity, primary gas stream will be routed to SAP plant and the secondary gas stream will be routed through

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		46 chimneys?.	residual gases from the Sulphuric Acid Plant will be released through Chimney after tail-gas scrubbing, meeting the prescribed norms of Central Pollution Control Board (CPCB). Out of 46 Chimneys/Process Vents, 4 Chimneys are proposed with 100 meter (300 feet) height. Impact Assessment has been carried out and the incremental impacts have been superimposed on the baseline data to assess the ground level concentrations after the project is operational. The predicted ground level concentration after the operation of the project will also be within the National Ambient Air Quality Standards and thus not expected to have any long term impact on the surrounding ecosystem. Details are provided in Chapter 4 of the EIA Report.	scrubber. And, there is no provision in the plant/process for storage of SO_2 gases and will be processed immediately to produce sulphuric acid. Sulphuric acid plant (SAP) has been installed with highly efficient (Double Conversion Double Absorption) DCDA process to control the SO_2 emission to less than 1 kg/t of sulphuic acid produced. The Details of Episodal SO_2 Stack Emissions in Section-4.2.2.3 of Chapter-4.
		41. If you have studied about the impact of these Toxic Gases on people's lungs, then provide the copy of it and if not, then our demand is that the approval or rejection should be given on the basis of such study.	41. Our reply is same as point no. 40.	41. Refer the above point no.-40.
		42. Does the GPCB have the instruments to measure toxic gases concentration in air? If GPCB is unable to measure concentrations of metals then who will measure the pollution? Provide the detail about it.	42. The question does not pertain to us, therefore we do not offer any comment. Environmental monitoring will be carried out as mentioned in the chapter-6 of the EIA report and in line to the permissions granted.	42. Environmental monitoring during construction and operation phase is given in Table-6.1 & 6.2 of Chapter-6 in the EIA report.
		43. Will the effluent of the Smelter project be directly or indirectly discharged in the sea?	43. Proposed project will have zero liquid discharge facility and no treated water will be sent to the sea.	43. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). The water requirement details is given in Section-2.2.3. The process details and schematic flow diagram of ETP is given in Section-2.4.2 and Figure-2.23 of Chapter-2.
		44. The CEPT design in which industrial waste water will be treated is not mentioned in EIA. So, provide the copy of that design.	44. There is no proposal of tie up with any CETP. AEL will have its own ETP for treatment of wastewater. Details are provided in the EIA report.	44. Refer the above point no.-43.

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		45. The information or design of the water recycling plant is also not provided. Provide its information.	45. The Flow Diagram and the Capacities are provided in the EIA Report. Further planning will be carried out during detailed engineering.	45. Refer the above point no.-43.
		46. Provide the copy if the company has done the study of the existing health conditions of the local village people. Provide the details if the local village people have been explained the information in the simple language about this project.	46. EIA report includes details on demographic information about the study area. The Executive Summary of the EIA Report was prepared in local language and made available to all the panchayats within 10 km radius of the proposed site. The Executive Summary in local language was also made available at 5 Government Offices along with EIA Report. Adani foundation is working in the area of community health covering all the villages in the surrounding.	46. The demographic and socio-economic details are given in Section-3.10 of Chapter-3 in the EIA report.
		47. Provide number of total employment given to locals by APSEZ till date.	47. This is outside the scope of the EIA Report for the proposed project. However, local employment will be provided for proposed project based on eligibility and details are provided in the EIA report.	47. This is outside the scope of the EIA Report for the proposed project.
		48. The number of contracts received by local people in APSEZ and the detail of development activities including examples with name and village.	48. This is outside the scope of the EIA Report for the proposed project.	48. This is outside the scope of the EIA Report for the proposed project.
		49. Why nothing has been written in the EIA report about the objections of local village panchayat about the loss of local people and environmental damage? Provide the complete information about it. As the local people, animal-husbandry, health, environment and country may be adversely affected rather than benefits from above mentioned project, hence it is my submission that the project be abandoned. As we do not want to suffer from the pollution in future, we do not want the project and the development from it.	49. The EIA Report has been prepared as per the Terms of Reference issued by the Ministry of Environment, Forests and Climate Change.	49. As per TOR point public hearing is conducted, the minutes of meeting and proceeding with action plan is given in Section-7.1 of Chapter-7 in the EIA report.
36	Shri Usmangani H.	With respectful regards we have to inform that,	We acknowledge the receipt of your representation	

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	Sherseeya (Secretary), Natinal Fisheries Forum, At Post Kancoat, Taluka Vakaner, District Morbi	National Fisher folk Forum is engaged in welfare of communities residing on coastal areas, fishermen and conservation of marine environment. Fisheries, Marine environment and life shall have serious threat because of proposed copper refinery project of Adani Enterprise Ltd. in Navinal and Shiracha villages of Kutch District. In respect of the same, we have studied Draft EIA Report and on the basis of the same it is observed that such project on costal area, marine life shall have serious and irreparable loss. Hence we oppose the project at the site. We submit our written objections on issues mentioned hereunder and since the project site is not proper, we demand stoppage of the project at the site.	and have noted your concerns. We are herewith responding para wise to the issues raised by you:	
		1. Options for selection of project site by Adani Enterprise Ltd. are improper. There is no need to establish such project in coastal area. Since close pipeline conveyer system is available for transportation of raw material, this project can be established at a distance of more than 10 kms away from the coastal line, there is no logic behind establishing the project on coastal line. Water and electricity also can be made available there. Since zero water discharge, there is no issue of water wastage to be disposal. It is dangerous to establish such project on coast line and establishing such project by harmful of marine life and environment by leveling the area with sand is harmful.	1. The Copper Project is based on the import of Copper Concentrate, which is not available in our country in required quantity. Also, most of the finished products will be dispatched through sea route. These factors were considered as site selection criteria. The site is advantageous in terms of proximity to the port. With all the pollution control measures proposed, the environmental risks and impacts will be mitigated. The project is also based on zero liquid discharge. There are many such plants on coastal locations and have been operating without any significant impact on the coastal ecology. Part of the project site is forest land, which will be used only after obtaining final approval for diversion of forest land. The entire process and conditions of forest clearance will be complied, once obtained.	1. The proposed project details are given in Chapter-2 in the EIA report.
		2. Please provide us details of survey numbers of land in which the said project is proposed to come up with details of villages under which the said land falls and please include the same in final EIA Report.	2. The proposed project is located partly in notified SEZ and partly in forest land applied for diversion. The Survey Numbers for notified SEZ have been incorporated in the Form-1 application and its details are: *APSEZ area in Siracha and Navinal villages. Siracha village 125/1, 125/2, 126, 129, 135, 137, 138/1, 140,*	2. The survey numbers of proposed project is given in Table-1.1 of Chapter-1 in the EIA report.

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			141/P, 142/P, 143, 144/1, 144/2, 147/P, 295/1 part, 295/2 (forest land), unsurveyed land, old ACL and diverted Mundra forest land part. Navinal Village 223/P, 224/P, 225/P and old ACL. Same will also be included in the final EIA Report.	
		3. Please mention plot numbers and its area in respect of APSEZ land given to AEL for the project and also mention give plot wise details of persons in whose possession the same and please include the same in final EIA Report.	3. APSEZ has given in principle approval to transfer/ allot the land in favour of AEL after obtaining due permissions. A copy of letter is provided in the Annexure-III of the EIA report.	3. Memorandum of Understanding (MoU) is in place between Adani Ports & Special Economic Zone Limited (APSEZL) and Adani Enterprises Ltd (AEL) for 154.18 ha (381 acres). Land allotment letter is enclosed as Annexure-III.
		4. Furnish area wise details of all the plots which are with APSEZ at present. Also furnish details of plots sold out and unsold and please include the same in final EIA Report.	4. The land details related to proposed project are provided in the Point No. 2 above.	4. Refer the above point no.-3.
		5. Is the site for the project owned by the APSEZ a notified SEZ? Provide the copy of the notification. Please include the same in the final EIA report.	5. Part of the proposed project land, 154.18 ha is within the Notified SEZ. A copy of notification is enclosed as Annexure-III and same will be included in the final EIA Report.	5. Refer the above point no.-3.
		6. Is the area of the project that shall be given by APSEZ to AEL, to be considered under the SEZ? Provide the relevant details as per the government record and status. Please include the same in the final EIA report.	6. Part of the proposed project land, 154.18 ha is within the Notified SEZ.	6. Refer the above point no.-3.
		7. Provide the documents showing the ownership of APSEZ for the site at which the project is to be undertaken. Place the same in the final EIA report.	7. Proposed project includes notified SEZ area and the forest land. A copy of notified SEZ area is as per point no. 6 above. APSEZ has applied for forest land diversion and same is under progress. Details of land are provided in the chapter-2 of EIA the report.	7. Refer the above point no.-3.
		8. Provide the details of the land that is illegally siphoned off by MPSEZ at Shiracha, Danderi forest. Provide the details of the land that is not denotified by the government of India but has	8. We do not agree with your observation. AEL has not started any activity at the site and there is no encroachment on any land.	8. The construction will starts after getting all required statutory clearance from concern department.

		been taken into possession by the company. Place the same in the final EIA report.		
		9. Provide the date of the submission in case if the APSEZ would have sought approval of SEZ denotification (for AEL project area) from the government of India. Place the same in the final EIA report.	9. At the moment, there is no requirement of SEZ denotification for the proposed project area.	9. Refer the above point no.-3.
		10. Provide the planning and logic for undertaking project for AEL copper plant while obtaining the land at Shiracha, Daderi forest. Place the same in the final EIA report.	10. Alternative site analysis was carried out. The site selection criteria and the study of alternative sites is detailed in Chapter-5 of the EIA Report.	10. The comparison salient features of alternative sites done and details are presented in following Table-5.1 and is shown in Figure-5.1.
		11. Provide the copy of the permission for reclamation provided by the government of India, in any, to the MPSEZ for forest land and other land.	11. There is no proposal of reclamation in Forest Land. The proposal for diversion of forest land is under process. Other land under the proposed project is notified SEZ area.	11. There is no reclamation in the proposed project. Forest land of 102.38 ha (253 acres) is also involved which will be converted for industrial use. MoEF&CC (forest conservation division) has granted Stage-1 approval for diversion of 1576.81 ha of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018. Stage-I FC has been obtained as given in Annexure-V. The construction will start only after getting all required statutory clearance from concern department.
		12. The reserved forest is not mentioned under project of Form-1 but map and EIA report is shown. Why is this contradictory information provided?	12. The details of Forest Land are also shown in Form-I (Basic Information, Sl. Nos. 9, 12, 21 and 23).	12. The details regarding reserved forest have been mentioned in Section-9 (III) Environmental Settings of Form-I and Table-1.1 of Chapter-1 in the EIA report.
		13. The company is to make 30% green belt mandatory. Therefore 157 hector comes as 30% of green belt of 526 Ha. Out of the 526 Ha does the company wish to obtain 102 Ha of reserve forest and show it as green belt? If yes, from where will the company bring the rest of the 55 Ha of reserve forest?	13. Company has proposed 33% area for Green Belt. The 102.38 ha forest land, once diverted and allotted, will be part of the project area. The Green Belt will be developed in 33% of the total project area of 256.58 ha. There is no illegal encroachment of forest area.	13. As per guidelines and ToR point 33% land should be allotted for greenbelt development. AEL proposing 89.84 ha (35%) land for greenbelt development.

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		14. Is it proper to cut off the ready forest and initiate new plantation? Provide further information as for this in the report.	14. Forest land is part of proposed project area for which all necessary procedure and compliance will be made. Green Belt will be developed around the facilities as per desired norms.	14. The recommended species for greenbelt development are given in Table-4.12 of Chapter-4.
		15. As shown under the EIA report page no. C-3 16, most part of the project is situated on the Shiracha, Dedari forest land. Is this map false? Therefore, provide a correct map. And place the same in the final EIA report.	15. As per the map on Page C3-16, the project site also includes part of the Siracha Reserve Forest. Correct map is provided in the EIA report.	15. The details which are incorporated in the EIA report is correct and relevant to the proposed project.
		16. Provide the forest clearance copy that was received by the APSEZ for the above mentioned point. Moreover, place the same in the final EIA report.	16. The Forest Clearance is still under process. The details are available on the website of MoEF& CC (File No. 8-04/2016-FC).	16. Refer the above Point no.-11.
		17. Provide the names of all present directors/owners of APSEZ and AEL project and provide them in the final EIA report.	17. Present list of directors of AEL is enclosed as Annexure-xxx. Same will be included in the final EIA report.	17. List of directors of AEL is enclosed as Annexure-XVI in the EIA report.
		18. Provide the information that what is the dispute under the SLP 28788/2016 held before the Supreme court and WP (PIL) 12/2011 held before the Gujarat High Court against MPSEZ. Place the same in an elaborate manner under final EIA report.	18. SLP28788/2016 in the Supreme Court and WP (PIL) 12/2011 at Gujarat High Court are dismissed vide respective orders dated - and -. Therefore, there is no dispute.	18. There no dispute regarding the proposed project.
		19. What is the amount of penalty paid by the company to the government on the basis of the recommendation provided by Sunita Narayan committee to the Forest and Environment ministry? Provide the current status of the penalty and provide the legal information as for the same. Provide the file with remarks as for this issue in writing within the final EIA report.	19. In the matter of SunitaNarain committee report, APSEZ is complying as per directions of MoEF&CC vide their final order dated 18th Sep, 2015.	19. This is outside the scope of EIA report for the proposed project.
		20. Apart from the EIA report, Please provide the additional details as to how many natural river, drains are located in the land selected for Project Site and forest land, so that no river, drains	20. Dhaneshwari, a seasonal river flows in the western part of the proposed site. The flow of the river will be maintained, as shown in the Plant Layout on Page C2-3 of EIA Report.	20. Dhaneshwari, a seasonal river flows in the western part of the proposed site. The river steam will not be disturbed.

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		would be left to mentioned in the final EIA report out of knowledge. Our demand is to re-study with more accuracy. Our demand is to open all closed canals, bays and creeks again. Place information in the final EIA report.	Impact Assessment has been carried out covering 10 km area surrounding the project site and it includes water bodies (if any), local residents and villages. There is no proposal of closing any creeks.	
		21. Please provide GCZMA approved CZMP copy of the costal area near the AEL project.	21. Gujarat Coastal Zone Management Authority is the custodian of approved Coastal Zone Management Plan. However, authorized CRZ map superimposing project area prepared by authorized agency of MoEF&CC is provided in the Chapter-3 of the EIA report.	21. The prosed project is a Greenfield project and which is outside of the CRZ. Based on the survey which was carried out by Centre for Earth Science Studies (CESS, Thiruvanantpuram), which is an authorized agency by MoEF&CC, the proposed project site is outside CRZ and doesn't attract CRZ clearance. The CRZ map is shown in Figure-1.5 of Chapter-1 in the EIA report.
		22. Please provide a detailed colour copy of the CRZ map prepared by NIO which readable and understandable.	22. The CRZ Map enclosed is prepared by National Centre for Earth Science Studies and enclosed on Page C3-17 of EIA Report. More clear copy will be included in the final EIA report.	22. Noted and will be incorporated in the final EIA report.
		23. Keep the difference of mangroves trees that come into the CRZ 1 in close vicinity of the project. And provide a copy of the records required for it.	23. The proposed site is outside CRZ and the minimum distance from existing Mangrove in southern direction is more than 100 m.	23. The Study area and CRZ map are shown as Figure-1.2 and 1.5 of Chapter-1 in the EIA report.
		24. Provide information about the number of fishermen residing in the coastal area and about their existing business.	24. The occupational structure of the people in the area is detailed on Page C3-65 of the EIA Report. The main workers account for 90.57% of the total workers. The Work Participation Rate is 56.36%. Fishing is one of the activities. Details on number of fishermen in the study area will be included in the final EIA report.	24. The demography and socio-economic details are given in Section-3.10 of Chapter-3 in the EIA report.
		25. Show the number of fishermen who have become unemployed due to MPSEZ project	25. No fishermen will be impacted due to proposed project.	25. The proposed project is Greenfield project. There is no impacts on fisherman due to the proposed project.
		26. Provide the number of fishermen who do Pagadiya fishing near the project.	26. The details on pagadiya fisherfolk will be included in the final EIA Report.	26. The fisherman details is given in Section-3.10.6 of Chapter-3 in the EIA report.
		27. How many roads for commuting are closed for	27. Project will be developed over notified SEZ	27. Refer the above point no.25.

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		the fishers due to this project? or has been closed in the past? And update this information in the final EIA report.	area and forest land applied for diversion. APSEZ has created dedicated approach road for fishermen of Navinal and Siracha. Fishermen access roads will not be closed due to proposed project.	
		28. Provide the information on how many animals rely on forests and how people will be affected who use the forests in community by this project. And put it in the final EIA report.	28. There is no resettlement involved in the diversion of 102.38 ha of forest land. Flora and fauna study has been conducted as a part of EIA and management plan is also provided in the EIA report. All the conditions of Forest Clearance, once obtained, will be complied to mitigate the impact due to diversion of the forest land. The forest diversion can be recommended by the State Government after completing all the procedures and granted by MoEF&CC.	28. The anticipated impacts and mitigation measure to control pollution during construction and operation phase are provided in Section-4.1 and 4.2 of Chapter-4 in the EIA report.
		29. To make copper product, provide the information about Sulphur content, mercury and radiation and amount of active metals in raw material. And also mention how much amount of them will be there in slag. And place in the final EIA report.	29. Copper Concentrate will be the principal raw material, which has sulphur and mercury content of 34% and 50 ppm respectively. There is no known Uranium or Thorium content and its radiation in the raw material. Copper slag will contain Sulphur (0.5-1.5%) and mercury (BDL).	29. The process description and raw material details are given in Section-2.3 and in Table- 2.3 of Chapter-2 in the EIA report.
		30. Provide the information on the management of Copper Slag and Phospho gypsum according to the CREP.	30. There are no CREP Guidelines for Copper Smelter & Refinery.	30. There are no CREP Guidelines for Copper Smelter & Refinery.
		31. According to the CREP, show the steps to follow emissions from the sulfuric acid plant and put it in the final EIA report.	31. There are no CREP Guidelines for Copper Smelter & Refinery.	31. There are no CREP Guidelines for Copper Smelter & Refinery.
		32. Provide the information about the management of emissions reduction of sulfur dioxide as per CREP.	32. There are no CREP Guidelines for Copper Smelter & Refinery.	32. There are no CREP Guidelines for Copper Smelter & Refinery.
		33. Make utilization plan for copper slag and Phosphogypsum. And put it in the final EIA report.	33. Details on production quantity of copper slag and phosphogypsum is provided in the EIA report. Copper Slag can be used as a building	33. Hazardous cake and scrubber cake will be stabilized and stored in secured land fill as per guidelines of MoEFCC/ CPCB/ GPCB. An

			material (Added in Concrete as well as in ready mix), Road Construction & shot blasting and Phosphogypsum is used for Cement manufacturing, gypsum board Manufacturing andfertilizer. Both the materials will be sold in domestic and overseas market.	area of around 12.95 ha is identified and allocated. For the initial years of copper refinery plant operation till sustained utilization/management of copper slag and phosphogypsum; in the above application areas are developed, as well as for emergency purpose, copper slag storage area and gypsum storage of around 105 acres would be identified and made available for intermediate/emergency storage of the same. Provision would be made to reclaim the disposed copper slag and phosphogypsum from gypsum storage at a later stage for various utilization ventures. The solid waste generation, waste characterisation and mode of disposal is given in Section-2.4.3 of Chapter-2 in the EIA report.
		34. For the implementation of all CREP Guidelines of CPCB, applicable to the smelter, I demand that the specific plan is to be included in this draft EIA report and in the final EIA report, and to be placed before the Ministry of Environment and Forest at the time of approval. A copy of this is to be given to us too. Put the complete information in the final EIA report.	34. There are no CREP Guidelines for Copper Smelter & Refinery.	34. There are no CREP Guidelines for Copper Smelter & Refinery.
		35. Provide the detail as to whether the Navinal forest has been declared as biodiversity heritage place by the Gujarat State Biodiversity Board, or it is being under proposal. Put information in the final EIA report.	35. There is no notification on Navinal Forest being notified as Biodiversity Area.	35. There is no notification on Navinal Forest being notified as Biodiversity Area.
		36. Whether a study has been conducted about the Navinal- Shariya costal area carrying capacity? Provide information if the study is undertaken. Provide information on how much capacity will be left after AEL's project. Place information in the final EIA report.	36. Carrying Capacity Studies are undertaken by Statutory Authorities. We are not aware of any Carrying Capacity Studies carried out for this area. EIA studies have been conducted for the study area as per TOR granted by MoEF&CC.	36. EIA studies have been conducted for the study area as per TOR granted by MoEF&CC.

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		37. Provide the information on whether the comparison is made on EIA reports of both projects for the combined impact of air- water pollution caused due to the power plant of Adani and Tata Power, air, water pollution and after AEL's Copper plan. Put this information in the final EIA report.	37. The impacts due to proposed Copper project have been superimposed on the baseline data to show the cumulative impacts. The predicted impacts after operation of the project are found to be within the prescribed standards for Air and Water and hence not expected to have any significant impact on health, agriculture and animal husbandry. Details are available in Chapter 4 of the EIA Report.	37. Refer the above point no. 28.
		38. Provide the information about where the copies of the environmental literature of this project were kept which were translated from English to Gujarati according to the EAC meeting minutes.	38. The Gujarati Summary was placed at all the Gram Panchayats within 10 km of the proposed site in addition to the 7 places- The District Collector, Bhuj, District Kutch, District Development Office, Bhuj, District Kutch, District Industry Centre, Bhuj, District Kutch, Taluka Development Office, Mundra, District Kutch, Taluka Development Office, Mandvi, District Kutch, The Chief Conservator of Forest, Ministry of Environment, Forests and Climate Change Government of India, Regional Office (West Zone), KendriyaParyavaranBhavan, E-5, Arera Colony, Link Road -3, Ravishankar Nagar, Bhopal 462016 and Regional Office, Kutch (East), Gujarat Pollution Control Board, Room No. 215-216, Second Floor, Kandla Port Trust, Admn Building, Sector 08, Gandhidham, Kutch.	38. The public hearing proceeding and action plan details is given in Chapter-7 in the EIA report.
		39. So far, under the mangrove aforestation Program, in how many total numbers of has mangrove are planted by Adani Group and where are planted? Provide the detailed information along with the map and with the total amount of money spent.	39. This is outside the scope of the EIA Report for the proposed project.	39. This is outside the scope of the EIA Report for the proposed project.
		40. Will the power transmissions line in APSEZ be moved due to AEL's project? Provide more details.	40. Power Transmission Lines will be retained with some deviation.	40. The details will be given in detail engineering.
		41. The staff required (8 persons) for the	41. 8 persons are proposed as a part of	41. The environmental monitoring cell is shown

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		Environmental Management Plan of highly polluted Copper Refinery Plant is proper as shown in the EIA report? This pack is a best example of how serious the Adani group is to the pollution issues	Environment Cell alone. The Environment Management is not only limited to these 8 persons, but it includes the operations carried out by various departments for the management of environment.	in Figure-10.1 of Chapter-10 in the EIA report.
		42. Will Adani Port staff also look into environmental and pollution issues in this AIL project? Currently, how many staff are there who serves in the Adani Group and also have contributions in all the projects of the group (port, SEZ, power plant etc.)? Is it Possible legally? Provide the name and his eligibility of the APSEZ's environmental officer and head. Put information in the final EIA report.	42. Adani Enterprises Limited will have its own Environment Management Team headed by an environmentalist, capable of handling all the environmental and pollution issues of the Copper Project. Other issues are outside the scope of the EIA Report for the proposed project. The question does not pertain to proposed project and therefore we do not offer any comment.	42. Refer the above point no.-41.
		43. Why no information is given about TOR or any other place about the 30 acres of toxic waste in the chemical plant? Is this plan possible without TOR? Put information in the final EIA report.	43. The area under SLF is provided in the Pre-feasibility Report, which is a part of the TOR Application.	43. Secured Land Fill (SLF) is proposed over 12.95 ha within the project premises for disposal of ETP waste sludge and spent catalyst. Other Hazardous waste will be disposed through the approved recyclers.
		44. What will be the effect on coral of Gulf of Kutch and Jamnagar Marine National Park by dissolving sulfuric acid and other toxic gas and other tons of sulfur dioxide gas in the sea water in the direction of air surrounding marine area from 46 Chimneys ? Provide a copy of it if the study is undertaken about this. Put the information in the final EIA report. If the study is not done, then it is a demand to allow the project after studying and giving us a copy of it.	44. The SO2 gases produced during the process is an input raw material for Sulphuric Acid Plant and will be converted to Sulphuric Acid in the respective plant within the project area. The residual gases from the Sulphuric Acid Plant will be released through Chimney after tail-gas scrubbing, meeting the prescribed norms of Central Pollution Control Board (CPCB). Out of 46 Chimneys/Process Vents, 4 Chimneys are proposed with 100 meter (300 feet) height. Impact Assessment has been carried out and the incremental impacts have been superimposed on the baseline data to assess the ground level concentrations after the project is operational. The predicted ground level concentration after the operation of the project will also be within the National Ambient Air Quality Standards and thus not expected to have any long term impact on the surrounding	44. The SO_2 generation is a continuous process during smelting activity, primary gas stream will be routed to SAP plant and the secondary gas stream will be routed through scrubber. And, there is no provision in the plant/process for storage of SO^2 gases and will be processed immediately to produce sulphuric acid. Sulphuric acid plant (SAP) has been installed with highly efficient (Double Conversion Double Absorption) DCDA process to control the SO^2 emission to less than 1 kg/t of sulphuic acid produced. The Details of Episodal SO^2 Stack Emissions in Section-4.2.2.3 of Chapter-4.

			ecosystem. Details are provided in Chapter 4 of the EIA Report. There will not be any impact on coral of Gulf of Kutch and Jamnagar due to proposed project activity.	
		45. Provide us information about how much this plant will increase coral bleaching and marine acidification. By dissolving in moisture, Sulfur dioxide gets converted into sulfuric acid, how much pH will increase by going that into the ocean?	45. The project is being designed with zero liquid discharge, there is no likelihood of ocean warming or acidification due to proposed project. There will not be any coral bleaching and marine acidification due to proposed project.	45. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). The water requirement details is given in Section-2.2.3. The process details and schematic flow diagram of ETP is given in Section-2.4.2 and Figure-2.23 of Chapter-2.
		46. Due to the project what will be the increase in global warming?	46. The project is estimated to emit 0.53 Million Tons of CO_2 equivalent of GHG emission per year, which is insignificant in the context of Global Warming.	46. The Anticipated impacts on air and mitigation measures are given in Section-4.2.2 of Chapter-4 in the EIA report,
		47. How many billion tons of greenhouse gas will go to Earth's atmosphere by this project? Put information in the final EIA report.	47. The total GHG emission is estimated at 0.53 Million Tons of CO_2 equivalent per year. This information will be added as a part of final EIA Report.	47. Refer the above point no-46 in the EIA report.
		48. Show the plan to reduce the greenhouse gas in final EIA report.	48. We will be adopting advanced technologies which are having lesser footprint as compared to other existing conventional technologies in the market. However, alternative source of fuel will be explored to minimize the GHG emissions due to project activity.	48. Refer the above point no-46 in the EIA report.
		49. Provide in the final EIA report, the details of damage to the sea from the gypsum storage and the waste water that would be thrown out of it.	49. The Gypsum produced will have around 20% moisture and same will be stored in the Gypsum storage area proposed over 28.34 ha through dry conveying method. Gypsum storage area will be constructed with HDPE liner to prevent any leaching. Gypsum will be sun-dried and sold to the potential customers. There will not be any discharge of water outside the project premises.	49. Phosphogypsum produced during the process will be sold to cement industries as well as fertilizer and rest will be stock piled. Hydro fluro silicic acid generated as a by-product will be converted as aluminum fluoride as well as sold in the market.
		50. Provide the details of RO reject if it is to be discharge in the sea.	50. RO Rejects will be taken to Multi-Effect Evaporator. There will not be any discharge	50. An integrated water system is proposed, the effluent from the process units is treated

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			into the sea.	and reused to reduce water demand. It is also proposed to install a secondary Reverse Osmosis (RO) plant to further treat water from the effluent plant facility for effective use. Rejects from the reverse osmosis plant will be sent to Multi Effect Evaporator (MEF) for further recovery and solids generated will be sent to Secured Land Fill (SLF).
		51. Does the GPCB have the instrument to measure toxic gases from air? If GPCB is unable to provide the measurement of pollution, who shall measure the pollution? What is the integrity and reliability of other agencies?	51. The question does not pertain to us, therefore we do not offer any comment. Environmental monitoring will be carried out as mentioned in the chapter-6 of the EIA report and in line to the permissions granted.	51. Environmental monitoring during construction and operation phase is given in Table-6.1 & 6.2 of Chapter-6 in the EIA report.
		52. Will the industrial treated water for the entire Smelter project be directly or indirectly discharge in the sea? Provide specific reply in yes or no.	52. Proposed project will have zero liquid discharge facility and no treated water will be sent to the sea.	52. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD). The water requirement details is given in Section-2.2.3. The process details and schematic flow diagram of ETP is given in Section-2.4.2 and Figure-2.23 of Chapter-2.
		53. Will this smelter work on the principle of zero discharge? Therefore provide the further details as to this in the final EIA report at the time of EMP.	53. The entire project will work on the principle of Zero Liquid Discharge. Details are provided in the EIA report.	53. Refer the above point no.-52.
		54. Will this smelter recycle reuse the entire water? Provide the entire reuse plan and the related final EIA report.	54. The project will generate 6468 KLD of wastewater. Entire wastewater will be treated and reused within the plant. The details are provided in the EIA Report.	54. There is no CETP proposal. AEL is proposing ETP for the proposed project.
		55. The CETP design for treatment of industrial waste water coming out from the entire project is not shown in the EIA. Provide the copy of that particular design.	55. There is no proposal of tie up with any CETP. AEL will have its own ETP for treatment of wastewater. Details are provided in the EIA report.	55. Refer the above point no.-52.
		56. The information or design of the water recycling plant is also not provided. Provide its information.	56. The Flow Diagram and the Capacities are provided in the EIA Report. Further planning will be carried out during detailed engineering.	56. The details will be provided in detail engineering.

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		57. Provide the copy of the details as to proceedings undertaken by company for the recent judgment passed by the Honorable Supreme Court for preliminary treatment of the waste water. Place it under the final EIA report. The information as for these points has been kept hidden and a serious threat shall be generated for the Gulf of Kutch and Marine National Park along with fisheries. As the loss to people, animal-husbandry, health, environment and country is much more than benefit from the project, it is my submission that the project be abandoned while considering the legal tangles. It is our appeal to abandon this project that gives benefit of crores of rupees to the company against loss of multi crores to the people and government.	57. The judgement passed by Honorable Supreme Court is in relation to the existing industry and therefore not applicable, however details of the ETP for the proposed project is provided in the EIA report.	57. Not applicable
37	Shri Shri Vijay U. Gadhavi, President, Kutch Charan Sabha, Mandvi Naliya Road, Mandvi –Kutch	We, the undersigned herewith oppose the coming up dangerous copper refinery project of M/s Adani Enterprise Limited. We submit herewith our objection taking petition to your good office with the points shown here under and request you to take suitable action as to with-held the project at the earliest possible:	We acknowledge the receipt of your representation and have noted your concerns. We assure you that all the environmental safeguards will be put into place before operation of the project. We will also be adopting the latest technology for pollution control. The project will be implemented with Zero Liquid Discharge. The Environmental Impact Assessment has been carried out and all the environmental parameters will be within the statutory limits. We are herewith responding para wise to the issues raised by you:	
		1. The site shown by M/s. Adani Enterprise Limited (AEL) under the SEZ shown at Siracha village is a reserved forest and the only sustainability source of our cattle resulting in our only livelihood and income source. This land is still not allotted to the M/s. Adani Enterprise Limited (AEL) or MPSEZ and there still exist a forest land on the Government records which include the village Danderi forest land and is in government possession. Thus as on date no land is in the name of M/s. Adani Enterprise Limited (AEL) but the MPSEZ have proceeded for allotment of this	1. Out of 256.57 Ha of total project area, 154.18 Ha land is notified SEZ and 102.38 Ha fall under forest land. APSEZ has in principally agreed to allot the land for the project to AEL, as per APSEZ letter dated 15th April 2016 which is enclosed in EIA report. Forest Clearance has already been applied for this land by APSEZ (erstwhile MPSEZ Ltd). As the project proponent can submit the proposal for TOR, after applying the Stage-I forestry clearance, this requirement has also been complied with. Part of the project site is forest	1. The land requirement details are given in Section-2.2.1 of Chapter in the EIA report.

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		land to the above company for its copper refinery project and have reported to the Government accordingly. So we are taking objection for this proposed project by M/s. Adani Enterprise Limited (AEL) without proper sanction. If the land in question is in the possession of M/s. Adani Enterprise Limited (AEL) they should have shown 7/12 extract to us. Thus the company has not acquired required land from Government and yet they are trying to set the project which is ridiculous.	land, which will be used only after obtaining final approval for diversion of forest land. Forest clearance is recommended by State Government after completion of established process and finally approved by MoEF&CC.	
		2. We are totally against this project as the project will spread most dangerous toxic gas and stinking smell which is dangerous for the health of our children, cattle and other living elements as well as the sea **as its 300 ft high 46 chimneys will spread toxic gas all over the area 24 hours 365 days.**The Sulphur dioxide can even rust the iron, is a deadly gas which will come out from the plant process in lacs of tons and spread over nearby villages and will damage the lungs. Therefore, such project is not agreeable at any cost to us looking to the future of our generation, even if it contains golden features.	2. The SO_2 gases produced during the process is an input raw material for Sulphuric Acid Plant and will be converted to Sulphuric Acid in the respective plant within the project area. The residual gases from the Sulphuric Acid Plant will be released through Chimney after tail-gas scrubbing, meeting the prescribed norms of Central Pollution Control Board (CPCB). Out of 46 Chimneys/Process Vents, 4 Chimneys are proposed with 100 meter (300 feet) height. Impact Assessment has been carried out and the incremental impacts have been superimposed on the baseline data to assess the ground level concentrations after the project is operational. The predicted ground level concentration after the operation of the project will also be within the National Ambient Air Quality Standards and thus not expected to have any long term impact on the surrounding ecosystem. Details are provided in Chapter 4 of the EIA Report.	2. The process description of proposed project is given in Chapter-2 in the EIA report.
		3. It is feared that the entire area will be affected by residue of the plant and will spread black power over the agricultural crops and affect it with acidic and many other gaseous pollution also. There are many examples in the country that such metal plant has damaged the atmosphere by creating pollution in many ways and hence we oppose the same. We have come	3. The project will be developed with all the environmental safeguards as detailed in Environment Management Plan (EMP) in Chapter 9 of EIA Report. There are many such projects in the world, including the developed countries in Europe, America, Asia, etc. The apprehension mentioned by you is not in our knowledge. We are confident of operating this	3. The anticipated impacts on air quality and mitigation measure to control pollution during construction and operation phase are provided in Section-4.1.3 and 4.2.2 of Chapter-4 in the EIA report. About Rs. 1044 Crores will be spent on environmental protection. Environmental monitoring will be conducted on regular basis by AEL to

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		to know that the plant organizers have not made demographic survey of connecting area and not shown the negative points involved in their proposed project and also not shown the reactions by toxic gas, We cannot say more due to lack of more scientific knowledge. But we come to know that by this plant's gaseous air pollution there will be effect on flowers of crops and it will not develop naturally to yield the anticipated production quality and quantity. This will affect our livelihood and health naturally which the Indian Government should consider sympathetically and save the villages in the interest of public at large.	plant with all the safeguards to mitigate the pollution and protect environment. Demographic details are provided in Chapter 3 of the EIA Report. Proposed project will have facility to achieve Zero Liquid Discharge. Pollution control measures will be implemented to achieve emissions as per the prescribed standards by CPCB. Ambient Air Quality is found to be within the prescribed standards after development of the project. There will not be any significant adverse impact on the health of the people. EMP is provided in Chapter 9 of the EIA report.	assess the pollution level in the surrounding area. The proposed mitigation to be implemented during construction and operation phase is given in Table-10.1 and Table-10.2 of Chapter-10. The environmental monitoring during construction and operation phase is given in Table-6.1 & 6.2 of Chapter-6 in the EIA report.
		4. The company will produce about 50% residue of raw material while making the end product from copper and this residue come to approximately 8-10 lac tons (i.e. 1 lac trucks) and this will affect the entire area of Kutch. In such circumstance there will be no alternate except to leave the village and hence we oppose this project.	4. Copper slag, estimated 8 to 10 Lac Tonnes per year, will be produced from the copper plant as a by-product. Copper Slag is widely used in construction industry, road making, shot-blasting etc. Copper Slag is also known as Ferro-Sand and Iron-Silicate which is used by Cement companies as raw material to produce the green-cement. Efforts will be made to maximize the sale of the Slag generated from the proposed project in domestic as well as in export market.	4. The anticipated impacts on air quality and mitigation measure to control pollution during construction and operation phase are provided in Section-4.1.3 and 4.2.2 of Chapter-4 in the EIA report.
		5. There is problem of drinking water in our area and it is a question that how the company will manage for water requirement and if managed and what about effluent treatment?	5. The proposed project is based on desalinated sea water sourced from APSEZ. Proposed project will have facility to achieve Zero Liquid Discharge. Details are given in Chapter 2 of EIA Report.	5. The total water requirement for the project is about 32,267 KLD (32.3 MLD). The total desalinated water requirement for the project would be sourced from APSEZ Ltd, through M/s. Mundra Utility Pvt Ltd (MUPL). The water allocation letter is enclosed as Annexure-IV. The water requirement and breakup details are provided in Section-2.2.3 of Chapter-2.
		6. We have come to know that they are planning to make an hazardous waste plant for this 30 acre plant which will affect the villages.	6. Secured Land Fill (SLF) is proposed to be developed over the area of 30 Acres within the proposed project area. SLF will be constructed	6. An integrated water system is proposed, the effluent from the process units is treated and reused to reduce water demand. It is also proposed to install a secondary Reverse

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			and operated as per the CPCB guideline for Treatment, Storage & Disposal Facility (TSDF). The SLF, once filled to its capacity will be capped on top and soil cover will be spread and then plantation will be done. Monitoring of environmental parameters will also be carried out.	Osmosis (RO) plant to further treat water from the effluent plant facility for effective use. Rejects from the reverse osmosis plant will be sent to Multi Effect Evaporator (MEF) for further recovery and solids generated will be sent to Secured Land Fill (SLF). This water would be utilized to meet the DM water and plant/utility water requirement of proposed project. The water system, is highly integrated and is designed for Zero Liquid Discharge (ZLD).
		7. There are also some problems because of existing power plants in our area by Tata and Adani Group, even though we are going to face a new problem by this new project in the form of hazardous pollution which will affect our children and hence we oppose the project. Due to power plant some agricultural activities like date palm crop are affected but by this project it is sure that gas from copper refinery will affect our health also more make the atmosphere polluted, hence we oppose the project.	7. The impacts due to proposed Copper project have been superimposed on the baseline data to show the cumulative impacts. The predicted impacts after operation of the project are found to be within the prescribed standards for AAQ and hence not expected to have any significant impact on health, agriculture and animal husbandry. Details are available in Chapter 4 of the EIA Report.	7. The solid waste generation and management details are given in Section-2.4.3 of Chapter-2 in the EIA report.
		8. The company, M/s. Adani Enterprise Limited (AEL) is assuring about local employment butthe earlier companies like Tata group has not fulfilled such promises.	8. Local people will be given preference in employment as per eligibility. Skill development programme will be implemented to improve the employability of local people.	8. Employment requirement details during Construction and operation phases is given in Section-8.4 of Chapter-8 in the EIA report.
		9. We have come to know that there will be residue of mercury and this is a toxic chemical element which will spread in the air, so we are representing our appeal to the Government to please set up such plant in any non-populated area.	9. Mercury recovery facility is part of the proposed project. Mercury will not be released in the environment. Details are given in Chapter 2 of EIA Report.	9. The details are given in Chapter 2 of EIA Report.
		10. We have come to know that there are other materials like gold, silver and platinum are also a by-product of the company yet it is useless activity looking the health problem etc. In view of above we request you to kindly	10. Precious metals like gold and silver will be recovered as part of the process. For development of the local community a budget of Rs. 8.0 Crores per year has been provided under Corporate Social Responsibility. The	10. The details of products and by-products are given in Table-1.1 of Chapter-1 in the EIA report.

ANNEXURE-20(b)
PUBLIC HEARING HARD COPY REPRESENTATIONS AND REPLY ALONG WITH THE ACTION PLAN

		recommend the government to take necessary actions as to cancel this project as we do not need industrial development at the cost of public health.	areas of intervention will be education, health & sanitation, sustainable livelihood and rural infrastructure. The penalty mentioned by you pertains to APSEZ and as informed to us same has been withdrawn. We assure you that all the environmental safeguards will be provided during implementation and operation of the project.	
38	Shri Chauhan Pravinsinh Bhurubha, Village: Siraya, Tal. Mundra, Dis. Kutch	Refer Sr.No 37	Refer Sr.No 37	Refer Sr.No 37
39	Shri Jadeja Jaypalsinh M.	Refer Sr.No 37	Refer Sr.No 37	Refer Sr.No 37
40	Shri Turk Husen Ibrahim Nathani, Village Dhrab	Refer Sr.No 37	Refer Sr.No 37	Refer Sr.No 37
41	Shri Turk Ismail Abdul Kadar Jamadar, Village-Dharb	Refer Sr.No 37	Refer Sr.No 37	Refer Sr.No 37
42	Shri Turk Ismail Abdul Rashid Jamadar, Village-Dharb	Refer Sr.No 37	Refer Sr.No 37	Refer Sr.No 37
43	Shri Jadeja Gajendrasinh Bhimaji, Sarpanch, Kapuriya Wadi, Tal: Mundra Kutch	1. Damage caused by Adani Power Plant Project of Adani Enterprise Ltd. a) It is mentioned in point no. 2 of permission granted to Adani Power on dt. 21/10/2008 and point no. 2 of C.R.Z. clearance of Intake and Disposal Facility dt. 29/05/2008 that effluent discharge should be made through pipeline. But effluent discharge is made by constructing open channel by Adani Power. Thus, environment permission is violated. b) The ground water has become more salty due to intake channel construction by Adani Power. c) Breach is found in guideline of coal handling.	The issues raised are for APL and are not related to the proposed project activity therefore we do not offer any comment.	This is outside the scope of the EIA report for the proposed project.

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ANNEXURE-20(b)
PUBLIC HEARING HARD COPY REPRESENTATIONS AND REPLY ALONG WITH THE ACTION PLAN

		d) It is mentioned in condition no. 7 of CRZ clearance that no trouble someness should be caused to the local community due to Intake Channel and Effluent Discharge pipeline. But the roads are closed by Intake Channel and Effluent Discharge pipeline. The road to approach grazing land is closed for cattle breeders are closed and road to approach religious place on sea shore is closed. e) It is mentioned in condition no. 9 of CRZ clearance that no displacement of house of the people or fishermen should be caused due to project. Hindrance should not be caused due to pipeline in coming and going of fishermen and the officer boats. All those fishermen dwelling on old Kotdi Bandar since long are displaced due to intake channel. Open channel is built in place of pipeline for Effluent discharge and as it passes through Kotdi creek, the movement of boats of fishermen is interrupted. Thus, this condition is violated. f) It is mentioned in condition 21 of the environment permission that half yearly compliance report should be submitted. The compliance thereof is not followed. Refer Sl. No. 34	Refer Sl. No. 34	Refer Sl. No. 34
44	Shri Pravinsinh Bhurubha Chauhan, Siracha, Tal. Mundra	Refer Sl. No. 35	Refer Sl. No. 35	Refer Sl. No. 35

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EAC OBSERVATION:

The Chapter-5 consists of only listing of alternative technologies. The committee opined that the PP shall select out of alternative technologies available, based on the selection of the technology, the impact prediction shall be made and mitigation measures shall be proposed.

REPLY:

Adani Enterprises Limited (AEL) has shortlisted **Outotec Flash Smelting** followed with Pierce smith Converting and Anode furnace as its process technology for Copper Smelter Plant.

Copper Smelting Technology:
Various processes available for pyro-metallurgical extraction of copper are as follows.

- Reverberatory smelting – Old & Outdated
- Electric Furnace smelting– Old & Outdated
- Outokumpu Flash smelting (Currently Outotec)
- Furukawa Flash smelting
- INCO Flash smelting
- SKS Smelting – New Emerging
- Noranda process
- Teniente Converter
- Mitsubishi process
- Contop process
- ISAsmelt process
- Ausmelt process
- Vanukov process

Copper Primary Smelting is broadly divided into two categories

- Flash Smelting
- Bath Smelting

Flash Smelting	Bath Smelting
Outokumpu Flash smelting (Currently Outotec)	ISAsmelt process (TSL)
Furukawa Flash smelting	Ausmelt process (TSL)
INCO Flash smelting	Vanukov process
	Mitsubishi process
	SKS Smelting
	Noranda process
	Teniente Converter
	Contop process
	Reverberatory smelting
	Electric Furnace smelting

Review of Smelting Processes:

Smelting Processes	Status of Development		Remarks	
	Industrial Scale operation status	Environmental Performance: Potential & Constraints	Production Level: Potential and/or limitations	Comments
Reverberatory furnace smelting	Established	Limited to a certain extent	Limitation for smelting in one unit	Obsolete technology
Electric furnace smelting	Established	Good	Limitation for production rate	Not suitable for large scale plant
Outotec flash smelting	Established	Good	High smelting rate possible in one unit	Widely accepted as proven technology
Furukawa Flash smelting	Established	Good	High smelting rate possible in one unit	Not widely accepted
INCO flash smelting	Established	Good	Limitation of proven smelting rate per unit	Does not permit flexibility in change of matte grade.
Noranda process	Established	Average	Continuous process for blister Copper production	High copper in slag & high sulphur content in Blister copper
CONTOP (Continuous top blowing process flash furnace)	One plant in operation at ASARCO El Paso, Texas	Average	Less popular and accepted process	
Ausmelt	Established	Good	High smelting rate possible in one unit	Accepted as proven technology
ISA Smelt	Established	Good	High smelting rate possible in one unit	Accepted as proven technology
Mitsubishi process for Continuous copper smelting	Established	Good	So far >200 000 t/yr production level reached	Potential for further development
Vanyukov process	Six industrial scale furnaces in Russia and Kazakhstan	Potentially Good	No Definite analysis available	Information for a substantiated judgement is not available

The above mentioned technologies available for copper smelting were evaluated against factors like investment and operating costs, commercial acceptability, environment considerations, technical considerations like copper recovery, sulphur recovery, flexibility in operation etc.

The following five technologies for smelting of copper concentrates were short listed based on their commercial success for further consideration.

1. Outotec(Outokumpu) Flash smelting
2. Top Submerged Lance (TSL) Smelting
    a. ISA smelt process
    b. Ausmelt Process
3. SKS Smelting Process
4. INCO Flash smelting
5. Mitsubishi process
6. Other less popular smelting

The other processes are not being considered due to reasons like obsolete technology, high energy consumption, environmental problems, poor efficiency etc.

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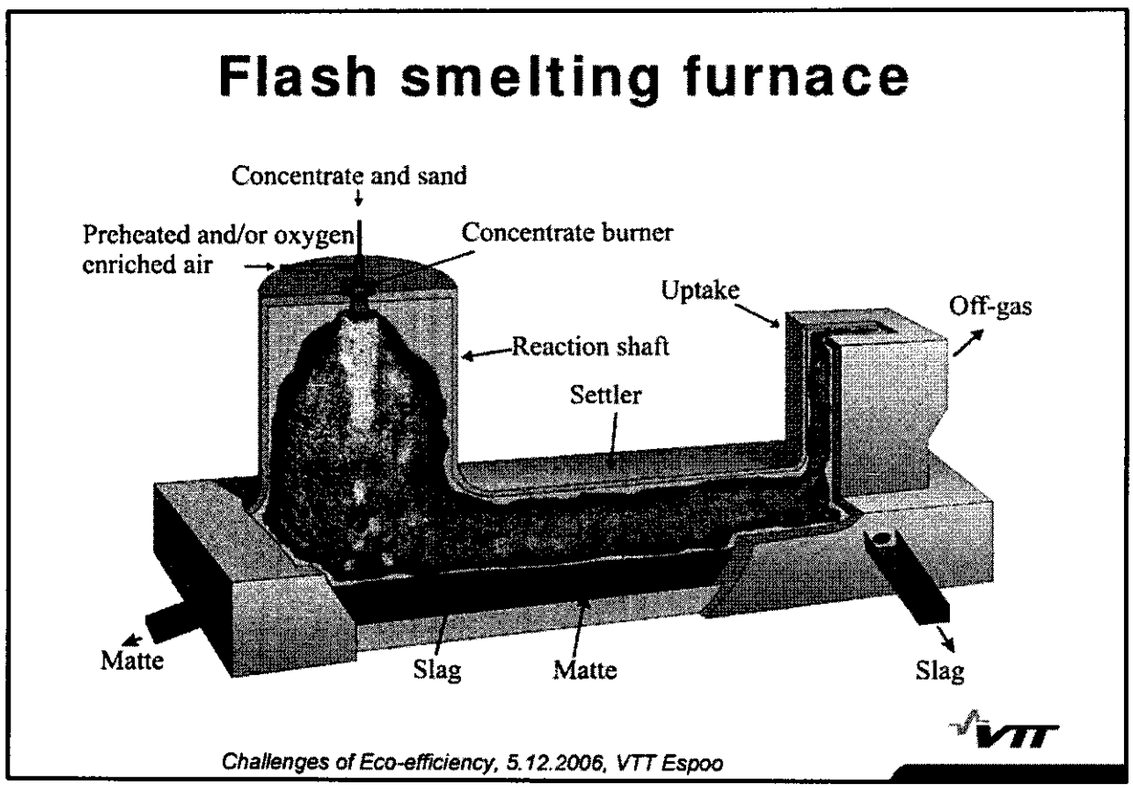
In **Outotec Flash smelting** and **INCO Flash smelting**, smelting reactions take place when the concentrate is in suspension in the furnace, whereas ISAsmelt process and Mitsubishi process, the reactions take place in side of molten bath. In addition to this, first three smelting processes (listed above) are to be integrated with batch operating of converting process to produce blister copper. However, the Mitsubishi process is a continuous process to produce blister copper.

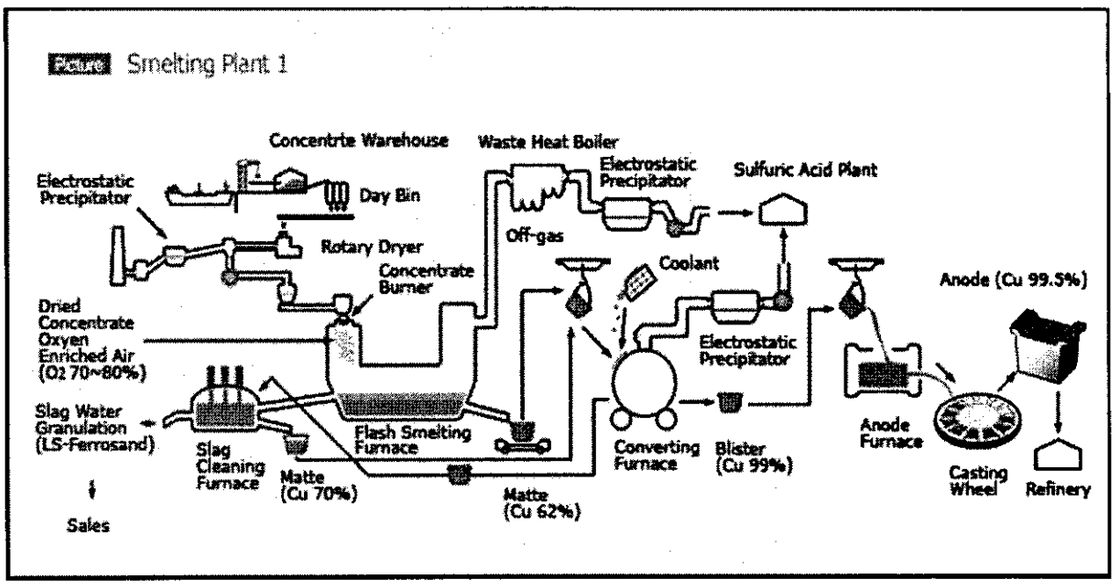
Smelting Technologies:

A. Outotec(Outokumpu) Flash smelting

The first commercial operation based on Flash process was started in 1949. Out of all the processes, Outotec flash smelting process has been the most popular process route of copper smelting. It consists of a flash furnace, waste-heat boiler and electrostatic precipitator, and the structure.

Outotec flash process essentially consists of dispersing and oxidizing a dry concentrate in an oxygen-enriched air stream. The moisture in the concentrate and the flux mix is first removed in a steam dryer and then fed to the Flash Smelting Furnace (FSF). The FSF consists of three main sections: vertical reaction shaft, horizontal rectangular settler and vertical uptake shaft. The reaction shaft is a refractory lined cylindrical shaped tower suspended from the furnace steel frame. The refractory lining is thermally protected by copper cooling water jackets.





A Typical Flash Smelting Furnace

The concentrate burner located at the Reaction shaft head disperses the gas/solid mixture as smelting reactions takes place in the reaction shaft. Molten products and smelting process off-gas are conducted to the horizontal settler part. When the suspension leaves the reaction shaft, the reacted molten concentrate particles and inert flux particles are separated from the gas stream and flow towards molten slag and matte.

In the molten bath, the reactions are almost completed and matte and slag will be settled at the settler of the furnace as respective layers due to their different density – a lighter slag phase rich in iron and a heavier matte phase rich in copper. The settler is rectangular, refractory lined box sitting on concrete base. The settler walls and roof are also protected by copper cooling water elements. In the furnace settler matte and slag layers are formed and separated.

The process off-gases are conducted further to the uptake shaft. The latest furnace settler section is capable of extending further in the reaction shaft end than usual. The roof in this part of the settler is lower than in other parts of the settler. It is possible to install feeders in this portion which may be used to feed coke and electronic scrap if required. The idea is to partially reduce the slag already in the section, which reduces the burden of cleaning the slag in electric furnace.

The uptake shaft is a vertical, refractory lined / cooling jacket structure at the other end of the settler. The uptake shaft leads the FSF process off-gases to the waste heat boiler. The uptake shaft is also suspended from the rigid steel frame surrounding the furnace.

Matte tapping holes are located on the settler side wall. Matte is periodically tapped through matte tapping hole via matte launder to ladles. The matte ladles are transported to Peirce Smith converters by bridge crane.

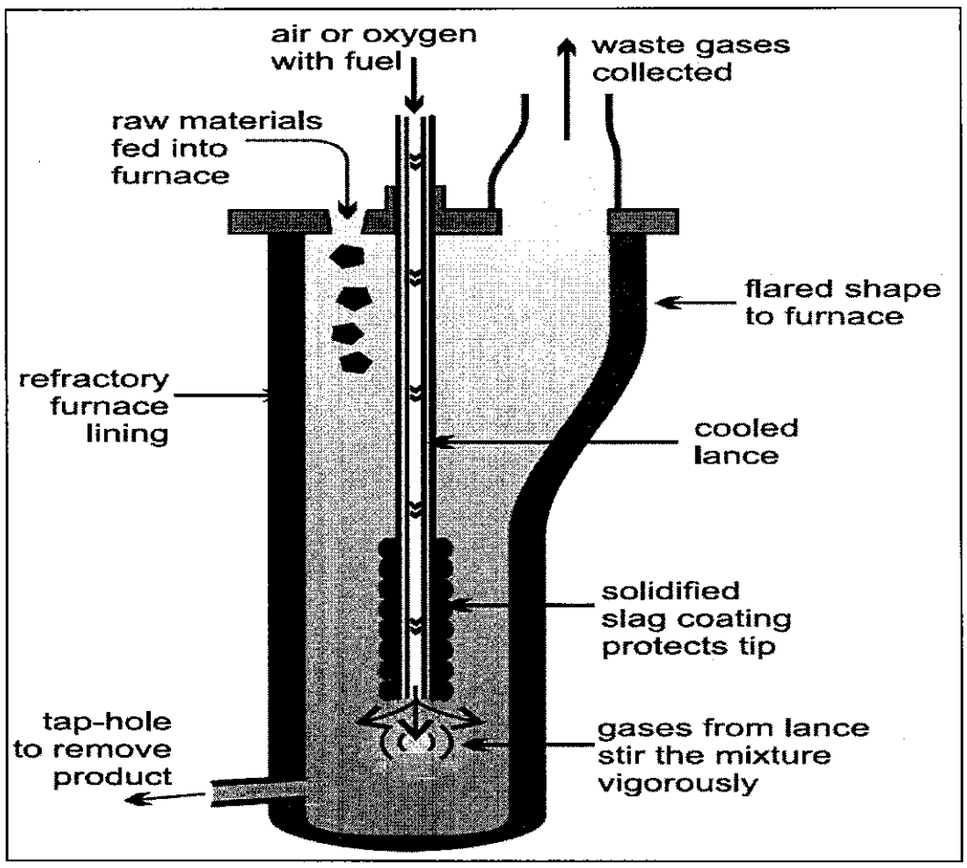
B. Top Submerged Lance Smelting

The top submerged lance smelting process for the extraction of copper from its sulphidic concentrates is done in a vertical cylindrical, refractory brick lined, flat roofed furnace vessel. The moist solid concentrate is fed into the tall cylindrical furnace. The oxygen enriched air and fuel is fed to the molten mixture of slag and matte called bath through a vertical lance which is actually "pipe within pipe" assembly. The products of the process are matte/slag mixture and strong SO_2 off gas.

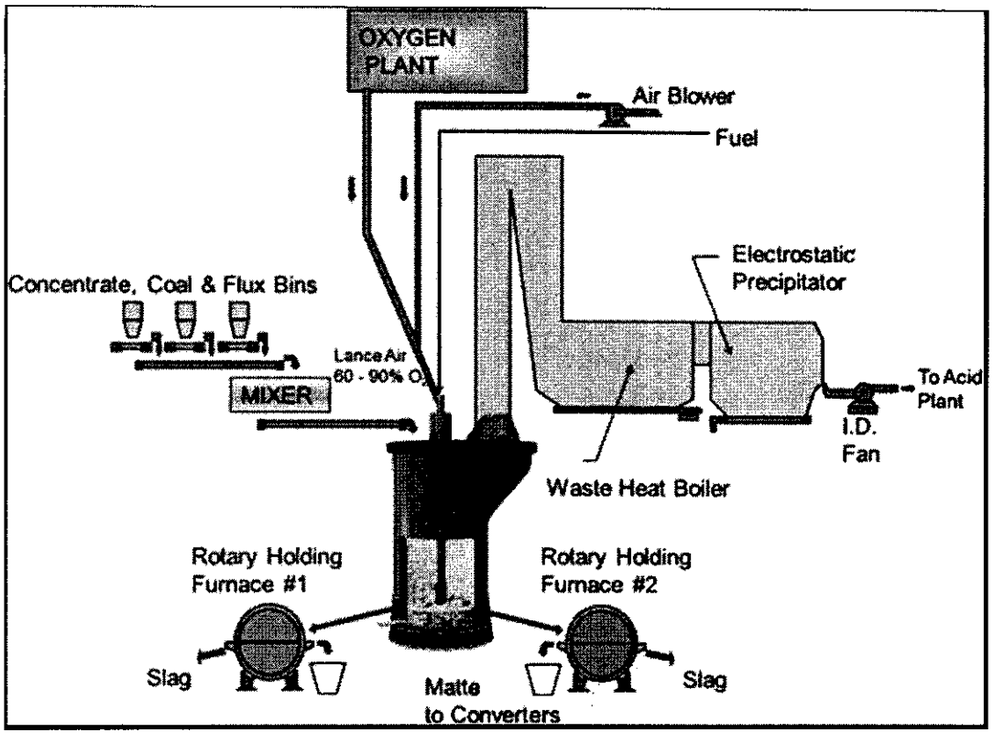
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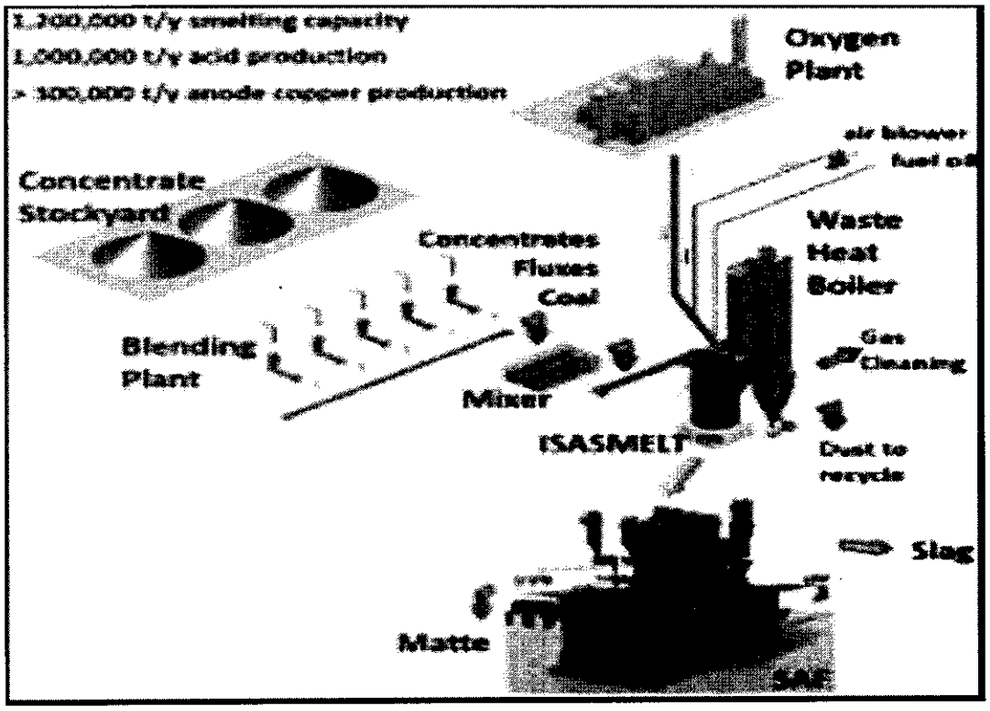
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The process was initiated in 1971 by Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) for investigating the process of injecting coal into tin slags to improve the reduction kinetics. This research led to the development of technology suitable for a variety of pyro-metallurgical applications, including smelting and converting of sulphide concentrates. Different organisations used this process for research and improvement and presently two separate organisations, successfully operates and provides the process technology known as Isamelt (owned by Glencore Technology) and Ausmelt (owned by Outotec). Both smelting are based on the TSL technology with little difference in the process and design.



A TYPICAL ISASMELT FURNACE





The matte/slag mixture is tapped periodically by Isamelt process whereas it is fed continuously to another furnace by Ausmelt process. The SO_2 rich off-gas is passed through a heart recovery boiler and electrostatic precipitator before sending it to the sulphuric acid plant. A small amount of oxygen is added above the bath to ensure the sulphur leaves the furnace as SO_2 rather than Sulphur. This prevents sulphur condensation in the gas cleaning system. In Ausmelt furnace, this is done using the outermost pipe in the lance assembly, known as shroud. Isamelt furnace accomplish this by injecting air in the freeboard area of the furnace.

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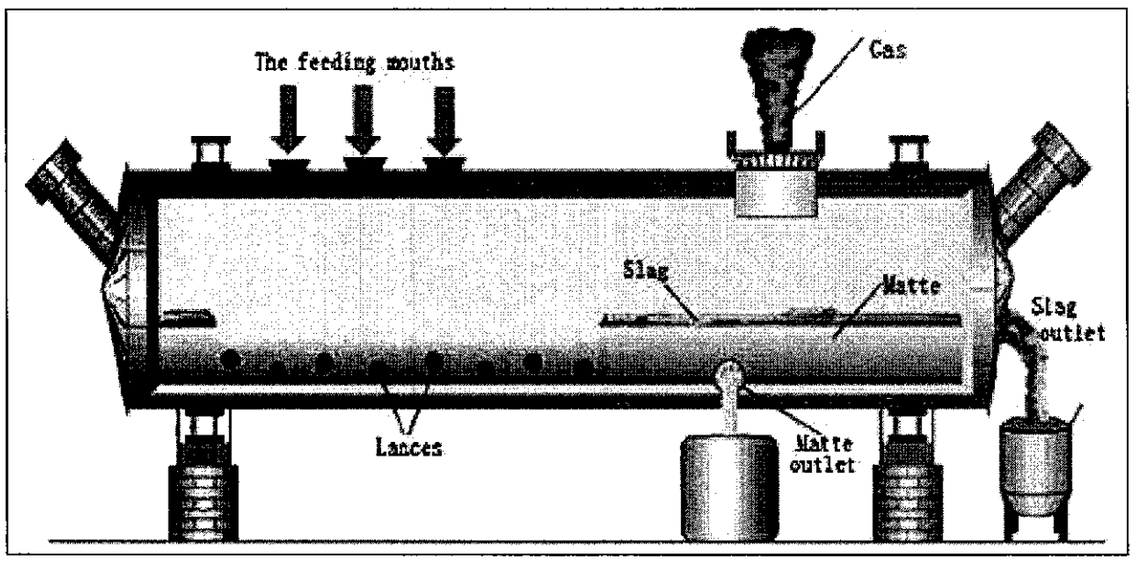
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The products of the ISASMELT process, matte and slag mixture are tapped periodically from the bottom of the furnace through a water-cooled copper tap hole. The liquid matte (63% Cu) and slag flow into an Electric slag cleaning furnace (ESCF) or Rotary Holding furnace (RHF) via a launder.

C. SKS Smelting Furnace

The SKS copper smelting process was jointly developed by huikoushan Mining Corp. and ENFI (Beijing Central Engineering and Research Institute for Non-ferrous Metallurgical Industries) in China. It is a new bath copper concentrate smelting process with oxygen enriched air. The pilot plant test work was completed successfully in 1993. SKS has demonstrated to be an advanced bottom blown smelting process. This technology got the First-Class Prize of Scientific and Technological Progress awarded by CNNC (China National Non-ferrous Metal Industry Corp.) in 1994.

The SKS process has significant capital and operating cost advantages. Its environmental and industrial safety and hygiene performance represents a substantial improvement when compared to conventional technologies. The technology has generated great interest in the Chinese metallurgical industry. Feasibility studies and basic designs have been carried out to incorporate in retrofit and green field smelter projects in China and abroad.



A TYPICAL SKS FURNACE

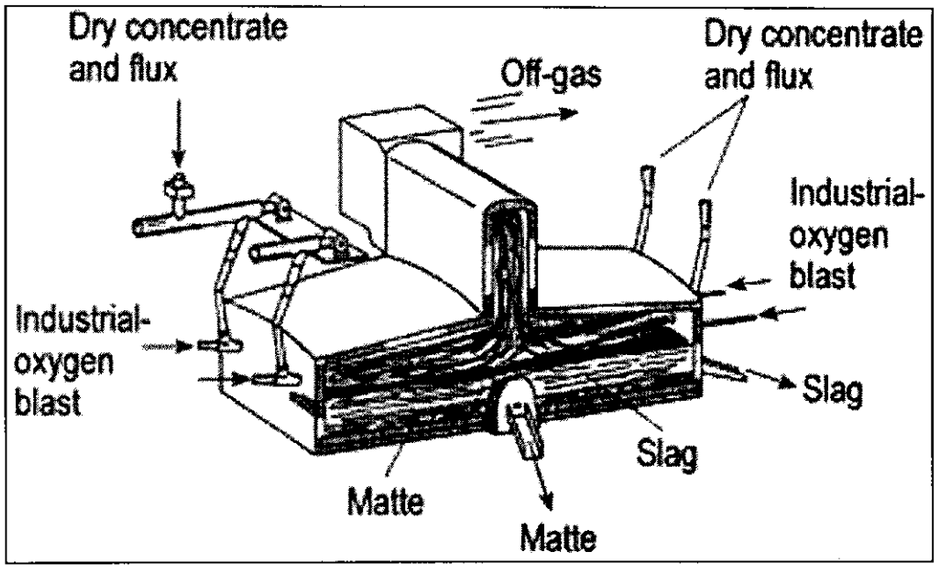
The SKS furnace is a horizontal cylindrical reactor however, the oxygen enriched air is blown into the furnace from the bottom. Mechanism model of the SKS process was developed by analyzing the smelting characteristics deeply. The furnace section from top to bottom is divided into seven functional layers, i.e., gas layer, mineral decomposition transitioning layer, slag layer, slag formation transitioning layer, matte formation transitioning layer, weak oxidizing layer and strong oxidizing layer.

The furnace along the length direction is divided into three functional regions, that is, reaction region, separation transitioning region and liquid phase separation and settling region. These layers or regions play different roles in the model in describing the mechanism of the smelting process. The SKS smelting is at a multiphase non-steady equilibrium state, and the oxygen and sulfur potentials change gradually in the length and cross directions. The smelting capacity of the SKS process could be raised through reasonably controlling the potential values in different layers and regions.

D. INCO process

The furnace was developed by the International Nickel Company ('INCO') for processing Nickel but later it was used for copper smelting also. The first commercial operation based on INCO process was started in 1952. Presently, the process is in operation in three copper smelters in North America.

This furnace has a different concentrate feed design compared to the Outokumpu flash furnace. The Inco flash furnace has end-wall concentrate injection burners and a central waste gas off-take, while the Outokumpu flash furnace has a water-cooled reaction shaft at one end of the vessel and a waste gas off-take at the other end. While the INCO flash furnace at Sudbury was the first commercial use of oxygen flash smelting,fewer smelters use the INCO flash furnace than the Outokumpu flash furnace.



A TYPICAL INCO FLASH FURNACE

INCO process has higher operating cost and marginally lower investment cost compared to Flash process. The process utilises commercial oxygen for copper smelting. As a result, low volume of high strength sulphur dioxide gases are produced, which are favourable for sulphuric acid or liquid sulphur dioxide production.

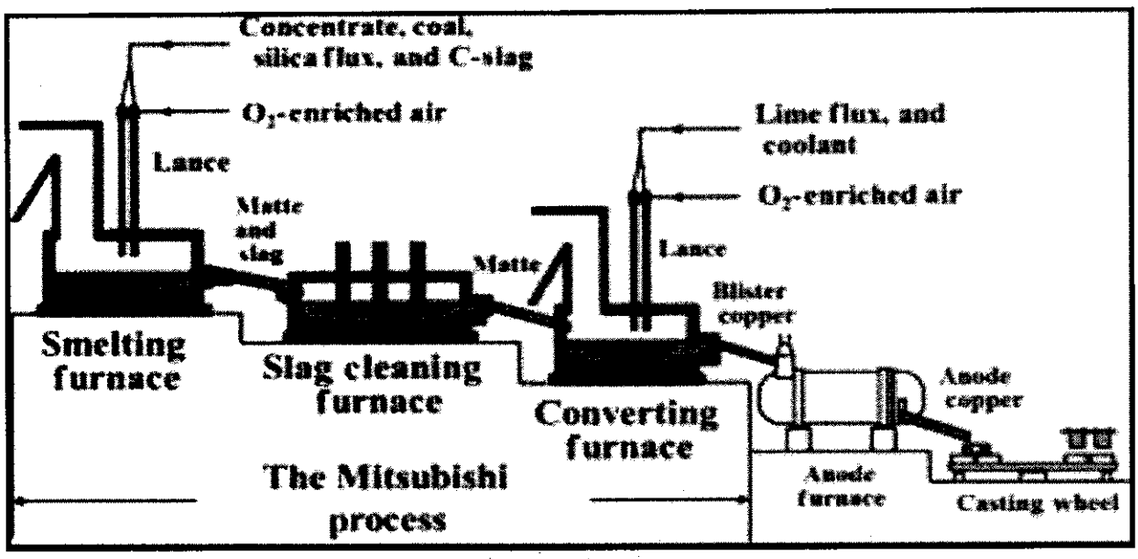
The INCO process does not permit much flexibility in change of matte grade. The matte grade produced is comparatively lower resulting in more processing time in downstream converting process. Though the process is fairly established, yet it has not been widely adopted.

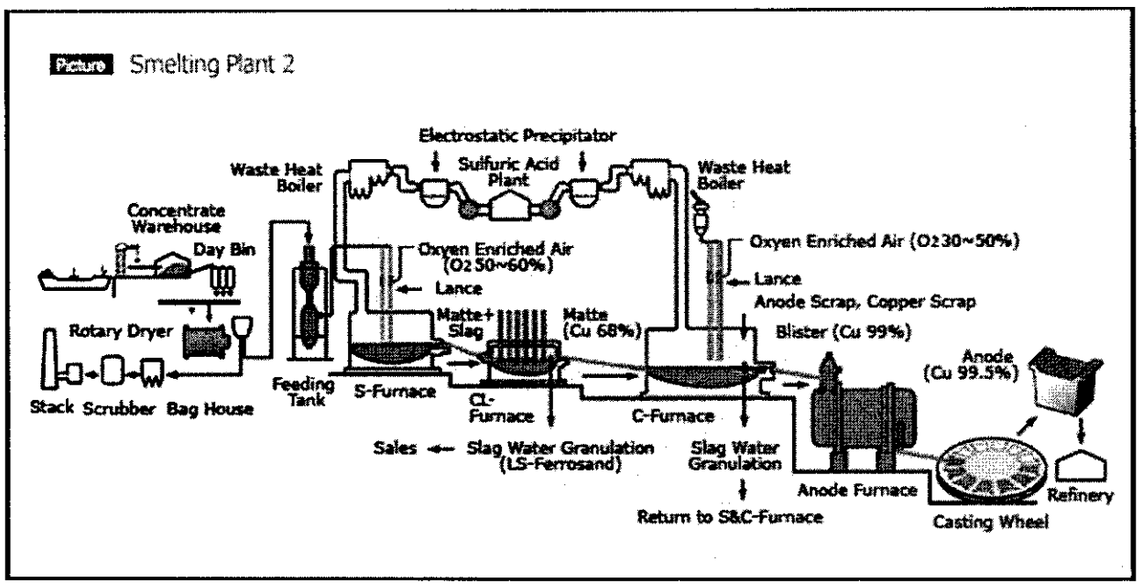
E. Mitsubishi Process

The first commercial operation based on Mitsubishi process was started in 1974. Mitsubishi process is an integrated continuous process for production of blister copper from concentrates, making use of three interconnecting furnaces in which metal flow takes place through launders by gravity.

The process has the advantage that it is a continuous one and supplies steady sulphur dioxide gas to acid plant, high copper recovery, flexibility in treating varying concentrate grade, comparatively lower in investment cost, compact, less fugitive emissions, but higher in operating cost. The process stabilization time is comparatively more than other processes and operation is complex.

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A Typical Mitsuibishi Furnace

Mitsubishi process is an integrated continuous process for production of blister copper from concentrate, making use of three interconnecting furnaces by launders through the metal flow in gravity. At Naoshima, Japan first commercial installation was started on 1974.This process has been adopted in four smelters world wide- at Japan, Canada, Indonesia and India. Though the process has been commercially adopted, it is not so popular due to requirement long period for stability of process and complicated operation of converting process.

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World Top Copper Smelters:

S.N.	Smelter	Country	Operator/Owner(s)	Process	Concentrate Source	Capacity (KTPA)
1	Guixi (smelter)	China	Jiangxi Copper Corp.	Outotec Flash	Imported Concentrate	900
2	Birla Copper (Dahej)	India	Birla Group (Hindalco)	Outotec Flash, Ausmelt (Demolished), Mitsubishi Continuous	Imported Concentrate	500
3	Chuquicamata (smelter)	Chile	Codelco	Outotec &Teniente converter	Capitive Mine	450
4	Hamburg	Germany	Aurubis	Outotec, Contiment, Electric	Imported Concentrate	450
5	Besshi/Ehime (Toyo)	Japan	Sumitomo Metal Mining Co. Ltd.	Outokumpu Flash	Imported Concentrate	450
6	Saganoseki/Ooita (Smelter)	Japan	Pan Pacific Copper Co.Ltd.	Outotec Flash	Imported Concentrate	450
7	El Teniente (Caletones)	Chile	Codelco Chile	Reverberatory/Teniente Conv	Capitive Mine	400
8	Jinchuan (smelter)	China	Jinchuan Non-Ferous Metal Co.	Reverberatory/Kaldo Conv	Imported Concentrate	400
9	Jinchuan (Fangchenggang smelter)	China	Jinchuan Non-Ferous Metal Co.	Outotec Flash	Imported Concentrate	400
10	Jinguan (smelter)	China	tongling Non-Ferrous Metals Group	Outotec Flash	Imported Concentrate	400
11	Xiangguang copper (smelter)	China	Yanggu Xiangguang Copper Co.	Outotec Flash	Imported Concentrate	400
12	Sterlite Smelter (Tuticorin)	India	Vedanta	Isasmelt Process	Imported Concentrate	400
13	Norilsk (Nikelevy, Medny)	Russia	Norilsk Nickle	Reverb, Electric, Vanyukov	Capitive Mine	400
14	Pirdop (smelter)	Bulgaria	Aurubis (99.77%)	Outotec Flash	Imported Concentrate	360
15	Ilo Smelter	Peru	Southern Copper Corp. (Grupo Mexico 75.1%)	Isasmelt Process	Capitive Mine	360
16	Onahama/Fukushima	Japan	Mitsubishi Materials Corp & Metals & Resources Co. Ltd	Mitsubishi/Reverb	Imported Concentrate	354
17	Jinlong (Tongdu)	China	Tongling Nonferrous Metals Corp. (57.4%); Sumitomo (35%), Pingguo	Outotec smelter	Imported Concentrate	350
18	Yunnan	China	Yunnan Copper Industry Group (Local Government)	Isasmelt Process	Imported Concentrate	350
19	Kansanshi (smelter)	Zambia	First Quantum Menerals Ltd.	Isasmelt Process	Capitive Mine	350
20	Naoshima/Kagawa (smelter)	Japan	Mitsubishi Materials Corp.	Mitsubishi Continuous	Imported Concentrate	342

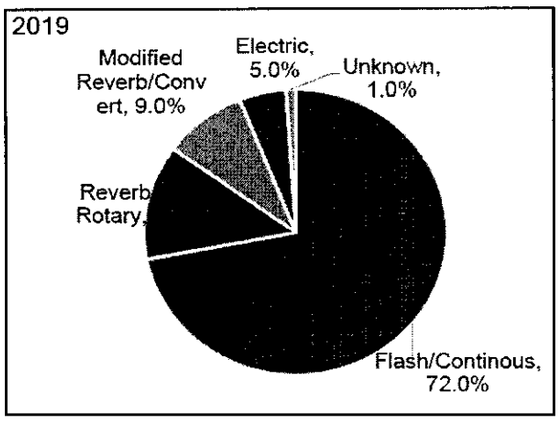
Source: Copper Fact book – 2018, International Copper Study Group

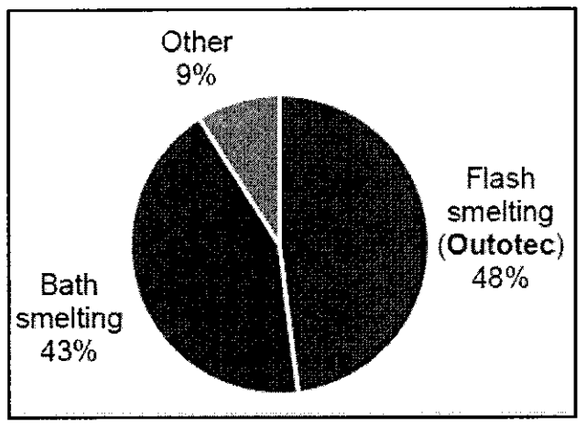
Based on the above table, it shows that large capacity plants which are operating with imported copper concentrate are based on flash smelting technology.

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Copper smelting process distribution





Smelting Technology wise Copper smelter installation in the world:

Technology	Flash Smelting (FSF)	Top Submerged Lance Smelting (TSL)	Mitsubishi Smelting	Bottom Blowing Smelting (SKS/BBS)	Side Blowing Smelting (SBS)
Country of Origin	Finland	Australia	Japan	China	China
Number Of Plants in World	39	21	5	12	11
Total Capacity In World(kt/a)	8787	3191	1475	1350	900
Number Of Plants in Europe	12	3	0	0	0
Total Capacity In Europe(kt/a)	2300	194	0	0	0
Number Of Plants in America	5	2	0	0	0
Total Capacity In America (kt/a)	1390	496	0	0	0
Number Of Plants in Australia & SEA	7	1	5	0	0
Total Capacity In Australia & SEA (kt/a)	1400	218	1250	0	0
Number Of Plants in Africa & Middle East	4	3	0	0	0
Total Capacity In Africa (kt/a)	800	553	0	0	0
Number Of Plants in India	3	1	1	0	0
Total Capacity In India(kt/a)	197	350	225	0	0
Number Of Plants in China	8	11	0	12	11
Total Capacity In China(kt/a)	2700	1380	0	1350	900

Current Market Trends:

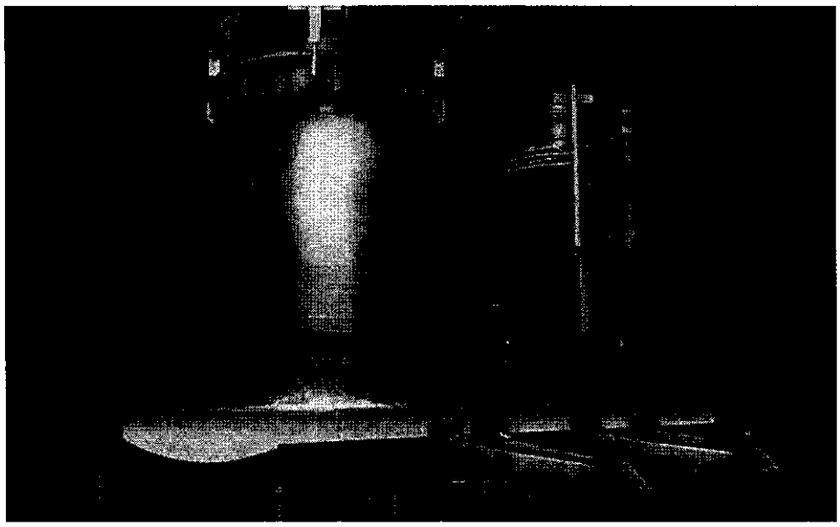
Based on the current market trends, Flash Smelting Furnace (FSF) and Top Submerged Lance (TSL) furnace technology has been evaluated further.

A. Flash Smelting (FSF)

Flash Smelting Technology was developed by Outokumpu in the early 1950s, which was first used for copper smelting, and then for nickel smelting. In flash smelting process dried concentrate particles mixed with flux material (Silica sand and Limestone powder) is flashed in the reaction shaft of the furnace around 1250 Deg C in an oxidising environment to change the state of matter from solid to liquid (Matte & Slag) and gas (SO_2). The process takes place with concentrate particles in suspension.

Advantages:

a) Chemical reaction of feeds mainly takes place in the high-temperature central burner, with high reaction temperature, fast reaction speed, strong smelting strength, and high production efficiency.
b) Copper concentrates are deeply dried before being fed into the furnace, with full utilization of heat from oxidation of S and Fe, and heat from slag forming, therefore the heat efficiency is high.
c) Enriched oxygen is blown for strengthened smelting, thus smelting offgas volume is stable with little fluctuations, and SO_2 concentration is high;



d) Central burner is lined with water-cooling jacket, so service life of furnace is long;
e) High overall availability of the smelting system;
f) Continuous and computer-controlled operation, with high mechanical and automation level;
g) Good furnace sealing, with little SO_2 low-latitude pollution and good operating environment.
h) Little energy consumption of blower, since low pressure air blowing is adopted.
i) Large single-line production capacity, suitable for smelters with large capacity.

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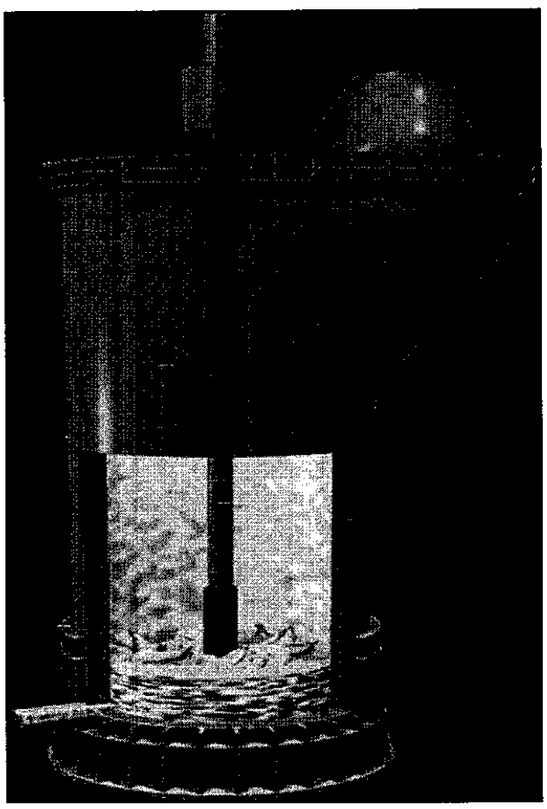
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Disadvantages:

a) Strict requirements on feeds: feeds shall be powder or ground before being fed into furnace.
b) Deep drying (Moisture <0.3%) is required for feeds, therefore, equipment such as flux preparation, and concentrate dryers shall be equipped, which has high capital cost and high steam consumption (steam generated from the waste recovery boiler is being used), and prevents the system to maximally utilize its self-generated energy to gain economic returns.
c) High dust rate, normally around 6%, therefore material recycling amount is large.
d) Furnace structure is complicated, with many spots for water cooling, therefore capital cost is high.

B. Top Submerged Lance (TSL) Smelting:

Top Submerged Lance Smelting (TSL Smelting) Technology was developed by Australian metallurgists in early 1990s and was first applied for a lead smelter in Australia. Later, TSL process was applied in Copper, Lead, Tin, Nickel smelting, as well as Zinc residue treatment, and lead slag treatment, etc.



Advantages:

a) Simple and short process. Copper concentrates with about 10% moisture, together with fluxes and coal can be directly fed by feeder into the furnace bath, where the melt has good mass and heat transfer conditions, therefore, the process has strong smelting strength, high productivity and can be easily operated.
b) Flexibility to feed types. Since there is no strict requirements on feed particle size and moisture, the furnace can smelt both powders and bulks (size <15mm

upto 10% of the total feed). It also allows certain fluctuations on feed contents. Due to the easy control and adjustments on smelting operation conditions, the process is suitable for treating various kinds of complex feeds.

c) Simple furnace structure. The furnace is a fixed upright-cylindrical vessel, with good sealing and less heat loss during smelting, thus can fully utilize heat from chemical reactions of feeds.
d) Flexibility to fuel types: no special requirements on the types and quality of fuels, so cheap fuels which can be purchased easily can be used.
e) Enriched oxygen is blown for smelting, thus SO2 concentration in offgas is high, which can be economically recovered, is good for sulfuric acid production and environmental protection.
f) Dust rate is around 2%, since concentrates are palletised before being fed into the furnace, and agitation in the furnace hearth is intense which has effective capturing effects over dusts. Low dust rate is beneficial to boiler operation.

Disadvantages:

a) Low availability: Lance is easily worn and has to be repaired on a regular basis, so lance life affects the availability of the plant. Its availability is lower than Flash Process;
b) Short lance life: the average lance life is 7-18 days;
c) High operating cost: there should be a separate electric furnace for separating matte and slag, and reductant coal is also needed during smelting process, therefore the operating cost is high;
d) High oxygen potential of slag, and foaming slag is very likely to be produced during smelting;
e) Difficult and complicated control of lance position;
f) Intense agitation of the smelting furnace leads to bad settling conditions, so a separate electric furnace shall be equipped to settle slag and matte.
g) Higher Gas Volume due to addition of Copper Concentrate with @ 8% Moisture.
h) Higher moisture content and high impurities in gases increases Effulent Treatment plant capacity and increased generation of the Arsenic Bearing Sludge (ETP Hazardous Cake)

Energy Comparison between the Smelting Technologies:

Smelting Technology	Electric Energy (MJ/tonne Anode)	Thermal Energy (MJ/tonne Anode)	Total Energy (MJ/tonne Anode)
Flash - Flash	9,266	1,518	10,784
Isa Smelt	6.903	4,175	11,078
Mitsubishi	8,508	2,498	11,006
Noranda-Teniente	10,088	2,657	12,746

Source: Energy Consumption in Copper Sulphide Smelting- P.Coursol & P.J.Mackey - Xstrata Process Support Centre & C.M.Diaz - University of Toronto – Proceedings of Copper 2010

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Table 4. Process Area electrical energy consumptions per process configuration

Process Area	FSF-FCT	FSF-PS	TSL-PS	BBS-BCC	MS-MC	Unit
Smelting Feed Preparation	5 322	5 391	561	275	4 828	MWh/a
Concentrate Smelting	14 800	14 755	25 140	65 037	40 874	MWh/a
Smelting Slag Cleaning	37 286	36 653	36 607	37 646	35 936	MWh/a
Converting Feed Preparation	9 845	47	47	0	0	MWh/a
Matte Converting	9 812	14 142	14 244	31 635	25 385	MWh/a
Converting Slag Treatment	1 886	2 696	2 695	2 433	1 758	MWh/a
Fire Refining and Casting	2 175	2 125	2 127	2 209	2 197	MWh/a
Secondary Gas Handling	2 756	6 536	6 546	3 643	3 366	MWh/a
WGC and Acid Making	58 024	62 291	64 804	64 764	60 962	MWh/a
SUB TOTAL	**141 906**	**144 635**	**152 769**	**207 642**	**175 306**	**MWh/a**
Per t of primary concentrate	141.9	144.6	152.8	207.6	175.3	kWh/t
Per t of anode copper	529.1	539.3	569.6	774.2	655.7	kWh/t

Source: UNDERSTANDING ELECTRICAL ENERGY USE AT COPPER SMELTERS - Lauri Pesonen - Outotec (Chile) S.A.

Greenhouse Gases: (Source: Outotec Technical Document)

For greenhouse gas emissions, CO_2 is considered as the relevant emission. Other potential greenhouse gases include:

- Water vapour, H_2O (not considered global warming pollution due to short lifetime in atmosphere)
- Methane, CH_4 (not emitted from smelter operations)
- Nitrogen oxides, N_2O, NO_x (will generally end up in the sulphuric acid, not in the atmosphere)
- Ozone, O_3 (not emitted from smelter operations)

CO_2 emissions from the primary smelting operations can be the result of:

- Burning fossil fuels
- CO_2 released from the raw materials (decomposition of carbonates)

	FSF-PS	ASF-PSC	Units
CO_2 from coal	0	51000	t/a
CO_2 from limestone	0	31500	t/a
CO_2 from fuel oil	577	459	t/a
Total	**577**	**82959**	t/a

Considering the various parameters **Flash Smelting technology** is selected based on the following:

1. Provenness of Technology – **More than 7 Decades**
2. Reference list of the plant – **39 Operating Plant**
3. Similar Capacity plants (~ 400 KTPA Copper) – **11 Nos**
4. Lower Electrical power consumption
5. Lower greenhouse gases emission
6. Environmental Performance
   a. Lower greenhouse gases emission
   b. High Capture of SO_2 Gas & Conversion Efficiency
   c. Low Hazardous waste generation from ETP
7. Flexibility in handling wide range of Raw Material
8. Recovery Efficiency
9. Operational flexibility

10. Annual Plant Availability – 90-92%

Copper smelter installations (Flash SMELTING)				
Year	Plant Location	Name of The Company	Country	Annual production of copper
2017	Sarcheshmeh	National Iranian Copper Industries (NICICO)	Iran	80,000
2017	Khatoon Abad	National Iranian Copper Industries (NICICO)	Iran	275,000
2014	Bor	Rudarsko Topioicarski Basen	Serbia	80,000
2013	Fangchenggang,Guangxi	Jinchuan Non-Ferrous Metals Co	China	400,000
2012	Tongling,Anhui	Tongling Non-Ferrous Metals Group	China	400,000
2011	Shanghang,Longyan,Fujian	Zijin Copper Co. Ltd	China	400,000
2011	Jinchuan,Jinchang,Gansu (Ni/Cu)	Jinchuan Non-Ferrous Metals Corp	China	150,000
2007	Guixi	Jiangxi Copper Corporation	China	480,000
2007	Shandong	Yanggu Xiangguang Copper	China	400,000
2004	Khatoon Abad	National Iranian Copper Industries Co.	Iran	80,000
2000	Rönnskär	Boliden Mineral AB	Sweden	160,000
1999	Onsan	LS-Nikko Copper Inc.	SouthKorea	200,000
1998	Dahej, Gujarat	Hindalco Birla Copper	India	180,000
1997	Tongling, Anhui	Jinlong Copper Company (JV Sumitomo)	China	450,000
1995	Salt Lake City	Kennecott Utah Copper Corp.	USA	275,000
1995	Chagres	Anglo American	Chile	175,000
1989	La Caridad, Sonora	Grupo Mexico	Mexico	210,000
1988	San Manuel	Magma Copper Co.	USA	200,000
1988	Chuquicamata, Calama	Codelco,	Chile	300,000
1987	Srednogorie	MDK G Damianov	Bulgaria	375,000
1986	El Tajo	Mexicana de Cobre SA	Mexico	210,000
1985	Guixi	Jiangxi Copper Corporation	China	480,000
1983	Isabel	Philippine Associated Smelting & Refining Co.	Philippines	200,000
1982	Camacari, Bahia	Paranapanema S.A.	Brazil	240,000
1982	Camacari	Caraíba Metais SA	Brazil	240,000
1981	Norilsk	Norilsk Mining & Metallurgical Co.	Russia	
1979	Onsan (LS-Nikko)	Korea Mining & Smelting Co Ltd.	SouthKorea	200,000
1976	Playas	Phelps Dodge Corporation	USA	
1975	Minera Sur Andes	Minera Sur Andes	Chile	175,000
1975	Huelva (Atlantic Copper)	Rio Tinto Minera SA	Spain	330,000

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Copper smelter installations (Flash SMELTING)				
Year	Plant Location	Name of The Company	Country	Annual production of copper
1974	Khetri	Hindustan Copper Ltd.	India	190,000
1973	Tennant Creek	Peko Wallsend Metals Ltd.	Australia	
1973	Samsun	Karadeniz Bakir Isletmeleri AS	Turkey	
1972	Pirdop	Aurubis	Bulgaria	375,000
1972	Saganoseki	Nippon Mining Co Ltd.	Japan	
1972	Hitachi	Nippon Mining Co Ltd.	Japan	
1972	Hamburg	Norddeutsche Affinerie AG	Germany	330,000
1972	Tamano	Hibi Kyodo Smelting Co Ltd	Japan	320,000
1972	Mount Morgan	Peko Wallsend Metals Ltd.	Australia	
1971	Ghatsila	Hindustan Copper Ltd.	India	20,000
1971	Toyo	Sumitomo Metal Mining Co Ltd.	Japan	450,000
1970	Huelva	Freeport-McMoran	Spain	330,000
1967	Kosaka	The Dowa Mining Co Ltd.	Japan	
1966	Baia Mare	Combinatul Chimico Metalurgic	Romania	
1962	Kokkola	Outokumpu Oy,	Finland	
1960	Isabel, Leyte	Pasar Copper Smelter	Philippines	200,000
1956	Ashio	Furukawa Co Ltd.	Japan	
1949	Harjavalta	Outokumpu Oy	Finland	150,000

Copper/Nickel smelter installations (ISASMELT)				
Year	Plant Location	Name of Company	Country	Capacity of copper concentrate (t/a)
2015	La Oroya	Doe Run Peru	Peru	280,000
	Solwezi	First Quantum	Zambia	1,200,000
2011	Liangshan	Yunnan Copper	China	500,000
	Ust-Kamenogorsk	Kazzinc JSC	Kazakhstan	290,000
2009	Chambishi	Yunnan Copper	Zambia	350,000
	Chuxiong	Yunnan Copper	China	500,000
2007	Ilo	Southern Copper Corporation	Peru	1,200,000
2006	Mufulira	Mopani Copper Mines	Zambia	650,000
2005	Tuticorin	Vedanta	India	1,200,000
2002	Kunming	Yunnan Copper	China	800,000
1996	Tuticorin	Vedanta	India	500,000
1992	Mount Isa	Mount Isa Mines Limited (MIM)	Australia	1,000,000
1992	Arizona	Freeport McMoRan Miami	USA	700,000
1991	Radio Hill	southern Copper Corporation	Australia	60,000
1987	Mount Isa	Mount Isa Mines Limited	Australia	120,000

Outotec Flash Smelting: In Outotec flash smelting process copper concentrate and flux additives need to have moisture content to the level of < 0.3% moisture. Moisture in the feed mix is around 8%, which is reduced to <0.3% with the help of rotary steam dryer; which is fitted with bag filter to collect the dried dust particles. Dried feed mix is conveyed with the help of pneumatic conveying system to the smelting furnace through day bin system. Day bins are also equipped with bag filters.

Smelting furnace is thoroughly sealed and is under negative draft for evacuating the generated process gases with the help of ID Fan through waste heat recovery boiler and hot gas electrostatic precipitator through closed gas ducting to Sulphuric Acid plant for production of the Sulphuric Acid.

Flash furnace is having settler to segregate the Matte and Slag. Copper Matte is tapped from the settler of flash furnace to the ladles and copper slag is tapped to electric furnace for further treatment of the copper slag to reduce the copper content < 1%. Fugitive gases from the Furnace Tapping are collected by hood system with the help of ID Fan. Fugitive gases will be treated first in the bag filter to collect the dust in the gases and later will be scrubbed in the scrubber, before releasing to atmosphere through stack.

Matte from the Flash furnace settler and electric furnace will be transported with the help of ladles to pierce smith converter for production of Blister Copper (> 98% Cu) and Slag produced will be returned back to electric furnace & slag cleaning furnace for recovery of the Copper. PS Converter furnace is under negative draft for evacuating the generated process gases with the help of ID Fan through waste heat recovery boiler and hot gas electrostatic precipitator through closed gas ducting to Sulphuric Acid plant for production of the Sulphuric Acid.

Blister Copper from PS Converter will be transported with the help of ladles to Anode Furnace for production of Anode Copper (> 99% Cu) and onwards to anode casting wheel for production of Copper anodes. Copper Anodes is the input material for Copper Refinery for production of Copper Cathode (> 99.99% Cu).

Fugitive emissions from all the furnaces are collected and treated in the flue gas desulfurization system. Residual gases post desulphurisation are released to atmosphere through well designed stack meeting the statutory standards.

Equipment such as Electric Furnace, waste heat recovery boiler, hot gas electrostatic precipitator, ID Fan, gas cleaning plant of the sulphuric acid plant, effluent treatment plant and fugitive gas handling system inclusive of flue gas desulphurisation system will be designed and sized to meet the regulatory norms.

The drawing of the various mitigation measures provided in **Annexure-21(Drawing 1 to 7)**.

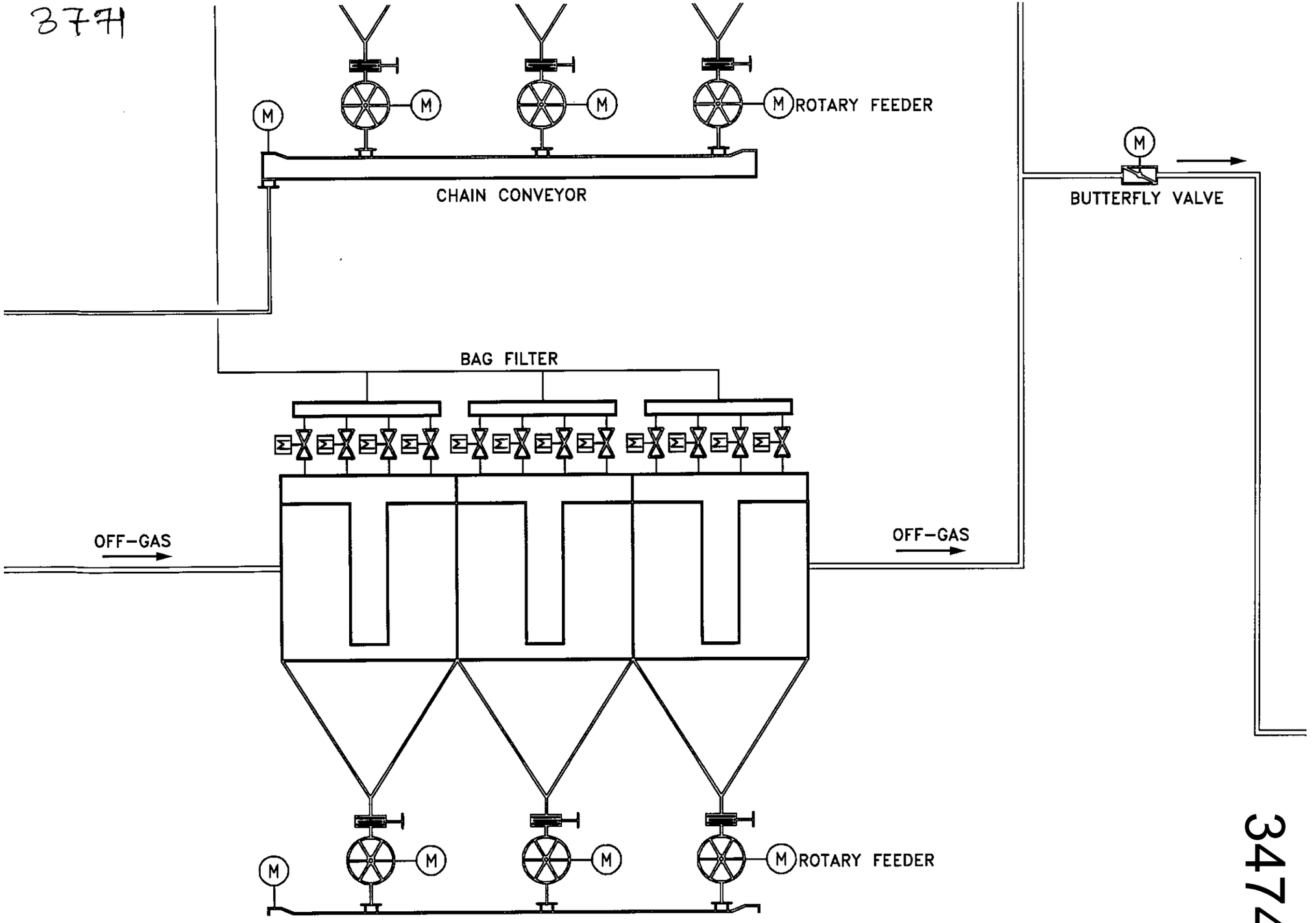
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Sr. No.	Parameter	Flash Technology	Mitigation Measure	Support Document
1	Concentrate Feed Mix	Dry – Moisture < 0.3% Q: ~ 62,150 Nm^3/Hr	Bag Filter and pneumatic Conveying for recycling within the process	Drawing No. 1
2	Smelting Furnace Off Gas Handling	ID Fan is used to evacuate through WHRB and Hot gas electrostatic precipitator to Sulphuric Acid Plant Q: ~111,994 Nm3/Hr	Sizing of the equipment (WHRB, HESP, ID Fan and Effluent Treatment Plant) based on the Gas Volume. Dust in the gas is recovered and pneumatic Conveying system is used for recycling.	Drawing No. 2
3	Fugitive emissions from Smelting furnace and electric furnace metal tapping and ladles	Fugitive Emission No of Metal Tap Hole: 8 (3 Operating at a time) Q: ~300,000 Nm^3/Hr	Collection hood, Bag Filter and Flue Gas Desulfurization Equipment sizing will be based on the total fugitive gas flow to the desulfurization.	Drawing No. 3
4	Pierce Smith Converter off gas Handling	ID Fan is used to evacuate through WHRB and Hot gas electrostatic precipitator to Sulphuric Acid Plant Q: ~2,05,618 Nm^3/Hr	Sizing of the equipment (WHRB, HESP, ID Fan and Effluent Treatment Plant) based on the gas volume. Dust in the gas is recovered and pneumatic Conveying system is used for recycling.	Drawing No. 4
5	Pierce Smith Converter Fugitive Gas Handling and Dust Handling System	ID Fan is used to evacuate through Collection hood, Bag Filter and Flue gas Desulfurization system to process stack Q: ~3,26,400 Nm^3/Hr	Sizing of the equipment in Collection hood, Bag Filter and Flue Gas Desulfurization system shall be based on the Gas Volume and gas characteristics. Dust in the gas is recovered and pneumatic Conveying system is used for recycling.	Drawing No. 5
6	Anode Furnace Off Gas Handling	ID Fan is used to evacuate through desulfurization system to process stack Q: ~87,183 Nm^3/Hr	Sizing of the equipment in flue gas desulfurization including Bag Filter shall be based on the gas volume and gas characteristics. Dust in the gas is recovered and recycled through closed bins.	Drawing No. 6
7	Anode Furnace Fugitive Gas Handling	ID Fan is used to evacuate through Collection hood, Bag Filter and Flue gas Desulfurization system to process stack system to process stack Q: ~144,000 Nm^3/Hr	Sizing of the equipment in Collection hood, Bag Filter and Flue Gas Desulfurization system shall be based on the gas volume and gas characteristics. Dust in the gas is recovered and recycled through closed bins.	Drawing No. 7

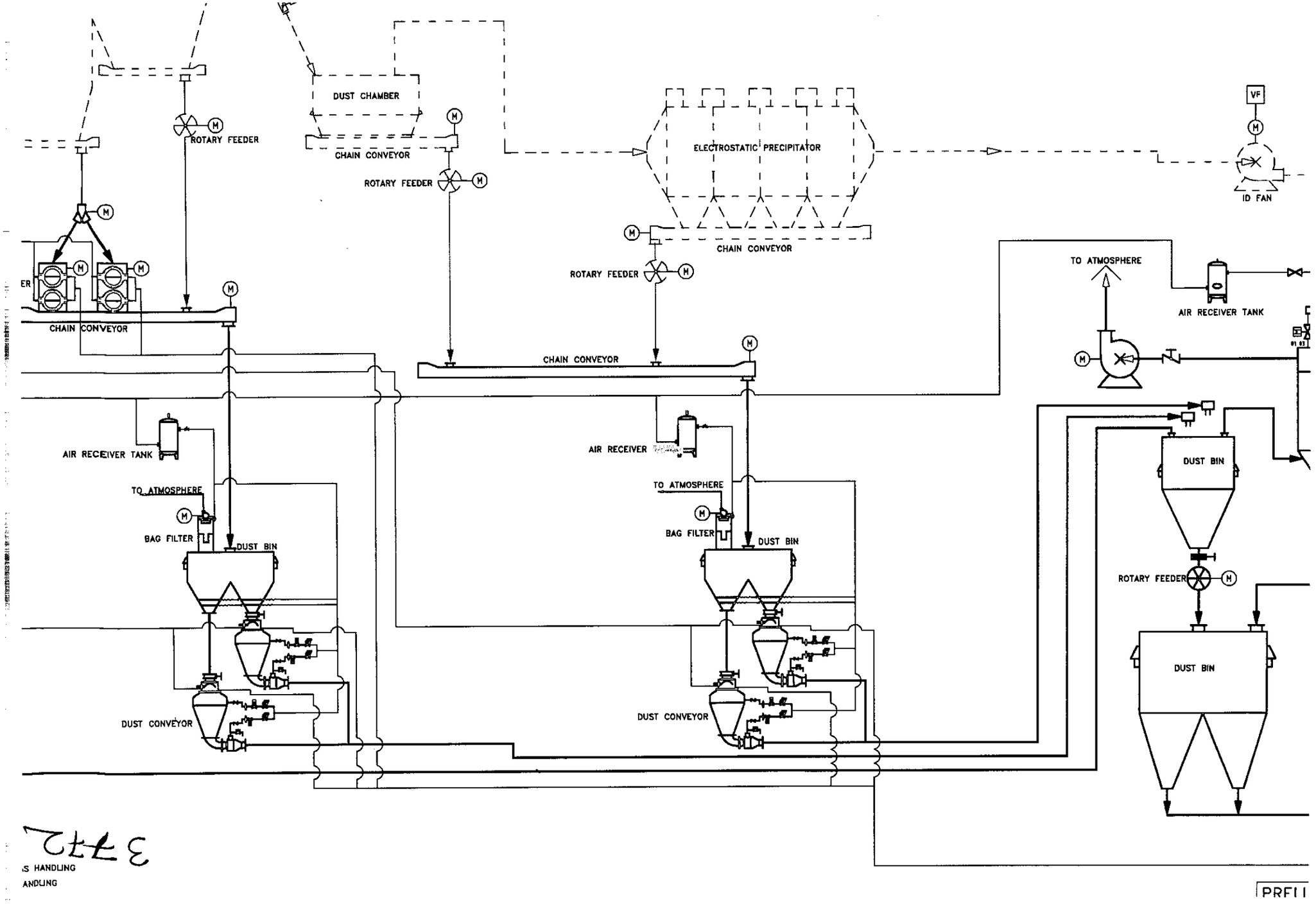
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M
ROTARY FEEDER
CHAIN CONVEYOR
BUTTERFLY VALVE
BAG FILTER
OFF-GAS
OFF-GAS
ROTARY FEEDER

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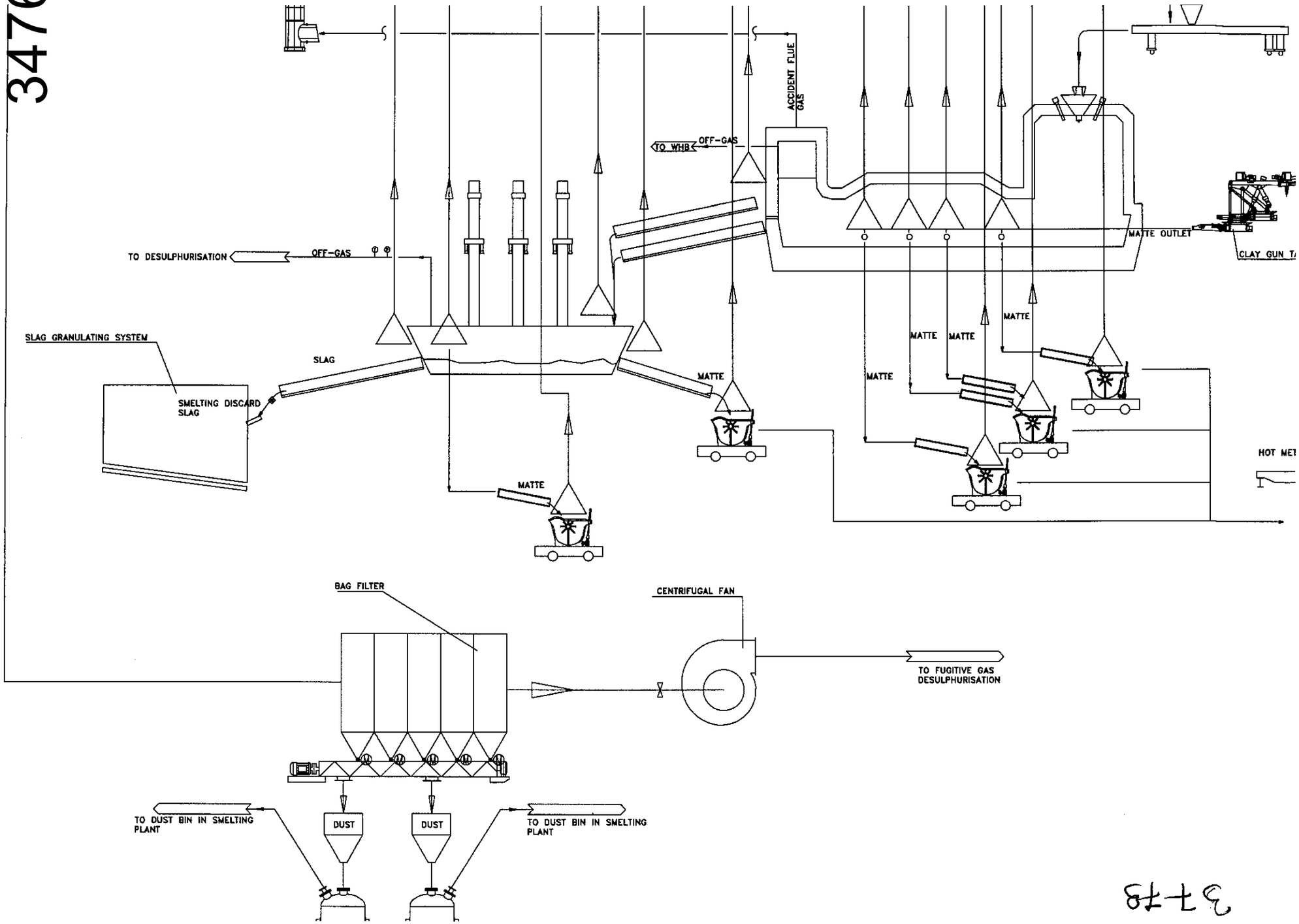


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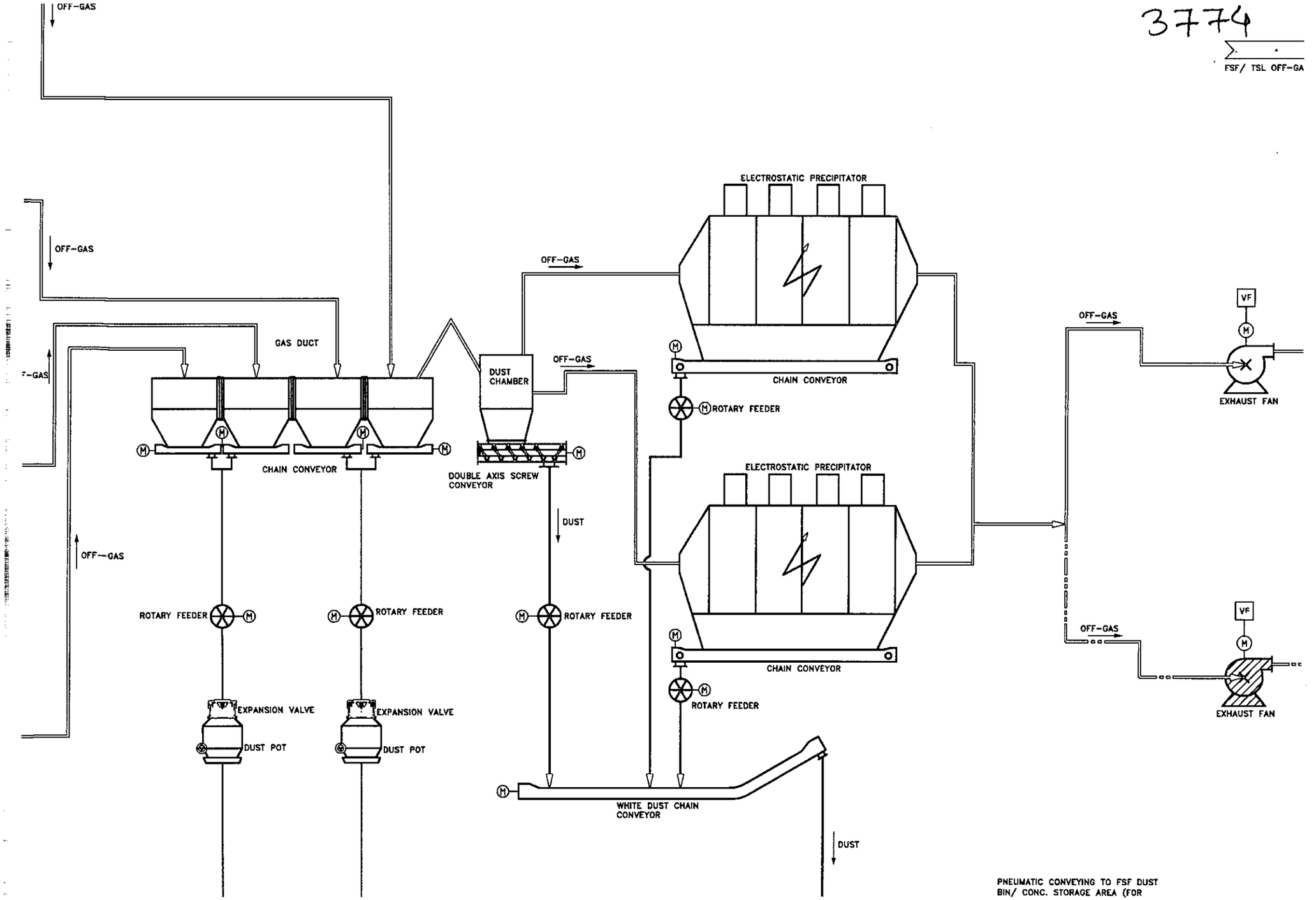

ACCIDENT FLUE GAS
TO WHB
OFF-GAS
TO DESULPHURISATION
OFF-GAS
MATTE OUTLET
CLAY GUN T
SLAG GRANULATING SYSTEM
SLAG
SMELTING DISCARD SLAG
MATTE
MATTE
MATTE
MATTE
MATTE
MATTE
HOT MET
BAG FILTER
CENTRIFUGAL FAN
TO FUGITIVE GAS DESULPHURISATION
TO DUST BIN IN SMELTING PLANT
DUST
DUST
TO DUST BIN IN SMELTING PLANT

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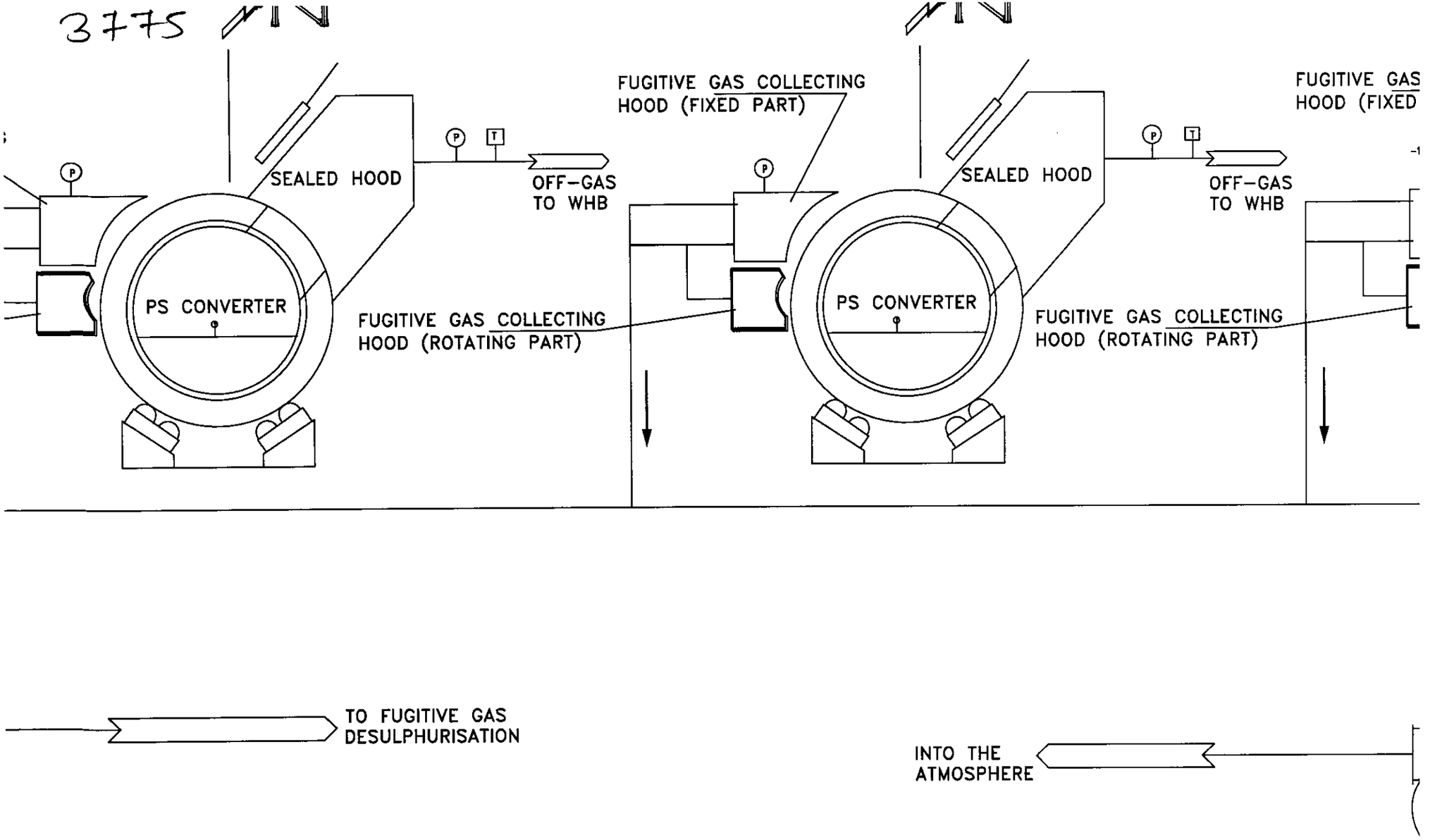
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FSF/ TSL OFF-GA



PNEUMATIC CONVEYING TO FSF DUST BIN/ CONC. STORAGE AREA (FOR

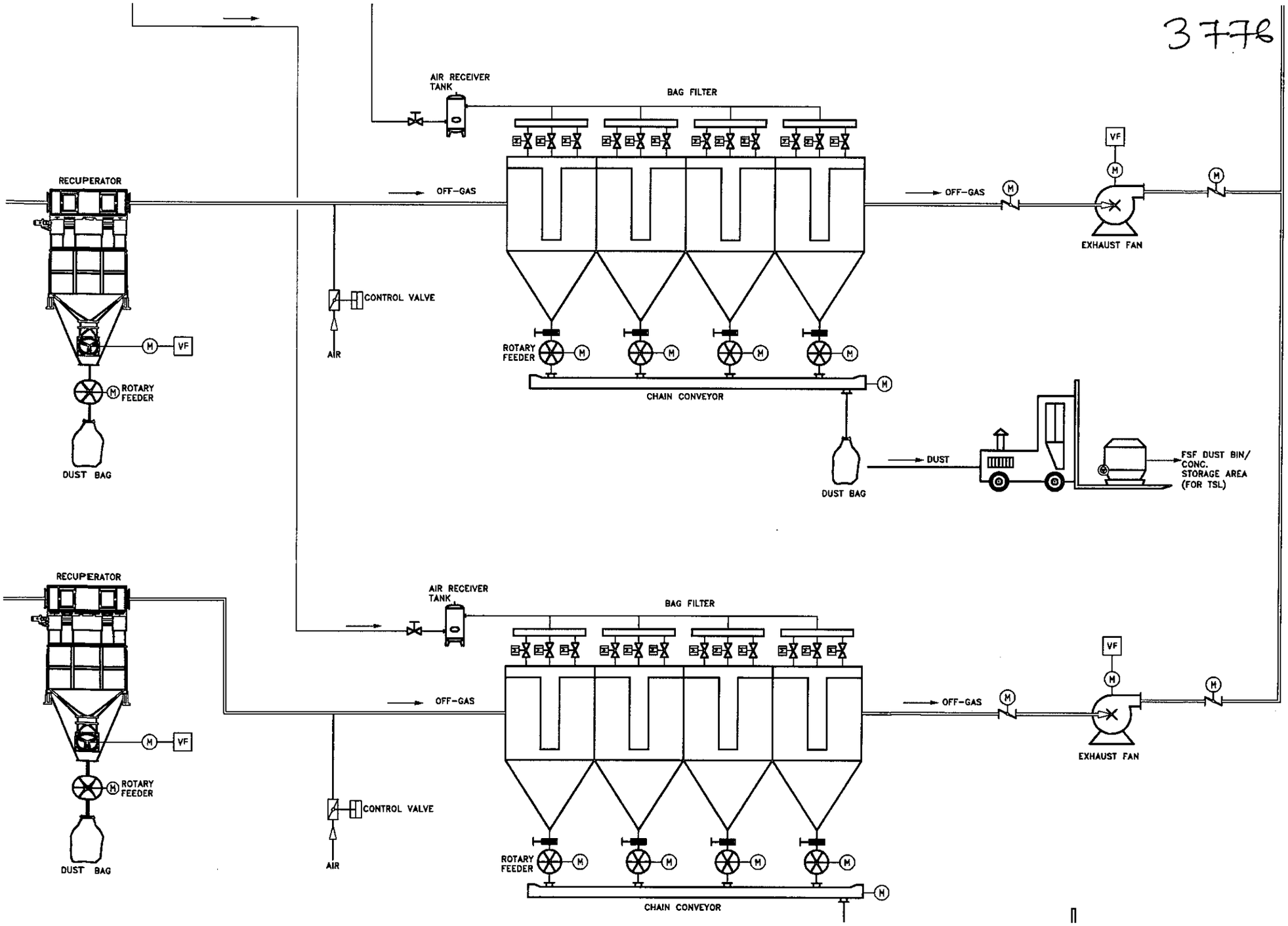
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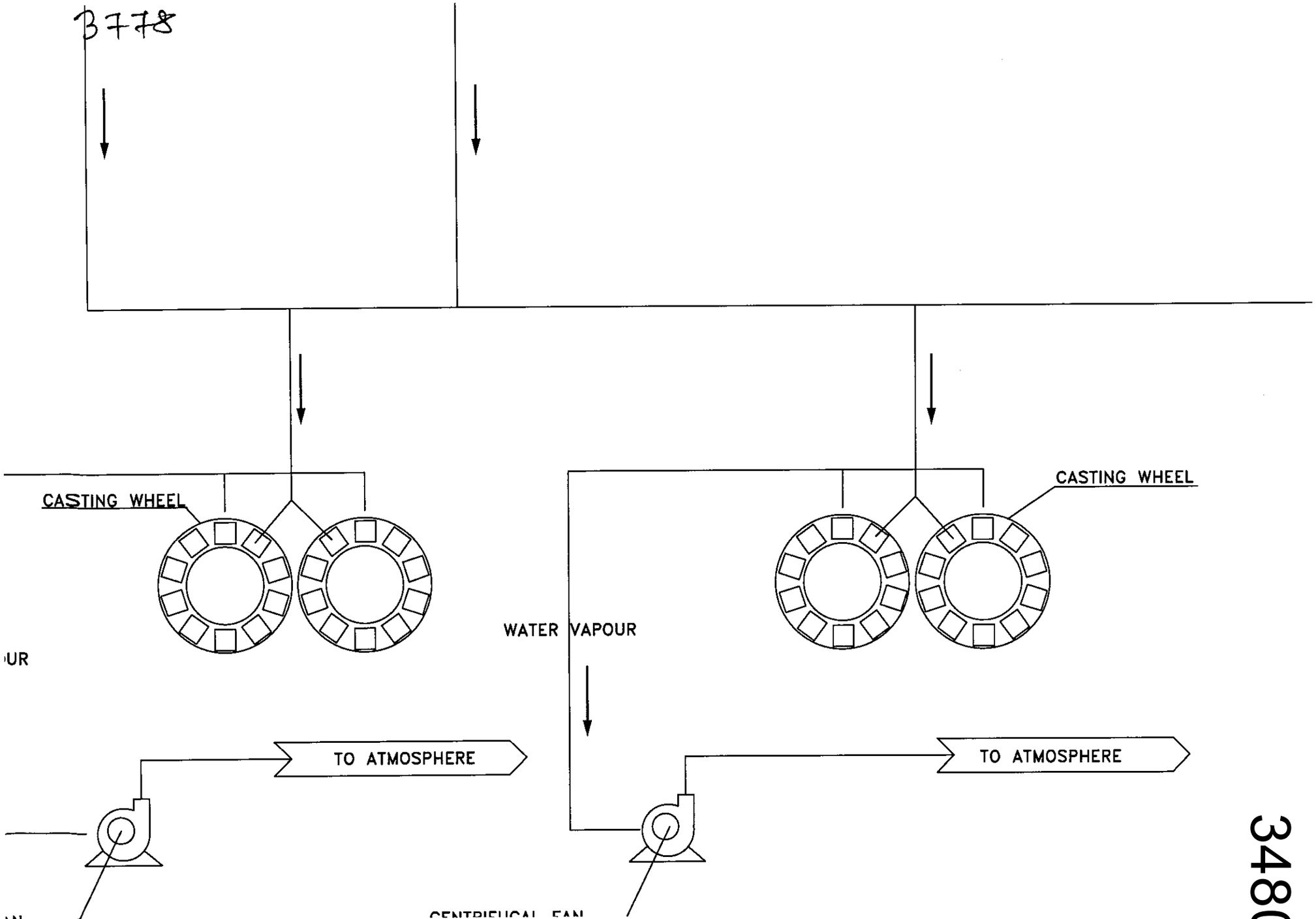

SEALED HOOD
OFF-GAS
TO WHB
PS CONVERTER
FUGITIVE GAS COLLECTING
HOOD (ROTATING PART)
FUGITIVE GAS COLLECTING
HOOD (FIXED PART)
SEALED HOOD
OFF-GAS
TO WHB
PS CONVERTER
FUGITIVE GAS COLLECTING
HOOD (ROTATING PART)
FUGITIVE GAS
HOOD (FIXED
TO FUGITIVE GAS
DESULPHURISATION
INTO THE
ATMOSPHERE

3478

3479

3776


AIR RECEIVER TANK
BAG FILTER
RECUPERATOR
OFF-GAS
OFF-GAS
VF
EXHAUST FAN
CONTROL VALVE
AIR
ROTARY FEEDER
CHAIN CONVEYOR
ROTARY FEEDER
DUST BAG
DUST BAG
DUST
FSF DUST BIN/ CONC. STORAGE AREA (FOR TSL)
RECUPERATOR
AIR RECEIVER TANK
BAG FILTER
OFF-GAS
OFF-GAS
VF
EXHAUST FAN
CONTROL VALVE
AIR
ROTARY FEEDER
CHAIN CONVEYOR
ROTARY FEEDER
DUST BAG


3778
CASTING WHEEL
CASTING WHEEL
WATER VAPOUR
TO ATMOSPHERE
TO ATMOSPHERE

3480

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EAC OBSERVATION:

Quantitative representation of mitigation measures was not presented.

REPLY:

Following is the preliminary list of the pollution abatement equipment has been envisaged and environmental mitigation measures for the proposed project;

Quantification & preliminary capacities of environment mitigation measures considered for 1.0 MTPA Copper Project								
Sr. No.	**Plant**	**Area**	**Description of Equipment**	**Quantity for 1MTPA**	**Average Control Efficiencies (%) for SO_2**	**Average Control Efficiencies (%) for PM**	**Average Control Efficiencies for (%) HF**	**Preliminary Specification**
-1-A	Copper Smelter	Concentrate Feed Area	Dust Suppression System	2	-	-	-	Automised water mist system
			Bag Filter	2	-	~ 99.5	-	• Q: 36,000 Nm^3/hr; • Temp: 40 ^0C; • Inlet dust load: 5 g/Nm^3; • Outlet dust load: 50 mg/Nm^3; • Area: 1000 Sq.m; • Type of Bag: PTFE+P84; • Dust is recycled back in production process
		Steam Drying	Bag Filter	4	-	~ 99.5	-	• Q: 62,150 Nm^3/hr; • Temp: 115 ^0C; • Inlet dust load: 256 g/Nm^3; • Outlet dust load: 50 mg/Nm3; • Area: 2300 Sq.m; • Type of Bag: PTFE+P84; • Dust is recycled back in production process
		Feed Bin	Bag Filter	2	-	~ 99.5	-	• Q: 6,000 Nm^3/hr; • Temp: 100 ^0C; • Outlet dust load: 50 mg/Nm^3; • Area: 400 Sq.m; • Type of Bag: PTFE+P84; • Dust is recycled back in production

EAC OBSERVATION No.-22

Quantification & preliminary capacities of environment mitigation measures considered for 1.0 MTPA Copper Project

Sr. No.	Plant	Area	Description of Equipment	Quantity for 1MTPA	Average Control Efficiencies (%) for SO_2	Average Control Efficiencies (%) for PM	Average Control Efficiencies for (%) HF	Preliminary Specification
								process
		Smelting Furnace	Hot Gas ESP	2	-	~ 99.5	-	• Q:97,386 Nm^3/hr; • Temp: 350 ^0C; • Inlet dust load: 107 g/Nm^3; • Outlet dust load: 100 mg/Nm^3; • Area: 150 Sq.m; • No. of Field: 4; • Dust is recycled back in production process
		Pierce Smith Converter	Water Cooled Double Hood	8	-	> 99.5	-	• Q: 100,000 Nm^3/hr; • To effectively collect the fugitive gases during production process.
			Hot Gas ESP	4	-	> 99.5	-	• Q: 102,809 Nm3/hr; • Temp: 350 0C; • Inlet dust load: 22 g/Nm3; • Outlet dust load: 100 mg/Nm3; • Area: 400 Sq.m; • No. of Field: 4; • Dust is recycled back in production process
1-B	Copper Smelter	Electric Furnace	Bag Filter	2	-	~ 99	-	• Q: 16,254 Nm^3/hr; • Temp: 150 ^0C; • Inlet dust load: 5 g/Nm^3; • Outlet dust load: 50 mg/Nm^3; • Area: 960 Sq.m; • Type of Bag: PTFE+P84; • Dust is recycled back in production process
			Wet Scrubber (Inclusive for smelting furnace fugitives)	2	~ 88	~ 95	-	• Q: 300,000 Nm^3/hr; • Inlet SO_2 load: 2000 mg/Nm^3; • Outlet SO_2: 300 mg/ Nm^3; • Amine Based Scrubbing

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Quantification & preliminary capacities of environment mitigation measures considered for 1.0 MTPA Copper Project								
Sr. No.	**Plant**	**Area**	**Description of Equipment**	**Quantity for 1MTPA**	**Average Control Efficiencies (%) for SO_2**	**Average Control Efficiencies (%) for PM**	**Average Control Efficiencies for (%) HF**	**Preliminary Specification**
		Anode Furnace	Bag Filter	2	-	~ 95	-	• Q: 23,963 Nm^3/ hr; • Temp: 150 ^0C; • Inlet dust load: 1 g/Nm^3; • Outlet dust load: 50 mg/Nm^3; • Area: 1100 Sq.m; • Type of Bag: PTFE+P84; • Dust is recycled back in production process
			Wet Scrubber	2	~ 70	~ 95	-	• Q: 115,619 Nm^3/hr; • Inlet SO_2 load: 1000 mg/Nm^3; • Outlet SO_2: 300 mg/ Nm^3; • Lime + Caustic Scrubbing
		Slag Cleaning Furnace Fugitive Gas	Bag Filter	2	-	~ 98	-	• Q: 12,200 Nm^3/ hr; • Area: 720 Sq.m; • Inlet dust load: 3 g/Nm^3; • Outlet dust load: 50 mg/Nm^3; • Type of Bag: PTFE+P84; • Temp: 150 ^0C; • Dust is recycled back in production process
			Wet Scrubber	2	~ 85	~ 70	-	• Q: 79,500 Nm^3/hr; • Inlet SO_2 load: 2000 mg/Nm^3; • Outlet SO_2: 300 mg/Nm^3; • Lime + Caustic Scrubbing
		PSC Fugitive Gas	Bag Filter	2	-	~ 98	-	• Q: 296,400 Nm^3/hr; • Temp: 63 ^0C; • Inlet dust load: 3 g/Nm^3; • Outlet dust load: 50 mg/Nm^3; • Area: 250 Sq.m; • Type of Bag: PTFE+P84; • Dust is recycled back in production process
			Wet Scrubber	2	~ 90 - 95	~ 70	-	• Q: 326,400 Nm^3/hr; • Inlet SO_2 load: 4000 mg/Nm^3; • Outlet SO_2: 300 mg/ Nm^3;

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Quantification & preliminary capacities of environment mitigation measures considered for 1.0 MTPA Copper Project								
Sr. No.	**Plant**	**Area**	**Description of Equipment**	**Quantity for 1MTPA**	**Average Control Efficiencies (%) for SO_2**	**Average Control Efficiencies (%) for PM**	**Average Control Efficiencies for (%) HF**	**Preliminary Specification**
								• Amine Based Scrubbing
		Revert Crushing System	Bag Filter	2	-	90 - 95	-	• Q: 19,000 Nm^3/hr; • Temp: 60 ^0C; • Area: 250 Sq.m; • Type of Bag: PTFE +P84; • Dust is recycled back in production process
2	Sulphuric Acid Plant	Gas Cleaning System	Wet ESP	20	-	99 - 99.9	-	• Q: 60,000 Nm^3/hr; • Water is used for cleaning purpose on periodical basis and sent to ETP.
			Effluent Treatment Plant	2	-	-	-	• Q: 80 m^3/hr
			RO Plant for treated effluent	2	-	75 - 80	-	• Q: 1600 m^3/hr; • Recovery 50% 1st stage and 30% in 2nd Stage
			Evaporation System	2	-	60 - 65	-	• Q: 350 m^3/hr; • Recovery 60%; • Sludge to SLF
		Conversion Section	Tail Gas Scrubber	4	~ 80 - 85	-	-	• Q: 301,520 Nm^3/hr; • Amine Based Scrubbing; • Inlet SO_2 load: 2000 mg/Nm^3; • Outlet SO_2: 300 mg/ Nm^3
3	Refinery Plant	Electro winning System	Wet Scrubber	2	85 - 92.5	-	-	• Q:4,500 Nm^3/hr; • Water is used and recycled in process.
			Effluent Treatment Plant	2	-	-	-	• Q:100 m^3/Day; • Bleed from electrolyte purification process is sent to ETP.
4	PMR Plant	Smelting Furnace	Wet Scrubber	2	~ 90 - 95	85 - 92.5	-	• Q:5,000 Nm^3/hr; • Water is used for flushing purpose on periodical basis and sent to ETP.
			Wet ESP	4	-	99 - 99.9	-	• Q:5,000 Nm^3/hr; • Water is used for flushing purpose on periodical basis and sent to ETP.
5	Phosphoric	Rock	Bag Filter	2	-	90 - 95	-	• Q: 55,000 Nm^3/hr;

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Quantification & preliminary capacities of environment mitigation measures considered for 1.0 MTPA Copper Project								
Sr. No.	**Plant**	**Area**	**Description of Equipment**	**Quantity for 1MTPA**	**Average Control Efficiencies (%) for SO_2**	**Average Control Efficiencies (%) for PM**	**Average Control Efficiencies for (%) HF**	**Preliminary Specification**
	Acid Plant	Phosphate Handling area						• Inlet dust load: 15 g/Nm^3; • Outlet dust load: 50 mg/Nm^3; • Dust is recycled back in production process
		Reaction System	Wet Scrubber	8	-	85 - 92.5	85 - 92.5	• Q:56,000 Nm^3/hr; • Water Scrubbing for production of H_2SiF_6
			Cyclone	2	-	~ 95	-	• Q:56,000 Nm^3/hr; • Water Scrubbing for production of H_2SiF_6
		Flash cooling System	Wet Scrubber	8	-	-	~ 99	• Q:100,000 Nm^3/hr; • Water Scrubbing for production of H_2SiF_6
			Cyclone	2	-	~ 95	-	• Q:100,000 Nm^3/hr; • Water Scrubbing and recycled back in process to recover the P_2O_5 Droplets
		Filtration Area	Wet Scrubber	2	-	-	~ 95	• Q:44,000 Nm^3/hr; • Water Scrubbing for production of H_2SiF_6
		Concentration System	Fluorine Recovery System	6	-	-	~ 75 - 80	• Q: 31,553 Nm^3/hr; • Water Scrubbing for production of H_2SiF_6
6	Aluminum Flouride Plant	Filtration Area	Cyclone	2	-	~ 95	-	• Q: 4,200 Nm^3/hr; • Water Scrubbing and recycled back in process
			Wet Scrubber	2	-	-	~ 95	• Q: 4,200 Nm^3/hr; • Water Scrubbing and recycled back in process
			Bag Filter	2	-	~ 95 - 99	-	• Q: 2,500 Nm^3/hr; • Dust is recycled back in production system

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Following are the preliminary process vents/stacks and chimney details for the proposed copper project:-

Sr. No.	Stacks	Height m	Dia m	Temp °C	Velocity m/s	Volume Nm3/hr	Material of Construction
	Unit -I & II						
	Flue Emission Through Stack attached to Boiler/Furnace/Heater						
1	Waste Heat Recovery Super heater - I* & II*	70	1	150	18	35,000	Carbon Steel
2	Sulphuric Acid Pre-Heater-I (Only for plant startup)	45	1.5	250	17	60,000	Carbon Steel
3	Sulphuric Acid Pre-Heater-II (Only for plant startup)	45	1.5	250	17	60,000	Carbon Steel
4	DG Set – I, II, III & IV (4 MVA Standby)	30	-	-	-	-	Carbon Steel
5	Boiler – II (operational only when steam is not available from smelter)	70	1	150	15	30,000	Carbon Steel
6	Shaft Furnace of CCR Plant-I*	36	1.5	200	9	37000	Carbon Steel
7	Anode Casting – I, II, III & IV	20	0.75	100	17	21,000	Carbon Steel
8	Main Stack Secondary Gas Scrubber- I, II, III & IV (Bi flue) (Convertor Fugitives and Anode & scrap melting furnace) *	150	2.8	60	17	345,900	Carbon Steel with glass Flake/FRP/Rubber Lining
			2.0	60	17	171,823	
9	Electric Furnace and Secondary gases from Smelting – I & II (Bi-Flue) *	120	2.0	150	17	135,000	Carbon Steel
			2.2	150	18	168,796	
10	Main Stack Sulphuric Acid Plant-I, II, III & IV (Bi-flue) *	150	2	75	16	150,760	Carbon Steel
			2	75	16	150,760	
11	Cathode Stripping M C – I*, II*, III* & IV*	30	0.3	50	6	1,500	FRP
12	Anode Scrap Washing MC– I* & II*	30	0.3	50	6	1,500	FRP
13	Electro winning Stack – I* & II*	45	0.3	40	19	4,500	FRP
14	Slag Granulation – I* & II*	45	1.4	100	18	80,000	Carbon Steel
15	Steam Dryer for Copper concentrate – I* & II*	60	1.4	120	15	62,150	Carbon Steel
16	Smelting Furnace Area (Emergency Vent-I & II only during process tripping)	45	1.8	300	18	86000	Carbon Steel
17	PS Convertor Area (Emergency Vent-I & II (only during process tripping)	45	1.8	300	18	86000	Carbon Steel
18	Dust Extraction – I & II (Rock Phosphate Handling Area) *	45	0.6	40	15	15000	Carbon Steel
19	Precious Metal Recovery Plant – I*& II*	60	0.6	60	16	15,000	Carbon Steel with glass Flake/FRP Lining
20	Phosphoric Acid Plant – I & II	120	2.1	50	18	206,000	Carbon Steel with glass Flake/FRP/ Rubber Lining

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EAC OBSERVATION:

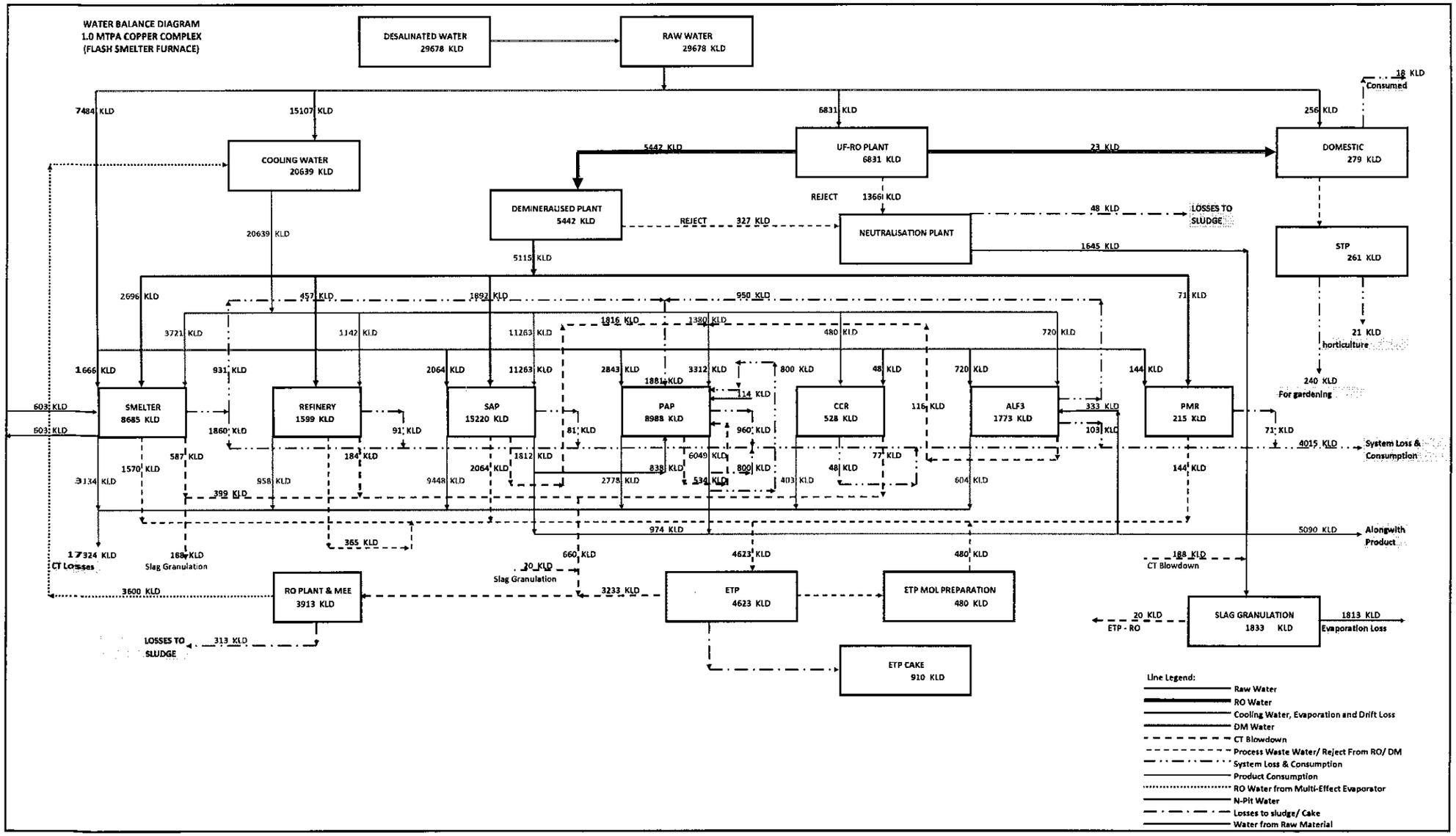
Revised water balance shall be submitted.

REPLY:

The water consumption for the proposed copper plant has been prepared based on the information submitted by various technology licensers.

The revised water balance is prepared facility wise providing details of fresh water requirement, recycled water, effluent generation, DM water and cooling water requirement along with the evaporation and system losses.

Revised Water Balance is presented in **Annexure-23.**


WATER BALANCE DIAGRAM
1.0 MTPA COPPER COMPLEX
(FLASH SMELTER FURNACE)
DESALINATED WATER 29678 KLD
RAW WATER 29678 KLD
18 KLD Consumed
7484 KLD
15107 KLD
6831 KLD
256 KLD
COOLING WATER 20639 KLD
5442 KLD
UF-RO PLANT 6831 KLD
23 KLD
DOMESTIC 279 KLD
DEMINERALISED PLANT 5442 KLD
REJECT 1366 KLD
48 KLD
LOSSES TO SLUDGE
REJECT 327 KLD
NEUTRALISATION PLANT
20639 KLD
5115 KLD
1645 KLD
STP 261 KLD
2696 KLD
457 KLD
1892 KLD
950 KLD
71 KLD
21 KLD horticulture
3721 KLD
1142 KLD
11263 KLD
1816 KLD
1380 KLD
480 KLD
720 KLD
240 KLD For gardening
1666 KLD
931 KLD
2064 KLD
11263 KLD
2843 KLD
3312 KLD
1881 KLD
800 KLD
48 KLD
720 KLD
144 KLD
603 KLD
603 KLD
SMELTER 8685 KLD
REFINERY 1599 KLD
SAP 15220 KLD
PAP 8988 KLD
CCR 528 KLD
ALF3 1773 KLD
PMR 215 KLD
114 KLD
116 KLD
333 KLD
103 KLD
71 KLD
4015 KLD
System Loss & Consumption
1860 KLD
91 KLD
81 KLD
960 KLD
587 KLD
184 KLD
1812 KLD
6049 KLD
77 KLD
1570 KLD
2064 KLD
838 KLD
800 KLD
48 KLD
144 KLD
3134 KLD
958 KLD
9448 KLD
2778 KLD
534 KLD
403 KLD
604 KLD
399 KLD
974 KLD
5090 KLD
Alongwith Product
365 KLD
17324 KLD CT Losses
188 KLD Slag Granulation
660 KLD
4623 KLD
480 KLD
188 KLD CT Blowdown
20 KLD Slag Granulation
3600 KLD
RO PLANT & MEE 3913 KLD
3233 KLD
ETP 4623 KLD
ETP MOL PREPARATION 480 KLD
20 KLD ETP - RO
SLAG GRANULATION 1833 KLD
1813 KLD Evaporation Loss
LOSSES TO SLUDGE
313 KLD
ETP CAKE 910 KLD
Line Legend:
Raw Water
RO Water
Cooling Water, Evaporation and Drift Loss
DM Water
CT Blowdown
Process Waste Water/ Reject From RO/ DM
System Loss & Consumption
Product Consumption
RO Water from Multi-Effect Evaporator
N-Pit Water
Losses to sludge/ Cake
Water from Raw Material

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EAC OBSERVATION:

HIRA shall be prepared for worst case scenario

REPLY:

The HIRA study has been prepared based on the methodology using a comprehensive checklist of hazards guidelines provided by the ISO 17776: 2002.

Considering the details of the various units and storage systems, the nodes of Copper Smelter Plant including converter and anode furnace, sulphuric acid plant and LPG storage bullets were taken up for the HIRA study for the worst-case scenarios.

- Metal leak from furnace;
- Fire in LPG bullet;
- Failure of SO_2 gas blower; and
- Failure of sulphuric acid tank & phosphoric acid tank.

Detailed report on worst case scenario for proposed Copper Refinery project with recommendations is presented as **Annexure-24.**

The recommendations emerging from this HIRA study of the worst-case scenarios at Mundra Copper Refinery Facility of M/s. Adani Enterprises Limited are listed below:

1. Metal Leak from Furnace:

Furnace is used for copper ore concentrate smelting and converting. Furnace is made of steel shell and protected by water cooled copper block and chrome –magnesite refractory suitable for copper manufacturing. Thermocouples are installed for online monitoring of the metal temperature inside the furnace as well as refractory temperature. Furnace temperature is monitored periodically through pyrometer.

In case of the Furnace Leak:

a) Cordon off the area with suitable signage boards;
b) Evacuate the people from affected areas;
c) Furnace operation will be suspended from the control room;
d) Burners will be switched off from the control room;
e) Mud blocks will be used to arrest the leak;
f) Water atomizing sprays will be used to cool the furnace shell;
g) Metal will be contained with the help of sand bund;
h) Generally sand bund will be kept is available around the furnace foundation;
i) Water atomizing sprays will be used to cool the leaked metal; and
j) Spilled metal after cooling will be recycled back into smelting process.

In case of Injury:

a) Use of water tub and shower for burn injuries;
b) First aid will be provided at the Occupational Health Center (OHC);
c) Further treatment will be provided at District Hospital; and
d) Burn injuries will be treated at burn care unit, Bhuj. The budget for the burn care unit is proposed in CER.

Maintenance Protocol for Furnace - Routine Inspection & Maintenance:
(periodicity to be followed per company standards)

1) Periodical Visual Inspection:

a) Look for hot spots, if any;
b) Check the cooling of shell - check condition of water jackets and spray piping/ nozzles;
c) Replace lance based on condition;
d) Check the condition of tapping ports refractory;
e) Check the condition of waste cooled furnace mountings;
f) Look for corrosion in shell and nozzles;
g) Check the condition of base supports and foundation bolts and nuts;
h) Check the condition of shell welds, welding between shell/nozzles & shell/supports;
i) Check the condition of welding of support elements, if any;
j) Check for settlement, if any, of furnace foundation;
k) Check the condition of piping connected to lances including flexible elements, if any; and
l) Check the condition of access ladders and platforms.

2) Periodical Inspection of Furnace:

a) Carry out thermography of furnace;
b) Check and repair/ reline tapping ports refractory;
c) Hydrotest water cooled furnace mountings;
d) Check and adjust water spray pattern;
e) Check condition of water jacket;
f) Check the thickness of shell and dished ends - ultrasonic thickness check; and
g) Inspect heat recovery elements, if any, connected to the furnace.

3) Major Inspection & Maintenance of Furnace:

a) Assess condition of furnace refractory- check for wear out, spalling, cracks in refractory lining;
b) Reline refractory, if required, based on condition assessment;
c) Assess condition of furnace using elaborate NDT checks; and
d) UT, DP, MPI of shell, dished ends and nozzle pipes.

2. LPG Bullet Fire

There are 2 bullets of 100 Tons each for plant-1 and plant-2. LPG bullets will be designed, manufactured and constructed as per PESO standards.

In case of the LPG Bullet Fire:

a. Cordon off the area with suitable signage boards;
b. Evacuate the people from affected areas;
c. Automatically shutting down the LPG supply to plant operation from the control room;

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d. Water sprinkler system fitted on the LPG Bullet;
e. Water curtain system will get automatically started, to prevent the fire spreading the nearby facilities; and
f. Starting of the firefighting system provided at the LPG bullet area boundary.

In case of injury:

a. Use of water tub and shower for burn injuries;
b. First aid will be provided at the occupational health center;
c. Further treatment will be provided at District Hospital; and
d. Burn injuries will be treated at burn care unit, Bhuj District Hospital. The budget for the burn care unit is proposed in CER.

Maintenance Protocol for LPG Storage Bullet - Routine Inspection & Maintenance:
(periodicity to be followed per company standards)

1) Periodical Visual Inspection:

a) Look for corrosion in shell and nozzles;
b) Check the condition of saddle supports and foundation bolts and nuts;
c) Check the condition of shell welds, welding between shell / nozzles, & shell / saddles;
d) Check the condition of welding of saddle elements;
e) Check whether the saddles are seating properly on the foundation support base;
f) Check whether bullet is earthed properly - check whether earthing bosses and earthing flats are is in satisfactory condition and are connected firmly;
g) Check for settlement, if any, of bullet foundation;
h) Check the condition of piping connected to the bullet;
i) Check the condition of fire protection system for the bullet; and
j) Check the condition of access ladders and platforms.

2) Periodical Inspection of Bullet:

a) Check the thickness of shell and dished ends - ultrasonic thickness check;
b) Check thickness of nozzle pipes;
c) Test the resistance of Bullet earth connections / earth pits;
d) Test the safety valves mounted on the bullet - hydro test, leakage test & popping test; and
e) Visual inspection of pipe supports - piping connected to bullet.

3) Major Inspection of Bullet:

a) Assess condition of bullet using elaborate NDT checks;
b) UT, DP, MPI of shell, dished ends and nozzle pipes;
c) Radiography of shell, dished ends and nozzle pipes welds;
d) UT, DP and MPI piping connected to tank; and
e) Hydro test of bullet.

3. Failure of the SO_2 Blower in Sulphuric Acid Plant

SO_2 blower is designed to provide the suction for the gases generated from the copper smelting and converting furnace and push through catalytic converter and acid tower for manufacturing of sulphuric acid before releasing the residual gases through stack post tail gas scrubbing.

In case of the failure of the SO_2 blower in sulphuric acid plant due to electricity disturbance or any process interlocks.

a. Smelting furnace operation will be suspended automatically by stopping the copper concentrate feed to the furnace. This will stop the fresh generation of SO_2 gas from the furnace.
b. Residual gases available in the furnace, WHRB, ducts & ESP will be routed to Flue Gas Desulfurization (FGD) system for scrubbing through the bypass fan installed after the hot electrostatic precipitator.
c. Residual gases available in ducts between ESP and gas cleaning plant will be passing through sulphuric acid plant and tail gas scrubber by natural draught to the stack outlet.

Maintenance Protocol for SA Plant Main Blower - Routine Inspection & Maintenance:

(periodicity to be followed per company standards)

1) Periodical Visual Inspection:

a) Look for oil and steam leakages, if any;
b) Look for corrosion, if any, of blower components & machine base frame;
c) Check for abnormal noise, if any;
d) Check the temperature of bearing housings and lubricating oil;
e) Check the vibration of motor bearings (if driven by motor) and blower bearing housing -in addition to shaft vibration monitoring system;
f) Check the condition of machine support pedestals, base frame, foundation bolts and nuts;
g) Check the condition of welding of machine Support pedestal elements and Base Frame;
h) Check whether the base frame is seating properly on the foundation support base;
i) Check the condition of machine foundation, especially cracks, if any;
j) Check the condition of piping connected to the machine;
k) Check the differential pressure across lub oil filters;
l) Check the speed and vibration trends (shaft vibration system);
m) For steam turbine, if available, follow relevant points given above;
n) Drain acid mist catch pot at blower suction, if provided; and
o) Check the condition of inlet guide vanes, if provided.

2) Periodical Inspection of Blower & Driver:

a) Clean the lub oil filters;
b) Clean the lub oil cooler;

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c) Carry out preventive maintenance tasks as per check list provided by machine manufacturer including the following;
d) Check the condition of drive coupling and coupling bolts / elements (open inspection);
e) Check the condition of machine bearings (open inspection) - check bearing wear and bearing clearances;
f) Check driver and blower alignment;
g) Wear particle analysis of lub oil;
h) Clean lub oil coolers and check the condition of carry out leak test, if required;
i) Check for corrosion in lub oil sump / piping of nozzle pipes;
j) Visual inspection of duct supports - ducting connected to blower; and
k) Check the condition and calibrate speed governor.

3) Major Inspection and overhauling of Blower and Driver:

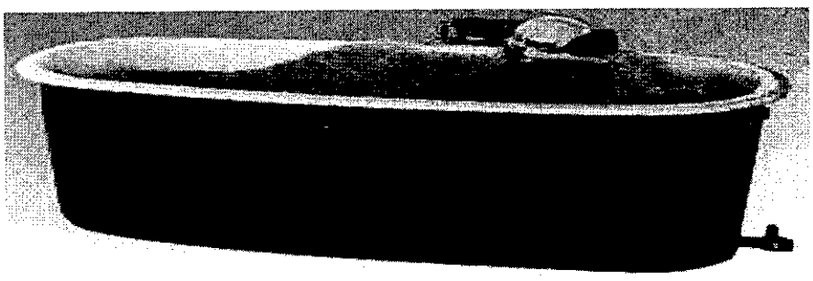
a) Check the condition of drive coupling and coupling bolts/elements (open inspection);
b) Check the condition of machine bearings (open inspection) - check bearing wear and bearing clearances;
c) Carry out open inspection of machine;
d) Check the condition of rotor - look for corrosion caused by acid mist carry over, if any;
e) Check the condition of seating areas of casing halves;
f) Assess condition of rotor and casing using relevant NDT checks - UT, DP, MPI of rotor blades, shaft, casing & casing bolts;
g) Overhaul the inlet guide vane assembly;
h) Inspect the suction and discharge dampers and overhaul, if necessary;
i) Check the condition and calibrate speed governor; and
j) Carry out solo run of driver and test over speed trip.

4. Failure of the Sulphuric Acid Tank and Phosphoric Acid Tank

Handling of sulphuric acid and phosphoric acid:

i. Sulphuric acid and phosphoric acid produced in our copper complex are hazardous chemicals. phosphoric acid is mild and less hazardous, while sulphuric acid is corrosive and more hazardous and toxic in nature.;
ii. There are 6 tanks of the sulphuric acid with a capacity of 5500 m^3 each for both plant # 1 and plant # 2;
iii. Carbon steel tanks are used for storage of sulphuric acid;
iv. There are 4 tanks of the phosphoric acid with a capacity of ~ 5500 m^3 each and 4 clarifiers with a capacity of ~ 1800 m^3 each for both plant-1 and plant-2;
v. Tanks and clarifier will be with natural rubber lined carbon steel material of construction with additionally carbon brick lining at the bottom of the tank as well as 1 meter height along the circumference;
vi. Relevant BIS standard will be used for civil construction as plant is coming in seismic zone – V;
vii. Carbon steel/SS316L and rubber-lined carbon steel pipes are used for handling sulphuric acid and phosphoric acid respectively;
viii. Signage boards along with DANGER signs with safety measures to be followed are displayed at Acid storage and handling facility;

ix. Storage Tanks are built-in with dyke, sump and pump for collection of acid leakage and transfer the same to other storage tanks;
x. Dyke is provided with impervious HDPE liner followed by acid resistant tiles to prevent seepage of the acid into the ground;
xi. Dyke will have capacity of 110% of the largest tank within the dyke;
xii. Tanks will be filled with maximum of 80% of the capacity, so that in case of any emergency spilled or leaked acid can be accommodated in the rest of the tanks;
xiii. Water shall not be sprayed on the spillages in case of sulphuric acid;
xiv. Lime powder/ soda ash shall be used for neutralization of sulphuric acid;
xv. Usage of PPE such as PVC gloves, PVC suit, face shield, and gum boots is ensured while handling sulphuric acid and phosphoric acid;
xvi. Safety showers and eye wash fountains are provided at easily accessible positions near the proposed acid storage facility and used if persons are affected with acid spray. Dunk tanks (large bath tub in which a person can be completely immersed) will be provided;



xvii. In case of major leaks from failure of storage tanks;
   a. Cordon off the area with suitable signage boards.
   b. Evacuate the people from affected areas.
   c. Check whether the dyke area drain valve is closed or not.
   d. Allow sulphuric acid/phosphoric acid flow towards sump line and transfer acid into other storage tanks.
   e. Use PVC suit, PVC gloves, and gum boots to handle the Sulfuric / phosphoric acid and airline respirator and PVC hood if acid fumes are pungent.
   f. Use portable SS pump to transfer the residual pool of acid into a suitable container.
   g. Send collected drums / acid containers to the designated area for further action.
   h. Neutralize residual acid with lime powder/ soda ash.
   i. Collect the contaminants and transfer the same to effluent treatment plant.

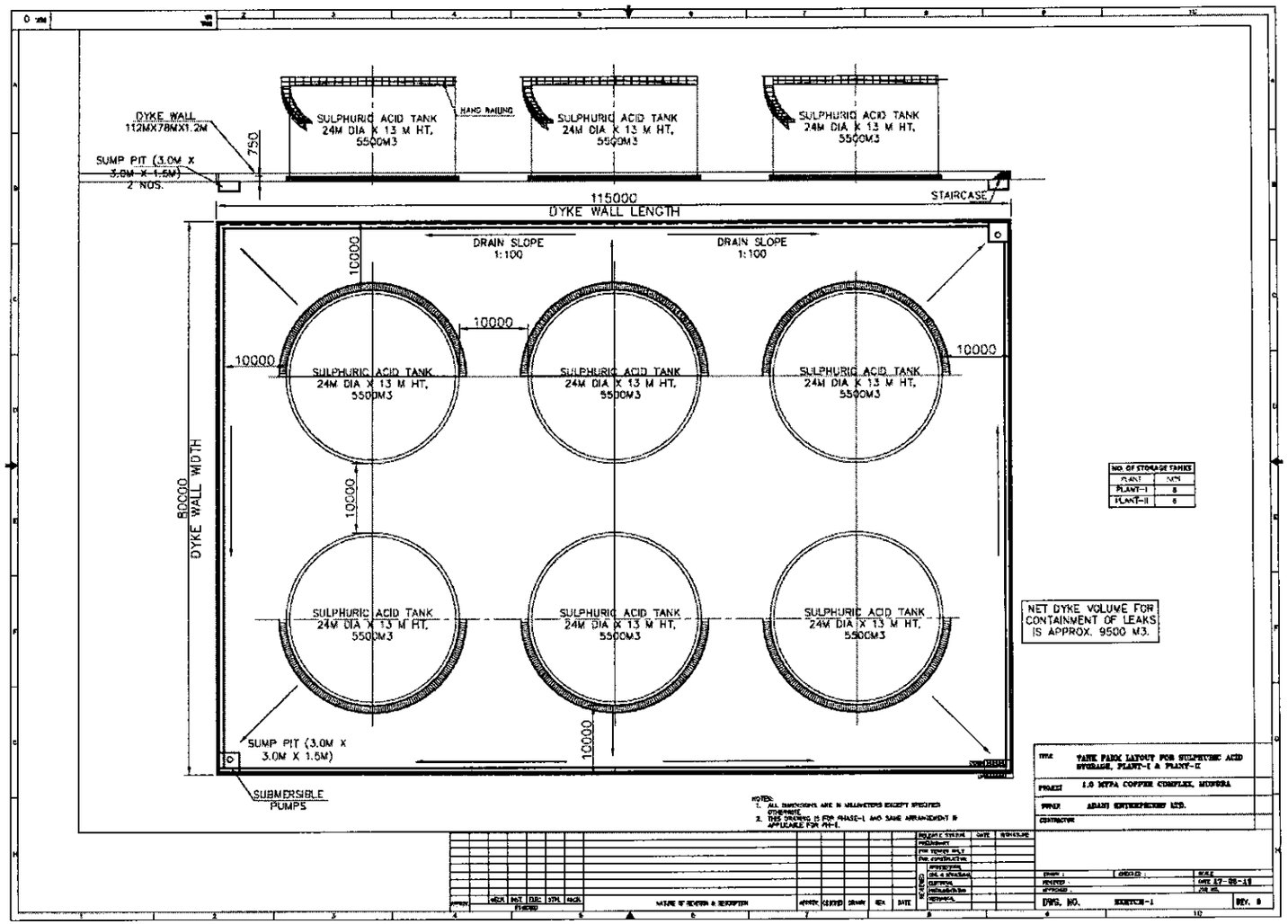
In case of injury:

i. Use of water tub and shower for burn injuries;
ii. First aid will be provided at the occupational health center;
iii. Further treatment will be provided at District Hospital; and
iv. Burn injuries will be treated at burn care unit, Bhuj District Hospital. The budget for the burn care unit is proposed in CER.

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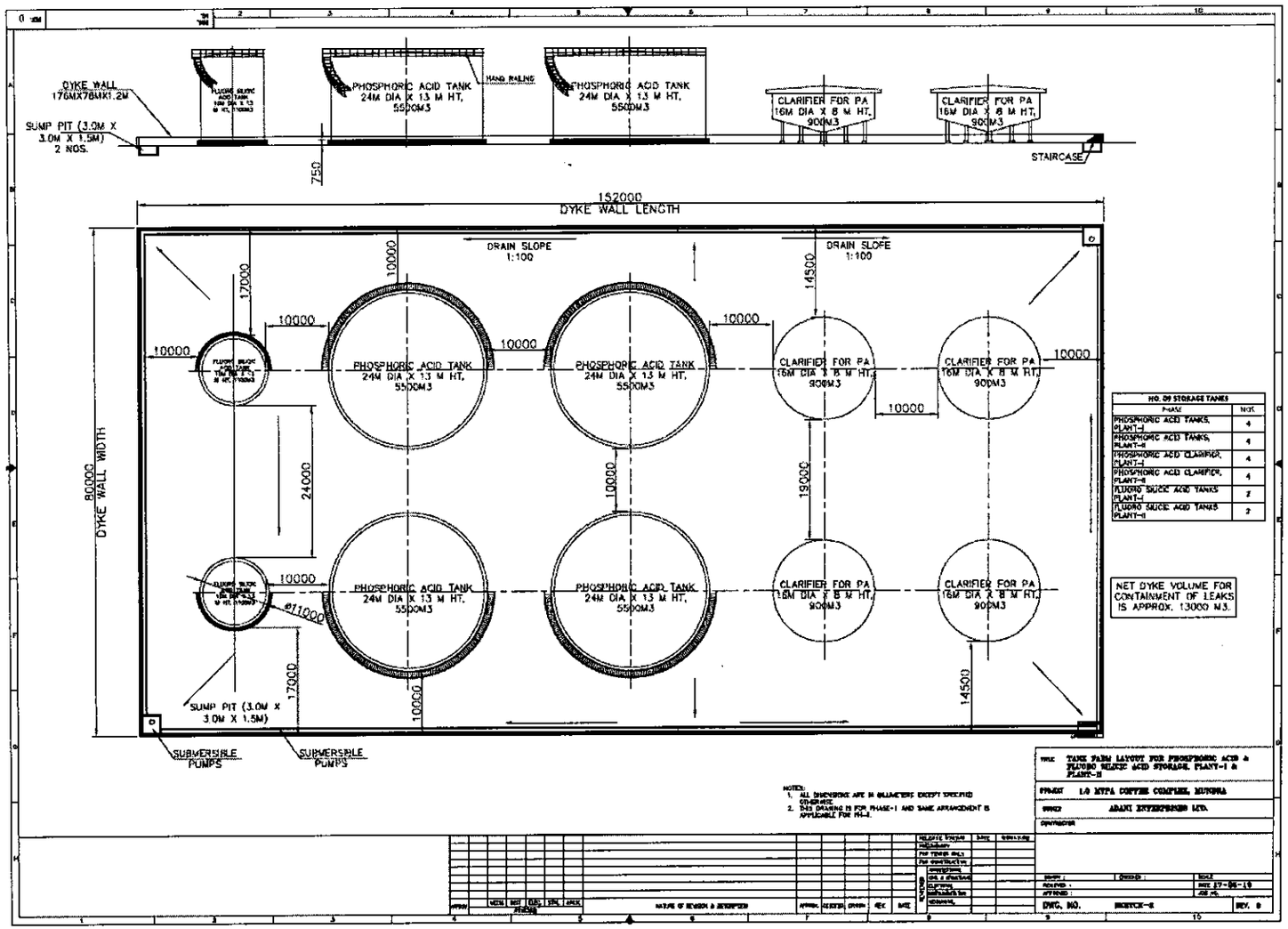
SULPHURIC ACID TANK STORAGE DETAILS



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PHOSPHORIC ACID TANK STORAGE DETAILS



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Maintenance Protocol for Sulphuric Acid Storage Tank - Routine Inspection & Maintenance:

(periodicity to be followed per company standards)

1) Periodical Visual Inspection of tank:

a) Check condition of desiccant and desiccant pot in the roof;
b) Look for corrosion caused by spillage of acid, if any - mainly around the acid inlet and level measurement nozzles in tank roof;
c) Check the condition of external rafters, purlins and other structural members, if any;
d) Check the condition of welding between roof plate and rafters / purlins / structural members;
e) Check the condition of welding of structural members;
f) Check for localized bulging / buckling, if any, in tank shell and roof;
g) Check for excessive out of roundness, if any, in tank shell;
h) Check for distortions, if any, in tank bottom plate;
i) Check whether the bottom plate is seating properly on the civil support base;
j) Check if bottom plate is lifted upwards locally;
k) Check whether tank is earthed properly;
l) Check whether earthing bosses and earthing flats are is in satisfactory condition and are connected firmly;
m) Check whether the acid resistant brickwork / tiling is in satisfactory condition;
n) Check for settlement, if any, of tank foundation;
o) Check the condition of tank outlet line and its supports- especially those located within the dyke;
p) Check the condition of dyke walls and acid collection sumps inside and outside the dyke; and
q) Check the condition of tank access ladders, stairs and platforms.

2) Periodical Inspection of tank:

a) Test the properties of desiccant and replace based on condition (can be reused after reheating to remove moisture provided other properties fall within standards;
b) Check the thickness of roof, shell and bottom plates - Ultrasonic thickness check;
c) Check shell thickness in the area close to acid inlet nozzle;
d) Check thickness of tank nozzle pipes;
e) Test the resistance of tank earth connections / earth pits; and
f) Visual inspection of pipe supports - piping connected to tank.

3) Major Inspection of tank:

Internal Inspection of tank:

a) Check condition of tank internals -acid inlet nozzle down comer pipe, tank outlet nozzle emergency stopper arrangement- if available;
b) Check the condition of internal roof rafters, purlins and other structural members, if any;
c) Assess condition of tank using elaborate NDT checks -UT, DP and MPI of shell, roof. bottom plates and nozzle pipes;
d) DP and MPI of shell, roof. bottom plate & nozzle pipe welds;
e) Vacuum check of bottom plate welds;
f) UT, DP and MPI piping connected to tank;

g) Visual inspection of pipe supports; and
h) Hydro test of tank if major repairs are carried out.

Maintenance Protocol for Phosphoric Acid Storage Tank - Routine Inspection & Maintenance:

(periodicity to be followed per company standards)

1) Periodical Visual Inspection of tank:

a) Look for corrosion caused by spillage of acid, if any - mainly around manholes vent, acid inlet and level measurement nozzles in tank roof;
b) Check the condition of external rafters, purlins and other structural members;
c) Check the condition of welding between roof plate and rafters / purlins / structural members;
d) Check the condition of welding of structural members;
e) Check for localized bulging / buckling, if any, in tank shell and roof;
f) Check for excessive out of roundness, if any, in tank shell;
g) Check for distortions in tank bottom plate, if the bottom plate is provided with a slope from outer to center;
h) Check for corrosion of bottom plate projecting outside the shell and laid in level with protective Mastic layer, if a tank bottom plate is flat;
i) Check whether the bottom plate is seating properly on the civil support base. Check if bottom plate is lifted upwards locally;
j) Check whether tank is earthed properly - check whether earthing bosses and earthing flats are is in satisfactory condition and are connected firmly;
k) Check whether the acid resistant brickwork / tiling is in satisfactory condition;
l) Check for settlement, if any, of tank foundation;
m) Check the condition of tank outlet line and its supports- especially those located within the dyke;
n) Check the condition of dyke walls and Acid collection sumps inside and outside the dyke;
o) Check the condition of tank access ladders, stairs and platforms; and
p) Check the condition of agitator / raker base, if available.

2) Periodical Inspection of tank:

a) Test the resistance of tank earth connections / earth pits; and
b) Visual inspection of pipe supports - piping connected to tank.

3) Major Inspection of tank:

Internal Inspection of tank:

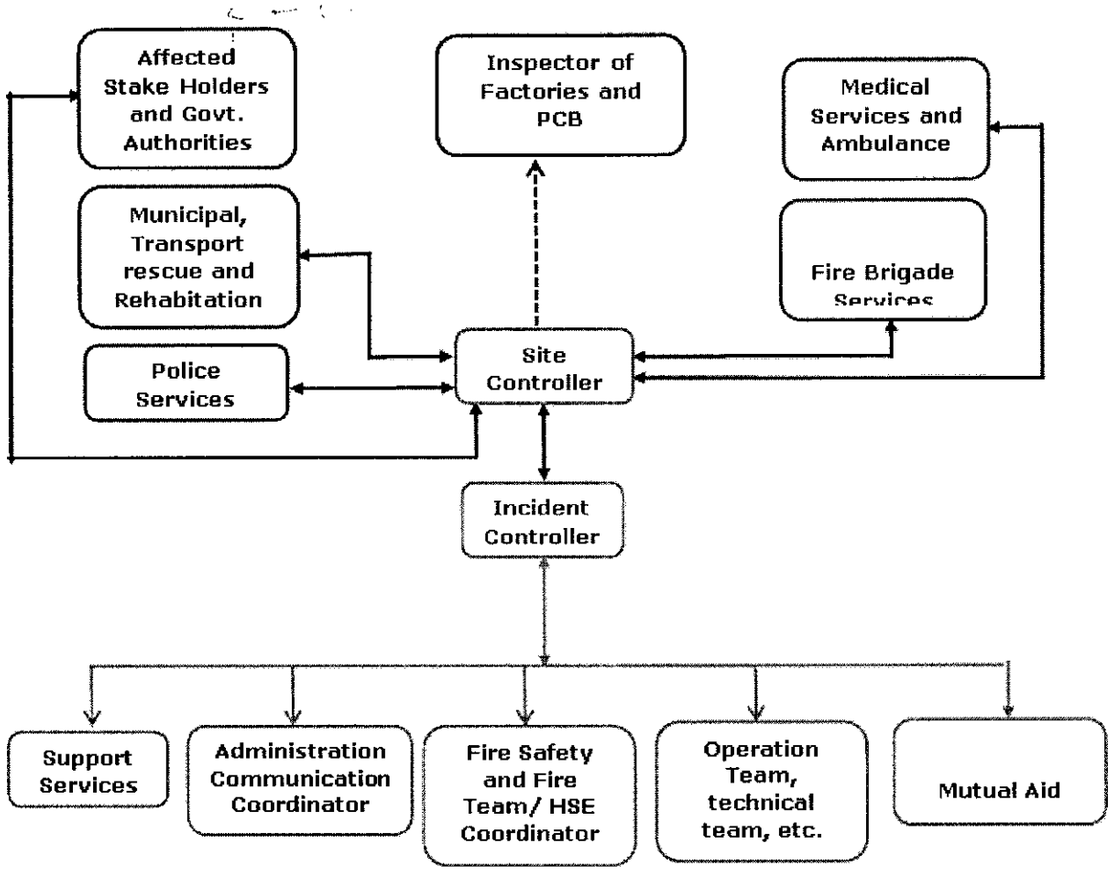
a) Check condition of tank internals - agitators, rakers, if available;
b) Assess condition of tank rubber lining using elaborate NTD checks - hardness, thickness and holiday (high voltage spark) testing of rubber lining over shell, roof, bottom plates and nozzle pipes;
c) Check condition of rubber lining of piping connected to tank using ndt tests as above;
d) Visual inspection of pipe supports; and

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e) Hydro test of tank if major repairs are carried out or if tank rubber lining is replaced.

➢ **DISASTER MANAGEMENT PLAN**



ONSITE EMERGENCY PLAN

Mechanism for Incident Control Reporting:

a) Anyone notices an emergency situation such as Metal leak from furnace, fire in LPG bullet, gas leak, acid leak from storage tank, etc. would inform his immediate superior and emergency control center;
b) The person on duty in the emergency control centre would appraise the site controller;
c) Site controller verifies the situation from the incident controller of that area or the shift in-charge and takes a decision about an impending onsite emergency;
d) This would be communicated to all the incident controllers, emergency coordinators; and
e) Simultaneously, the emergency warning system would be activated on the instructions of the site controller.

The responsibilities of the key personnel during Emergency:

1) Site Controller

a) On receiving information about emergency, he would rush to Emergency Control Center (ECC) and take charge of ECC and the situation;
b) Assesses the magnitude of the situation on the advice of incident controller and decides evacuation, emergency declaration;
c) Organizes announcement by public address system about location of emergency;
d) Directs personnel for rescue, rehabilitation, transport, fire, brigade, medical and other designated mutual support systems locally available, for meeting emergencies;
e) Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the premises of the factory, informs to district emergency authority, police, hospital and seeks their intervention and help;
f) Informs Inspector of Factories, Deputy Chief Inspector of Factories, State Pollution Control Board and other statutory authorities;
g) Gives a public statement, if necessary; and
h) Keeps record of chronological events and prepares an investigation report and preserves evidence.

2) Incident Controller

a) Assembles the incident control team;
b) Directs operations within the affected areas with the priorities for safety to personnel, minimize damage to the plant, property and environment and minimize the loss of materials;
c) Directs the shutting down and evacuation of plant and areas likely to be adversely affected by the emergency;
d) Has regard to the need for preservation of evidence so as to facilitate any inquiry into the causes and circumstances, which caused or escalated the emergency;
e) Co-ordinates with emergency services at the site; and
f) Keeps in touch with the team and appraise the site controller about the progress.

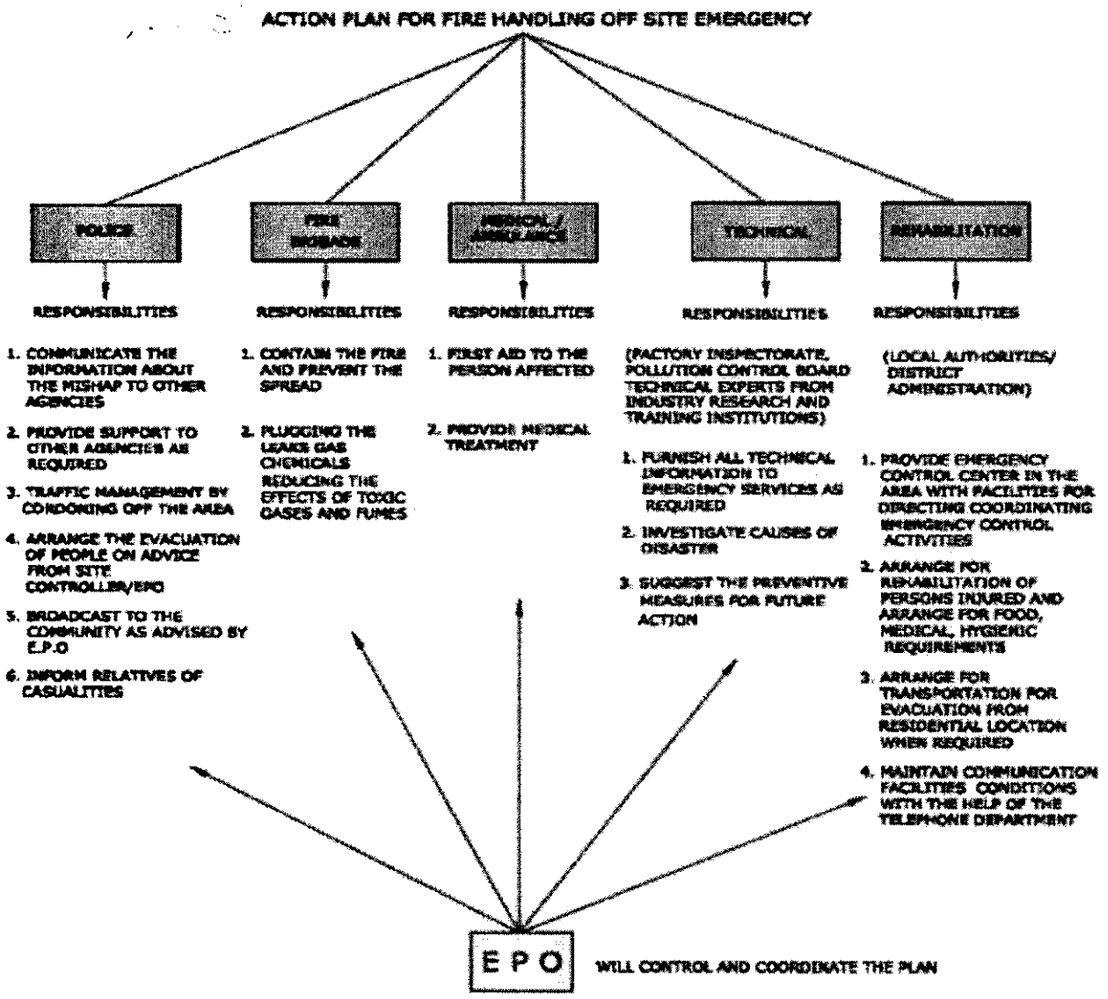
The responsibilities of the key personnel are appended below:

Site Controller

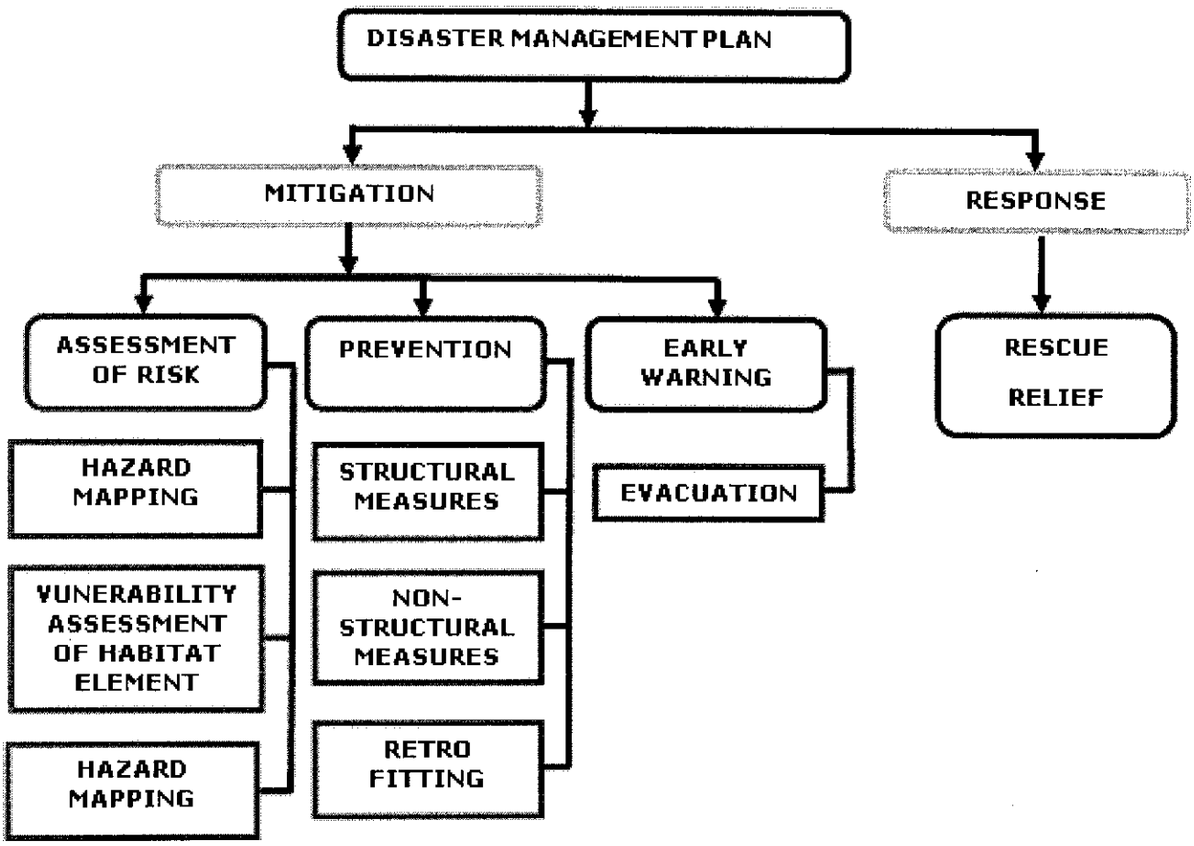
a) On receiving information about emergency, he would rush to Emergency Control Center (ECC) and take charge of ECC and the situation;
b) Assesses the magnitude of the situation on the advice of incident controller and decides evacuation, emergency declaration;
c) Organizes announcement by public address system about location of emergency;
d) Directs personnel for rescue, rehabilitation, transport, fire, brigade, medical and other designated mutual support systems locally available, for meeting emergencies;
e) Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the premises of the factory, informs to district emergency authority, police, hospital and seeks their intervention and help;
f) Informs Inspector of Factories, Deputy Chief Inspector of Factories, PCB and other statutory authorities;
g) Gives a public statement, if necessary; and
h) Keeps record of chronological events and prepares an investigation report and preserves evidence.

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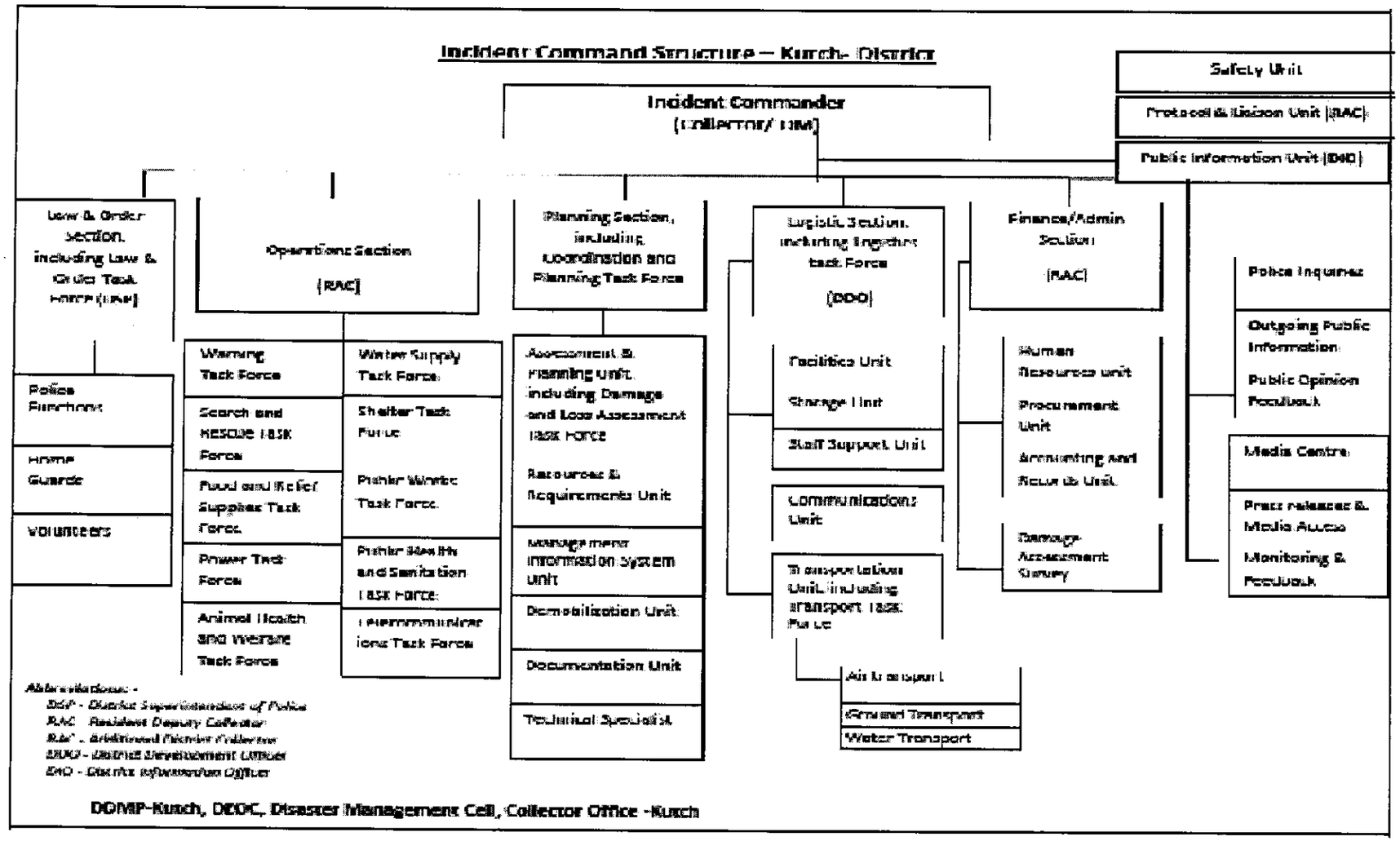
OFF-SITE EMERGENCY ORGANIZATION CHART



DISASTER MANAGEMENT PLAN

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KUTCH INCIDENT COMMAND SYSTEM ORGANIZATIONAL

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ADANI LIMITED

COPPER SMELTER - MUNDRA

Hazard Identification & Risk Assessment Study
for
Worst Case Scenarios

3803

1. INTRODUCTION

Adani Limited have taken up a project for installation of Copper Smelter with 9,00,000 TPA capacity at Mundra in Gujarat State.

In the process of granting Environmental Clearance for the Project, the Expert Appraisal Committee recommend to carry out a Hazard Identification & Risk Assessment (HIRA) study for the Worst-Case Scenarios.

Accordingly, this document presents the HIRA study report for the worst-case scenarios in the process plants and storage units in the Copper Smelter facility.

2. FACILITY DESCRIPTION

The Copper Smelter facility of Adani Limited at Mundra consists of the following major units.

S. No.	Plant	Units	Phase-I	Phase-II	Overall Plant Configuration
1	Copper Smelter Plant	TPA	4,50,000	4,50,000	**9,00,000**
2	Copper Refinery Plant	TPA	5,00,000	5,00,000	**10,00,000**
3	Continuous Cast Copper Rod Plant	TPA	2,50r,000	2,50,000	**5,00,000**
4	Copper Scrap & e-Scrap Melting Facility	TPA	50,000	50,000	**1,00,000**
5	Sulphuric Acid Plant	TPA	15,00,000	15,00,000	**30,00,000**
6	Phosphoric Acid Plant (as100% P2O5)	TPA	2,50,000	2,50,000	**5,00,000**
7	Aluminium Fluoride Plant	TPA	15,000	15,000	**30,000**
8	Oxygen (Industrial) Plant	TPM	48,000	48,000	**96,000**
9	Precious Metal Recovery Plant				
a	Gold	TPA	25	25	**50**
b	Silver	TPA	250	250	**500**
10	Selenium Recovery Plant	TPA	144	144	**288**
11	Waste Heat recovery boiler-based power plant	MW	20	20	**40**

The following major storage tanks are provided in the Copper Smelter facility.

Sr. No.	Chemical Stored	No. of Tanks	Capacity of Each Tank	Total Capacity	Type of tank
1	Sulphuric acid (98%)	15	5500 KL	**1,50,000 T**	Vertical cone roof tanks. Carbon steel
2	Phosphoric acid	8	4500 KL	**30,000 T**	Vertical cone roof tanks. Carbon steel with rubber lining
3	LPG	4	100 T	**400 T**	Above ground horizontal cylindrical tanks (bullets)
4	Furnace oil	4	1000 T	**4000 T**	Vertical cone roof tanks. Carbon steel
5	HSD	2	500 KL	**1000 KL**	Vertical cone roof tanks. Carbon steel

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3. OBJECTIVE AND METHODOLOGY OF HAZID STUDY

The objective of this HIRA review is to identify all significant hazards associated with the proposed facility which have potential consequences with high severity level to harm people, environment or property, with a view to eliminating or reducing the hazards through the application of inherent safety at an early stage of the design.

The stated objectives of a HIRA review are to:

a) Identify potential hazardous events which can cause large impacts on impact/s on people, property, or the environment.
b) Identify existing safeguards;
c) If existing safeguards are considered inadequate, propose additional risk reduction measures by eliminating hazards, minimizing their effect or controlling the consequences of events as required.

HIRA Study Methodology

The HIRA study follows a structured, systematic methodology using a comprehensive checklist of hazards prepared on the basis of guideline provided by the standard ISO 17776: 2002.

The HIRA study proceeds as follows:

1. Select the system / section (or the activity) for review
2. Describe the main features of the system (layout, safety measures, operating conditions, etc.) or activity.
3. Select the first (or next) guideword category from the selected list
4. Consider the hazard and discuss its applicability in relation to the system / section under review
5. For each applicable hazard, consider if the hazard can be removed or reduced. If a hazard cannot be removed, note the main existing or planned safeguards and review their adequacy.
6. Perform risk rating.
7. Identify safeguards, as applicable
8. Make recommendations for further action, as required
9. Repeat steps 3 - 8 for all guidewords in the selected list
10. Repeat steps 1-9 for all systems / sections of the plant under review (or activities described in the procedure under review)

The following Risk Assessment Matrix prepared as per the guideline provided by Energy Institute (formerly known as Institute of Petroleum) UK.

Risk Assessment Matrix		Likelihood of Occurrence				
		A	B	C	D	E
Severity of Consequence	1	Low Risk				
	2					
	3					
	4		Moderate Risk			

Severity of Consequence			
Severity Level	Description		
	People	Environment	Asset
1	Slight injury or health effect	Slight effect	Slight damage
2	Minor/ reportable injury or health effect	Minor effect	Minor damage
3	Moderate/ lost time injury of health effect	Moderate effect	Moderate damage
4	Major injury or health effect/ Single fatality	Major effect	Major damage
5	Multiple fatalities	Massive effect	Massive damage

Likelihood of Occurrence	
A	Never heard of it in the industry
B	Heard of it in the industry
C	Happened more than once per year in the industry
D	Happened more than once per year in the organization/ group
E	Happened more than once per year in the location

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4. LIST OF NODES & DOCUMENTS

This HIRA study covers the Copper Smelter Facility of Adani Limited at Mundra.

Considering the details of the various units and storage systems, the following Nodes were taken up for the HIRA study of the worst-case scenarios.

Node No.	Node Description
1.	Copper smelter plant including converter and anode furnace
2.	Sulphuric acid plant & storage
3.	LPG storage bullets

Derailed HIRA work sheets for the above plants/ units are provided at Annexure – I.

The wort case scenarios emerging from the HIRA study are described below.

Copper Smelter Plant

Worst Case Scenarios:

1. Spill of Molten Metal
   Large quantity of molten copper and slag are contained in the process equipment and ladle used for transfer.
   Spillage of molten metal may cause damage as follows:
   - Serious burn injury to personnel in the area
   - Steam explosion if the molten metal comes into contact with water, which may cause local damage and splatter of molten metal.

   The damage is expected to be limited.

   The following safeguards are provided:
   - Refractory lining for the smelter process equipment
   - Interlocks with limit switches to prevent excess tilting of equipment holding molten metal
   - Periodic inspection and testing of ladles, EOT cranes and other lifting equipment
   - Good housekeeping to prevent water accumulation in the smelter area

2. Release of sulphur dioxide (SO2) gas from smelter/ converter.
   SO_2 gas evolved during smelting on copper sulphide ore is evacuated by SO_2 gas blower in sulphuric acid plant. Thus, the smelter is always under negative pressure to prevent release of SO_2 gas in the work area.

   In case the SO_2 gas blower stops on power failure, the SO_2 gas from smelter will escape into the surrounding work area resulting in toxic gas exposure of plant personnel.

   The following safeguards are provided:
   - Safety instrument interlock to stop the smelter unit automatically in the event of stoppage of SO_2 gas blowers or excess gas pressure in smelter. Being a gas at atmospheric pressure, the holdup inventory of SO_2 in the system is limited in quantity.
   - Automatic starting of Bypass fan installed after electrostatic precipitator (ESP) to evacuate the SO_2 gas from the system and divert it to flue gas desulphurisation (FGD) unit for safe disposal.

Sulphuric Acid Plant

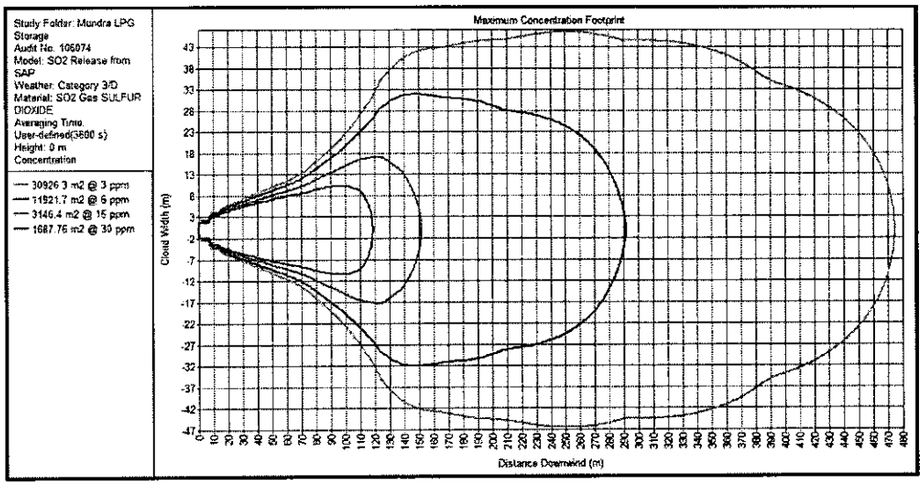
Worst case scenario: Release of gas containing SO_2 from major leak in plant equipment/ piping

Basis:

Gas volume inventory:	2,000 M^3
SO_2 gas concentration:	10 % (vol)
Pressure:	0.1 kg/cm^2g
Temperature (avg):	300 °C
Leak size:	150 mm diameter

Result of dispersion analysis

Downwind distance for 3 ppm SO_2 in air: 500 m



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Sulphuric Acid Storage Tanks

There are 6 tanks for storage of concentrated Sulphuric Acid with a capacity of 5,500 M^3 each for Plant #1 and Plant #2.

Worst Case Scenarios:

1. Spill of Sulphuric Acid from Storage Tanks
   Considering the large inventory of sulphuric acid in storage tanks, spillage of s acid may cause damage as follows:
   - Serious acid burn injury to personnel in the vicinity
   - Contamination of soil and surface/ sub-soil water
   - Damage of concrete on prolonged contact.

   The following safeguards are provided:
   - RCC dyke containment with internal acid-resistant tile lining and sump pump for transfer of collected acid
   - Tank overfill protection with multiple level instruments of high reliability
   - Adequate free space in each tank to facilitate emergency transfer from the tank under distress
   - Periodic inspection and maintenance of equipment & piping in acid service

2. Earthquake event
   In the event of an earthquake, the following types of damage are possible:
   - Liquefaction of soil around the pile foundations leading to spreading, bending and damage of the concrete piles
   - Sinking of tank foundation resulting in damage of acid outlet connection at tank bottom
   - Horizontal movement of foundation (by about 200 mm) leading to partial damage of tank bottom plate and side walls resulting in leakage of acid
   - Sloshing of acid in tank resulting in damage of tank roof and spillage of acid outside
   - Damage of dyke wall and floor resulting in release of acid to surrounding soil

   Based on the reports of damage to liquid storage tanks due to earthquakes, it is understood that major damage by tilting and displacement from foundation is not likely. The results of acid spill due to the damage of tank, foundation and dyke structures are as follows.
   - Serious acid burn injury to personnel in the vicinity
   - Contamination of soil and surface/ sub-soil water

   The following safeguards are provided:
   - RCC dyke containment with internal acid-resistant tile lining and sump pump for transfer of collected acid
   - The acid storage tanks, their foundations and RCC dyke structures shall be designed for seismic zone – V representing the highest seismic activity.
   - Sizing of foundations and dyke (length, width & height) will ensure adequate space inside the dyke to prevent spillage of acid outside.

   Recommendation:
   - Provide adequate head space above the maximum liquid level in the tank to minimise spillage due to sloshing in the event of earthquake
   - Emergency plan to arrest acid release from damaged dyke by use of acid-proof cement mortar and mitigate the effect by application of lime powder.

There are 4 tanks of the Phosphoric Acid with a capacity of about 5,500 m^3 each and 4 clarifiers with a capacity of about 1800 m^3 each for plant 1 and plant 2. and 4. Tanks and clarifier will be made of carbon steel with natural Rubber lining for the shell, carbon steel material of construction with additionally carbon brick lining at the bottom of the tank as well as 1 meter height along the circumference. The hazards and safeguards are similar to those mentioned for sulphuric acid storage tanks.

LPG Storage

There are 4 Nos. of above-ground horizontal cylindrical vessels (bullets) for storage of LPG.

Worst Case Scenarios:

1. LPG leak from storage tanks or associated piping resulting in jet fir, pool fire or vapour cloud explosion
2. Engulfment of above-ground LPG bullet in jet fire or pool fire resulting from leakage of LPG or spillage of fuel oil or HSD from tanks located in the nearby area leading to rupture of the LPG bullet and BLEVE/ fire ball.

The damage distances for the worst-case scenario of catastrophic failure of LPG bullet estimated using DNV Phast software are as follows:

Worst Case Scenario: Catastrophic Failure of LPG Bullet		
Damage Effect	Parameter	Damage Distance (metres)
Vapour Cloud Explosion Overpressure9	0.02 barg (0.3 psig)	470
	0.07 barg (1 psig)	290
	0.2 barg (3 psig)	Not reached
Fire Ball Thermal Radiation Intensity	4 kW/m^2	380
	12.5 kW/m^2	190
	37.5 kW/m^2	Not reached

It is seen that the effect distances for light injury/ damage may extend outside the plant boundary.

The following safeguards are provided:

- Dyke containment is provided for FO and HSD tanks to prevent oil spreading to LPG bullet area.
- Water spray system is provided for the LPG bullets to prevent overheating of the shells exposed to external fire, thus preventing failure of the vessel.

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5. RECOMMENDATIONS

The recommendations emerging from this HIRA study of the Worst-Case Scenarios at Mundra Copper Smelter Facility of Adani Limited are listed below.

Copper Smelter & Related Units

1. Ensure installation of LPG header and connecting pipes away from possible dropped object and impact by crane.
2. SO_2 gas piping should be covered under the condition monitoring system (NDT).
3. Provide redundancy for safety critical limit switches for tilting of equipment containing molten metal and other such service.
4. Provide emergency power supply to the Bypass fan installed after electrostatic precipitator (ESP) so that it is available when SO_2 gas blower stops on main power failure.

Sulphuric Acid Plant & Storage

1. Keep flange joints in sulphuric acid piping to the minimum required

   Provide flange guards for flange joints in sulphuric acid piping.
2. Provide overfill protection for acid storage tanks with independent level transmitters, one for high level alarm and another to close shut-off valve in tank inlet.

LPG Storage

1. Provide spiral wound metallic gasket or ring joint in LPG service as per OISD standard 144.
2. The flange joint in liquid outlet pipe should be located 3 m away from shadow of the bullet.
3. Provide remote operated shut off valve in LPG liquid outlet line from bullet.
4. Provide emergency power supply for the pump supplying water for the spray system around LPG bullets.

---x---

Annexure – 1

HAZID RECORD SHEETS

ATTACHMENT-1

Node 1: COPPER SMELTER PLANT

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
Hydrocarbons								
LPG	Large leak in LPG pipe	Damage by dropped object/ impact	Vapour cloud explosion. Damage of building.		4	B		**1. Ensure installation of LPG header and connecting pipes away from possible dropped object and impact by crane.**
Pressure hazards								
Gas under pressure								
Environmental hazard								
Weather & Natural Events	Water accumulation	Heavy rain		Facility designed for maximum wind speed and rainfall as per historic data & IS standard				
	Structure damage	Heavy storm						
		Earthquake		Structures designed for seismic zone as per IS standard				
Hot fluids								
Fluids >100 °C	Molten metal spill	Excess tilting while pouring molten copper blister to ladle Brake failure	Serous burn injury to O&M personnel	Safety system to bring converter to safe position in case of instrument or brake failure. Periodic test and inspection of EOT cranes and lifting equipment.	3	D		

Node 1: COPPER SMELTER PLANT

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
	Steam explosion if molten metal comes into contact with water on floor.	Water accumulation on floor/ drain in building Damage of copper cooling block I smelter/ converter due to worn out refractory. Improper application of oxygen lance.	Spillage of molten metal on O&M personnel; serious burn injury; equipment damage	Monitoring of temperature in copper cooling blocks with high alarm. Periodic check of refractory lining.	3	D		
Cold fluids								
Fluids <(-)10 °C								
H-14: Open flame								
Electricity								
Physical								
Noise								
Vibration								
UV/ IR/ Microwave radiation								
Asphyxiating atmosphere								
Reduced oxygen								

ATTACHMENT-1

Node 1: COPPER SMELTER PLANT

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
concentration in air								
Toxics in air	Release of hot SO_2 gas from smelter plant	Stoppage of SO_2 gas blower Large leakage in gas pipe due to corrosion	Release of SO2 gas in work place affecting large number of O&M personnel	Standby blower Exhaust pressure monitoring system with alarm and interlock to trip converter in case of loss of negative pressure in the system.	3	C		**2. Condition monitoring system (NDT) for SO_2 gas piping**
Chemicals								
Biological								
Ergonomics								
Work environment								
Physically demanding task								
Mentally demanding task								
Environmental aspects								
Resource use								
Discharge to water								
Discharge to land								
Emission to air								

ATTACHMENT-1

Node 1: COPPER SMELTER PLANT

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
Equipment damage								
Thinning due to wear/ rubbing								
Cracks due to impact								
Cracks due to cyclic loading								
Bearing failure								
Corrosion (pitting/ thinning)								
Instrument/ control malfunction								
Instrument/ transmitter malfunction								
Limit switch malfunction			Excess tilting of converter/ anode furnace due to limit switch malfunction	Trip interlock of angle exceeding specified limit	4	C		**3. Provide redundancy for safety critical limit switches for tilting of equipment containing molten metal.**
Utility failure								

ATTACHMENT-1

Node 1: COPPER SMELTER PLANT

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
Power failure	Loss of exhaust gas suction in smelter system	Stoppage of SO_2 gas blower due to power failure	Release of SO_2 gas from smelter system in work area. Toxic exposure of plant personnel to SO_2	Safety interlock to shut down smelter on stoppage of SO_2 gas blower. Bypass fan (with emergency power supply) for removal of residual gases from ESP to FGD	3	D		**4. Provide emergency power supply to the Bypass fan installed after electrostatic precipitator (ESP) so that it is available when SO_2 gas blower stops on main power failure.**
Cooling water failure				Low cooling water pressure alarm and trip.				
Instrument air failure				Fail safe position for control valves and actuators.				
Loss of containment								
Major leak/ release	Covered in previous top events							

ATTACHMENT-1

Node 2: SULPHURIC PLANT & STORAGE

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
Hydrocarbons								
Pressure hazards								
Environmental hazard								
Weather & Natural Events		Earthquake	Structural damage of sulphuric acid storage tank and dyke. Possible spill of sulphuric acid in surrounding area resulting in - acid burn injury - contamination of soil & water	Acid storage tanks, foundations and dyke structures designed for seismic zone – V as per IS 1893 Maximum filling of acid tanks will be limited to 80% for safety.				**Remark: The same points are applicable to Phosphoric acid storage tanks**
Hot fluids								
Fluids >100 °C								
Cold fluids								
Fluids <(-)10 °C								
Open flame								
Electricity								

ATTACHMENT-1

Node 2: SULPHURIC PLANT & STORAGE

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix S	L	R	Recommendations
Physical								
Noise								
Vibration								
UV/ IR/ Microwave radiation								
Asphyxiating atmosphere								
Reduced oxygen concentration in air								
Toxics in air	Please refer to Node 1							
Chemicals								
Sulphuric acid (concentrated)	Leakage of sulphuric acid	Gasket failure in acid piping/ equipment	Large acid spillage on personnel; serious acid burns		4	D		**5. Keep flange joints in sulphuric acid piping to the minimum required** **Provide flange guards for flange joints in sulphuric acid piping.**
	Overflow from acid storage tank	Malfunction of level instrument in acid storage tank	Large spill of sulphuric acid; acid burn injury to personnel.	Dyke with acid proof tiles for sulphuric acid tanks.	3	C		**6. Provide overfill protection for acid storage tanks with independent level transmitters, one for high level alarm and another to close shut-off valve in tank inlet.**
Biological								

ATTACHMENT-1

Node 2: SULPHURIC PLANT & STORAGE

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
Ergonomics								
Work environment								
Physically demanding task								
Mentally demanding task								
Environmental aspects								
Resource use								
Discharge to water								
Discharge to land								
Emission to air								
Equipment damage								
Thinning due to wear/ rubbing								
Cracks due to impact								
Cracks due to cyclic loading								
Bearing failure								
Corrosion (pitting/ thinning)								
Instrument/ control malfunction								

ATTACHMENT-1

Node 2: SULPHURIC PLANT & STORAGE

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
Instrument/ transmitter malfunction								
Limit switch malfunction								
Utility failure								
Power failure				Emergency power supply				
Cooling water failure				Low cooling water pressure alarm and trip.				
Instrument air failure				Fail safe position for control valves and actuators.				
Loss of containment								
Major leak/ release	Covered in previous top events							

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Node 3: LPG STORAGE

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
Hydrocarbons								
LPG								
Pressure hazards								
Environmental hazard								
Weather & Natural Events	Covered in Node 1							
Hot fluids								
Fluids >100 °C								
Cold fluids								
Fluids <(-)10 °C								
Open flame								
Electricity								
Physical								
Noise								
Vibration								
UV/ IR/ Microwave radiation								
Asphyxiating atmosphere								
Reduced oxygen								

3524

ATTACHMENT-1

Node 3: LPG STORAGE

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
concentration in air								
Toxics in air	Please refer to Node 1							
Chemicals								
Biological								
Ergonomics								
Work environment								
Physically demanding task								
Mentally demanding task								
Environmental aspects								
Resource use								
Discharge to water								
Discharge to land								
Emission to air								
Equipment damage								
Thinning due to wear/ rubbing								
Cracks due to impact								

3826

ATTACHMENT-1

Node 3: LPG STORAGE

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
Cracks due to cyclic loading								
Bearing failure								
Corrosion (pitting/ thinning)								
Instrument/ control malfunction								
Instrument/ transmitter malfunction								
Limit switch malfunction								
Utility failure								
Power failure				Emergency power supply				
Cooling water failure				Low cooling water pressure alarm and trip.				
Instrument air failure				Fail safe position for control valves and actuators.				
Loss of containment								

3526

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Node 3: LPG STORAGE

Hazard Category	Top Events	Causes	Consequences	Safeguards	Risk Matrix			Recommendations
					S	L	R	
Major leak/ release	Large LPG leak from storage bullet or associated piping	Flange gasket failure	Jet fire or pool fire impinging on LPG bullet; BLEVE/ fire ball hazard.; major damage and injury with potential for fatality.	Water spray system for external cooling of LPG bullets.	4	D		**7. Provide spiral wound metallic gasket or ring joint in LPG service as per OISD standard 144.** **8. The flange joint in liquid outlet pipe should be located 3 m away from shadow of the bullet.** **9. Provide remote operated shut off valve in LPG liquid outlet line from bullet.** **10. Provide emergency power supply for the pump supplying water for the spray system around LPG bullets.**

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ENVIRONMENTAL IMPACT ASSESSMENT

FOR

THE PROPOSED GREENFIELD COPPER REFINERY PROJECT (1.0 MTPA) AT ADANI PORT SPECIAL ECONOMIC ZONE LAND IN VILLAGES SIRACHA AND NAVINAL, TALUKA MUNDRA, DISTRICT KUTCH, GUJARAT

VOLUME-II

REPLY TO EAC OBSERVATIONS RAISED DURING MEETING HELD ON 23RD AUGUST 2019

Sponsor :

adani

M/s. Adani Enterprises Limited (AEL)

Siracha and Navinal Villages, Taluka Mundra,
District Kutch, Gujarat

Prepared by :

Vimta
Driven by Quality, Inspired by Science.

Vimta Labs Limited
142, IDA, Phase-II, Cherlapally
Hyderabad–500 051, Telangana State
env@vimta.com, www.vimta.com
(NABL Accredited and ISO 17025 Certified Laboratory, Recognized by MoEF&CC, New Delhi)

January 2020

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PREFACE

M/s. Adani Enterprises Limited (AEL)

Siracha and Navinal Villages, Taluka Mundra,
District Kutch, Gujarat

ENVIRONMENTAL IMPACT ASSESSMENT

FOR
THE PROPOSED GREENFIELD COPPER REFINERY PROJECT (1.0 MTPA)
AT ADANI PORT SPECIAL ECONOMIC ZONE LAND IN VILLAGES
SIRACHA AND NAVINAL, TALUKA MUNDRA, DISTRICT KUTCH,
GUJARAT

VOLUME-II
REPLY TO EAC OBSERVATIONS RAISED DURING MEETING HELD 23RD AUGUST 2019

For and on behalf of VIMTA Labs Limited

Approved by : **M. Janardhan**

Signed :

Position : **Head & Vice President (Env)**

Date : 10th January, 2020

The report has been prepared inline with the prescribed TORs issued vide letter No.J-11011/113/2016-IA.II(I) dated 21st June 2016 of Ministry of Environment, Forests and Climate Change, New Delhi.

This report has been prepared by **Vimta Labs Limited** with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

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30	The data retrieved from the LULC studies shall be utilized for the prediction of impacts and mitigation measures.	1168
31	The Air Quality modeling studies shall be re-worked out including the mercury and keeping the mixing height in view.	1172
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32	The Environmental Policy of the Organization is not meeting the requirements given in ToR Point No. 9(i), 9(ii), 9(iii), 9(iv).	1200
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33	The CER shall be calculated on the slab rates as per the Office memorandum issued on 1st May, 2018.	1205

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EAC OBSERVATION NO.-25

EAC OBSERVATION:

Management of white ash shall be spelled out.

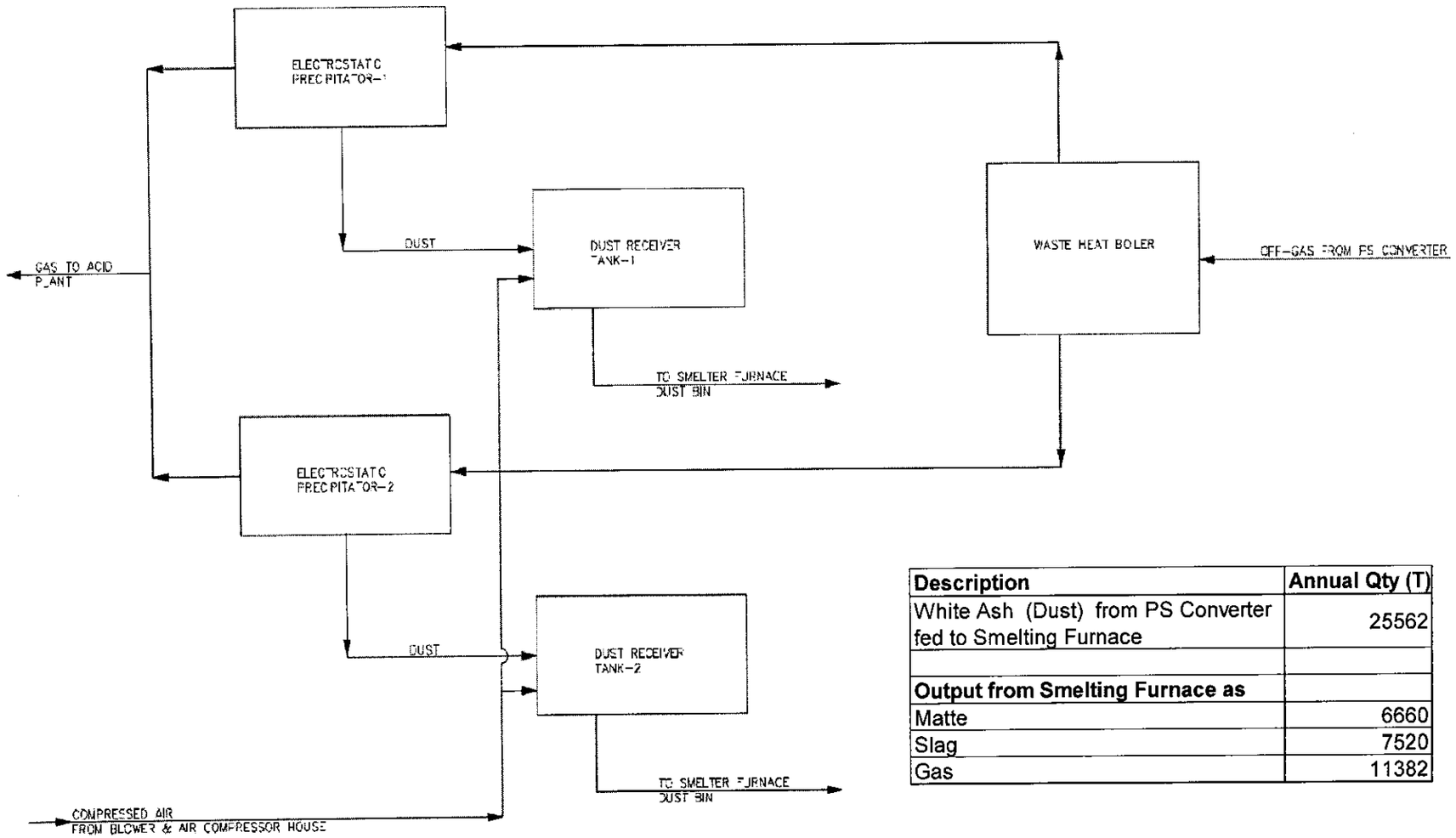
REPLY:

White Ash (Dust) Management:

- High temperature dust-laden gas ~1200^{0}C from Peirce Smith Converter (PSC) goes to the waste heat boiler to recover waste heat and produce steam and cool itself down to about 360^{0}C; while allowing much of the dust entrained in the gas to settle down at the same time; the dust-laden gas from all waste heat boilers reports in the balloon gas duct before it goes to the dust chamber for precipitation and then the ESP for dust removal.
- Dust-removed gas is sent by high temperature exhaust fan to the Sulphuric Acid Plant. The dust captured in the ESP is also called as white dust.
- This dust contains copper along-with impurities such as Lead, Zinc, etc.
- Dust captured in the PSC ESP is delivered by chain conveyor to the white dust bin. Pneumatic conveying system is used to send white dust to smelting furnace dust bin for blended with copper concentrate.
- Total amount of white dust collected will be 25,562 TPA
- Recycled white dust gets converted in the form of matte 6660 TPA, slag 7520 TPA and gas 11382 TPA.

EAC OBSERVATION NO.-25

BLOCK FLOW DIAGRAM: WHITE DUST (ASH) MANAGEMENT



Description	Annual Qty (T)
White Ash (Dust) from PS Converter fed to Smelting Furnace	25562
Output from Smelting Furnace as	
Matte	6660
Slag	7520
Gas	11382

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EAC OBSERVATION NO.-26

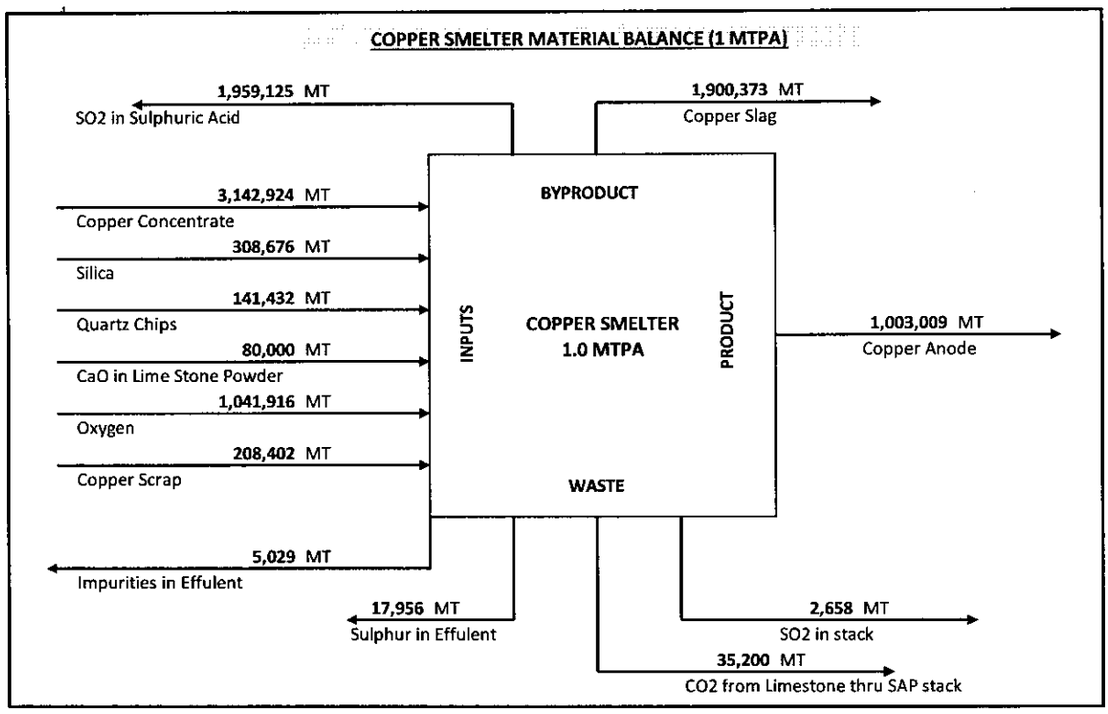
3833

EAC OBSERVATION:

Material balance shall be revised.

REPLY:

Revise material balance for Copper Refinery Project has been prepared facility-wise providing the details of input material, finished product, by product and waste generation. The revised material balance facility-wise is presented below.



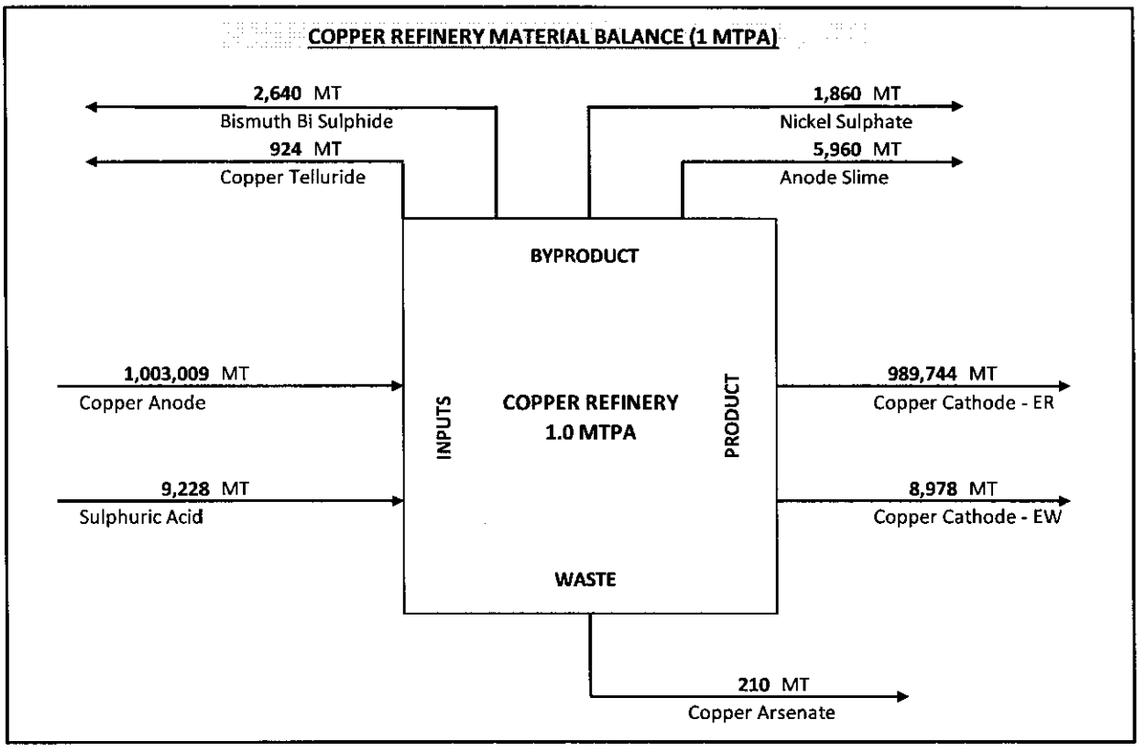
COPPER SMELTER MATERIAL BALANCE (1 MTPA)					
Input			**Output**		
Description	**UOM**	**Value**	**Description**	**UOM**	**Value**
Copper Concentrate	MT	3,142,924	Copper Anode	MT	1,003,009
Silica	MT	308,676	Copper Slag	MT	1,900,373
Quartz Chips	MT	141,432	SO_2 in Sulphuric Acid	MT	1,959,125
CaO in Lime Stone Powder	MT	80,000	SO_2 in stack	MT	2,658
Oxygen	MT	1,041,916	Sulphur in Effluent	MT	17,956
Copper Scrap	MT	208,402	CO_2 from Limestone through SAP stack	MT	35,200
Total	**MT**	**4,923,350**	Impurities in Effluent	MT	5,029
			Total	**MT**	**4,923,350**

MATERIAL BALANCE FOR COPPER CONCENTRATE AND BLISTER & SCRAP COPPER

Description	UOM	Qty
Copper Concentrate feed to Smelting Furnace	**MT**	**3,142,924**
Copper Grade (Average)	%	26
Copper in Concentrate	MT	817,160
Copper Slag	MT	1,900,373
Copper loss in Slag	%	0.7
Copper Recovery	%	98.0
Copper Anode from copper concentrate	**MT**	**800,817**

EAC OBSERVATION NO.-26

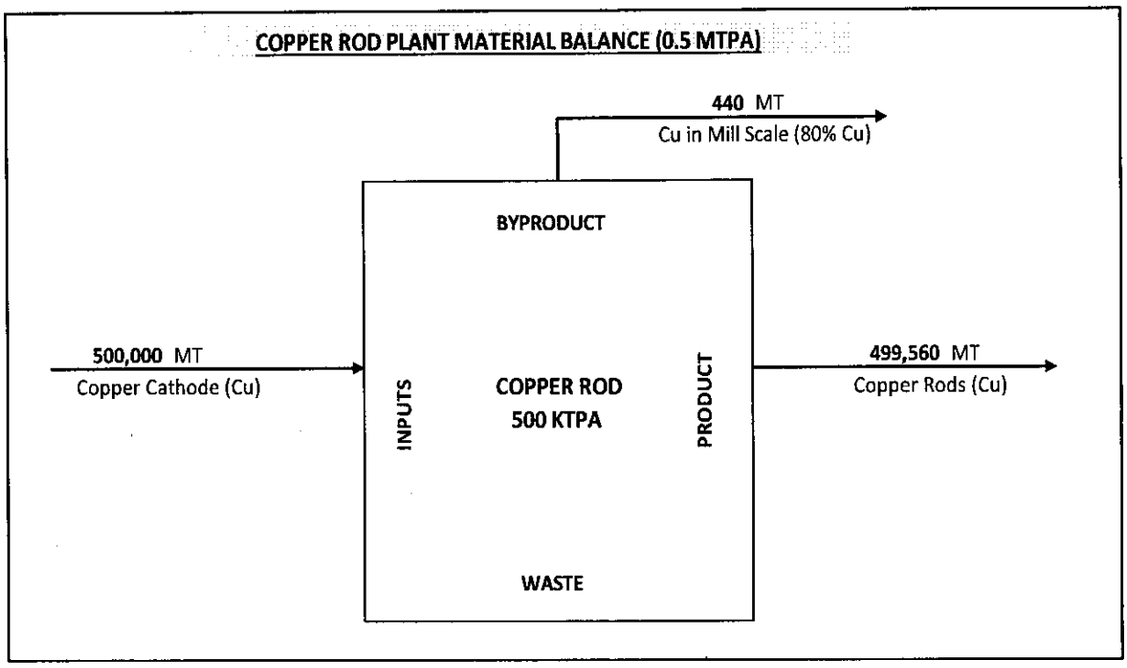
Description	UOM	Qty
Copper from Scrap & Blister feed to PS Converter and Scrap Melting Furnace	MT	208,402
Copper Grade (Average) Scrap & Blister	%	98
Copper Recovery	%	99.5
Copper Anode from copper scrap & Blister	**MT**	**202,192**
Total Copper Anode	MT	1,003,009
Copper Cathode	**MT**	**1,000,000**



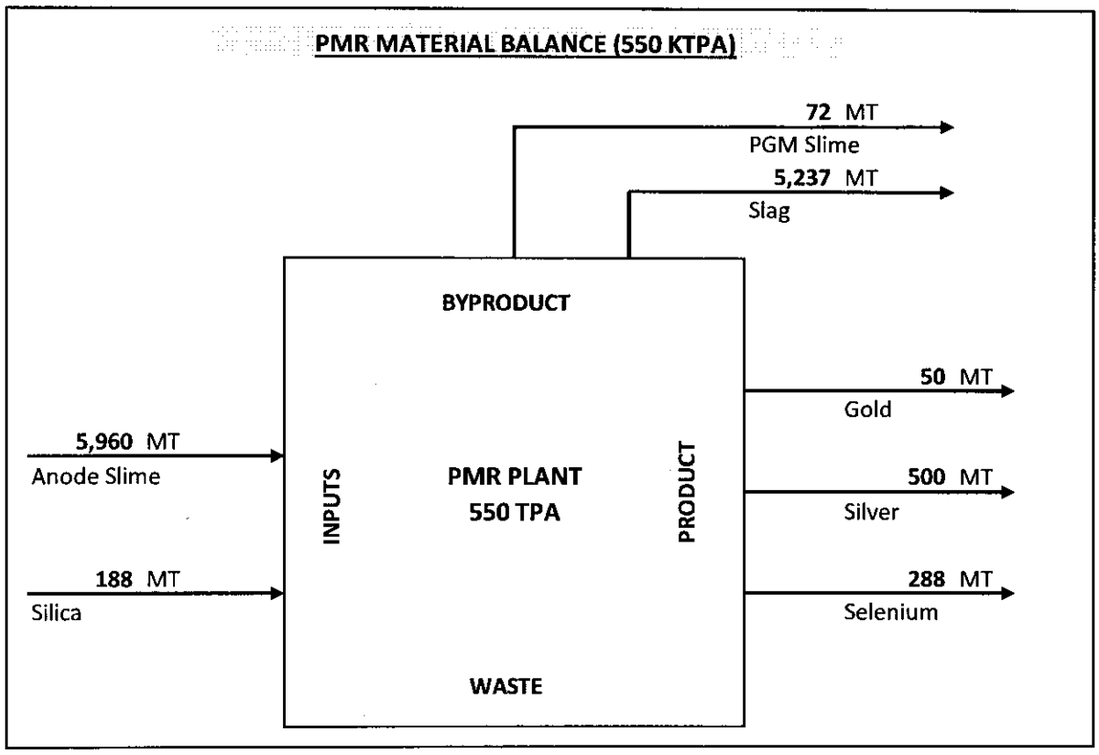
COPPER REFINERY MATERIAL BALANCE (1 MTPA)					
Input			Output		
Description	**UOM**	**Value**	**Description**	**UOM**	**Value**
Copper Anode	MT	1,003,009	Copper Cathode - ER	MT	989,744
Sulphuric Acid	MT	9,228	Copper Cathode - EW	MT	8,978
Total	**MT**	**1,012,237**	Arsenical Cathode	MT	1,920
			Copper Arsenate	MT	210
			Anode Slime	MT	5,960
			Nickel Sulphate	MT	1,860
			Bismuth Bi Sulphide	MT	2,640
			Copper Telluride	MT	924
			Total	**MT**	**1,012,237**

EAC OBSERVATION NO.-26

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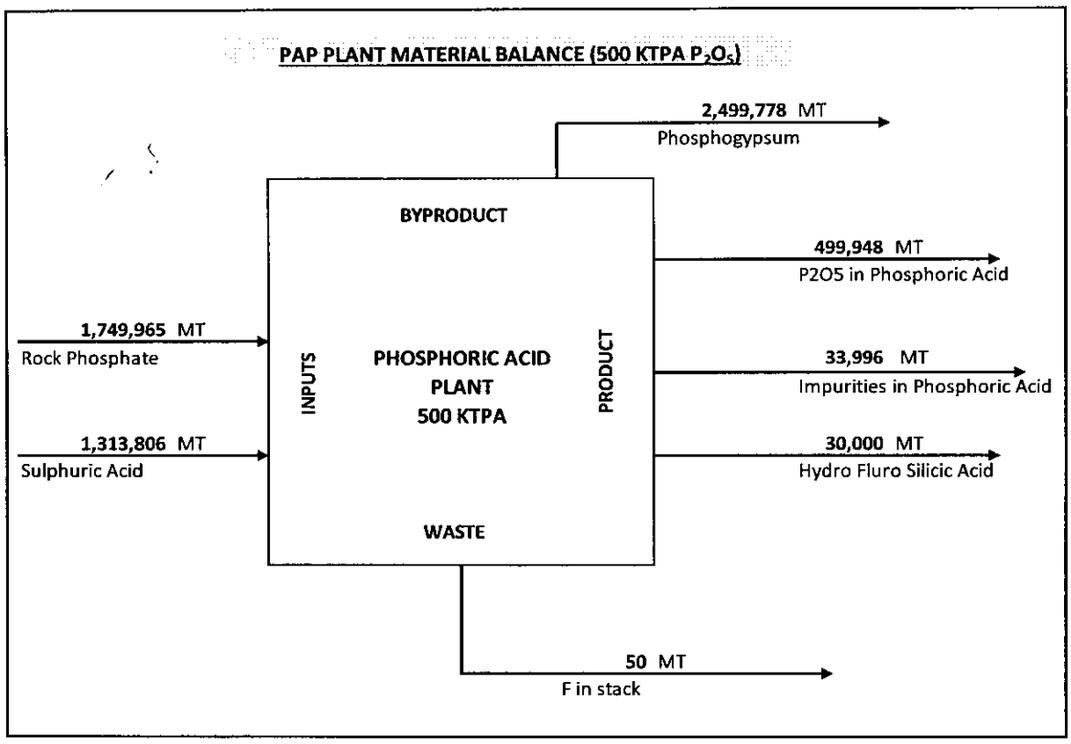
COPPER ROD MATERIAL BALANCE (0.5 MTPA)					
Input			**Output**		
Description	**UOM**	**Value**	**Description**	**UOM**	**Value**
Copper Cathode (Cu)	MT	500,000	Copper Rod (Cu)	MT	499,560
Total	**MT**	**500,000**	Cu in Mill Scale (80% Cu)	MT	440
			Total	**MT**	**500,000**



PMR MATERIAL BALANCE (550 KTPA)		
Input		
Description	**UOM**	**Value**
Anode Slime	MT	5960
Silica	MT	88
Total	**MT**	**6,148**
Output		
Description	**UOM**	**Value**
Gold	MT	50
Silver	MT	500
Selenium	MT	288
PGM Slime	MT	72
Slag	MT	5,238
Total	**MT**	**6,148**

EAC OBSERVATION NO.-26

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PAP PLANT MATERIAL BALANCE (500 KTPA P_2O_5)		
Input		
Description	**UOM**	**Value**
Rock Phosphate	MT	1,749,965
Sulphuric Acid	MT	1,313,806
Total	**MT**	**3,063,771**
Output		
Description	**UOM**	**Value**
P2O5 in Phosphoric Acid	MT	499,948
Impurities in Phosphoric Acid	MT	33,995
Phosphogypsum	MT	2,499,778
Hydro Fluro Silicic Acid	MT	30,000
F in stack	MT	50
Total	**MT**	**3,063,771**

EAC OBSERVATION:

The involvement of geological expert shall be provided.

REPLY:

Mr. J Rajendra Prasad, Functional Area Expert (FAE) is QCI- NABET empanelled consultant. He has visited Project site during the Feb' 2019 and conducted detailed Geological & Hydrogeological studies.



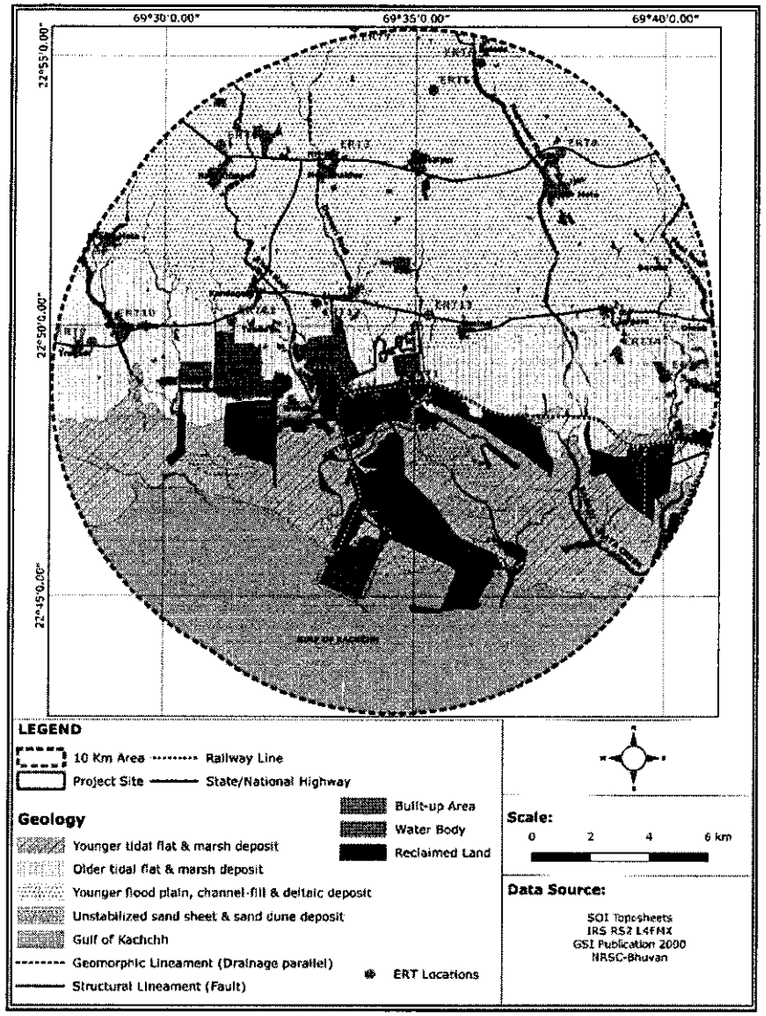
Mr. J Rajendra Prasad, Functional Area Expert (FAE)



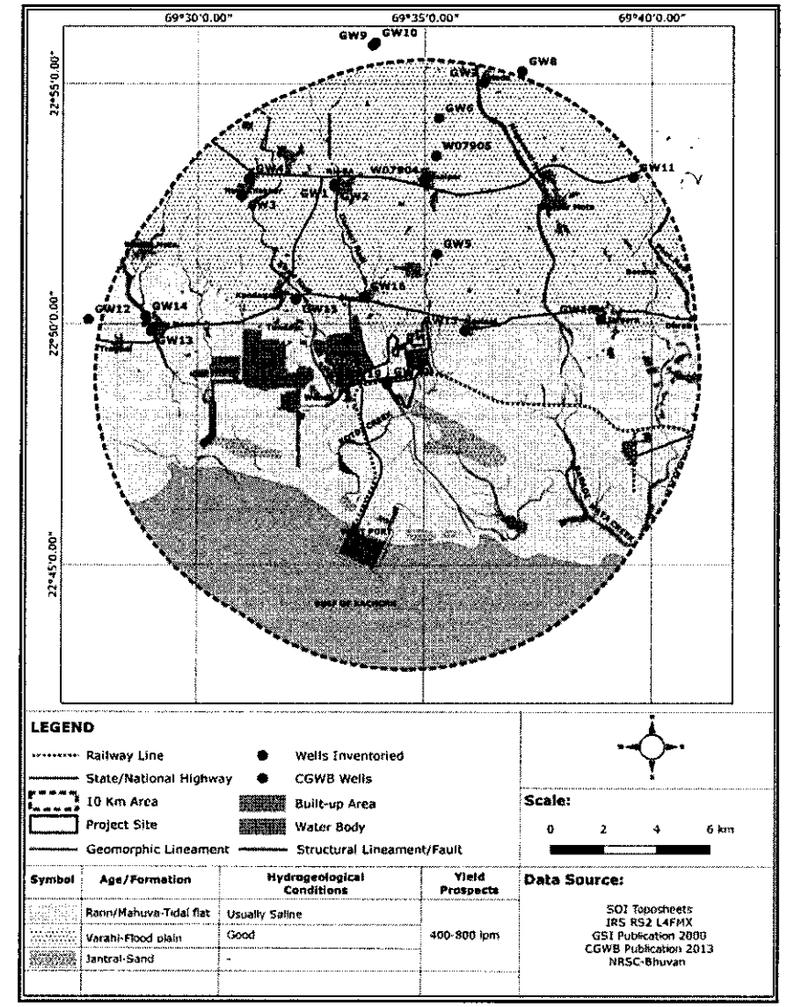
Team Members

EAC OBSERVATION NO.-27

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GEOLOGY OF THE STUDY AREA

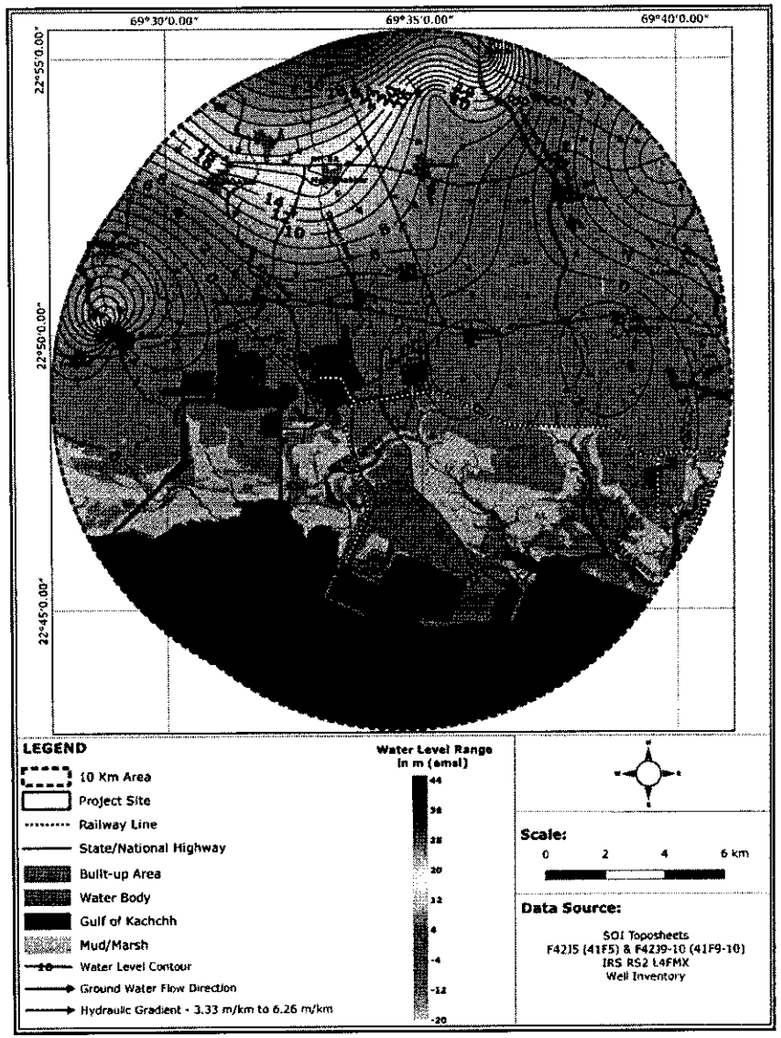


HYDROGEOLOGY OF THE STUDY AREA

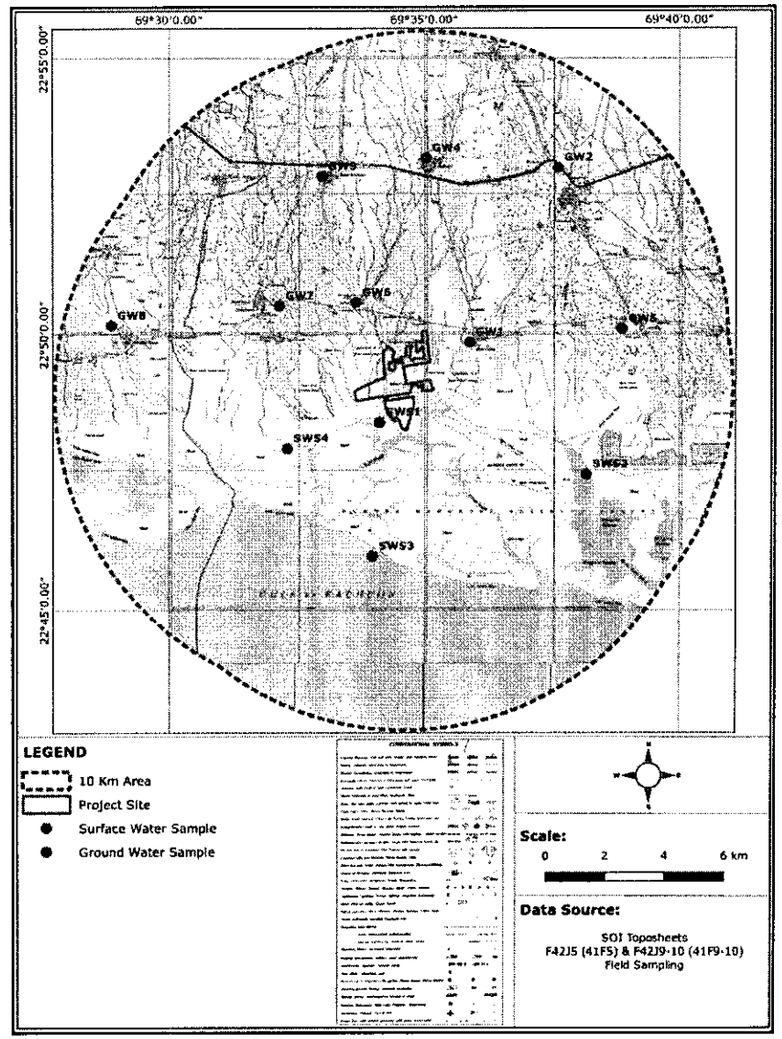
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EAC OBSERVATION NO.-27



WATER LEVEL CONTOURS – FEB 2019

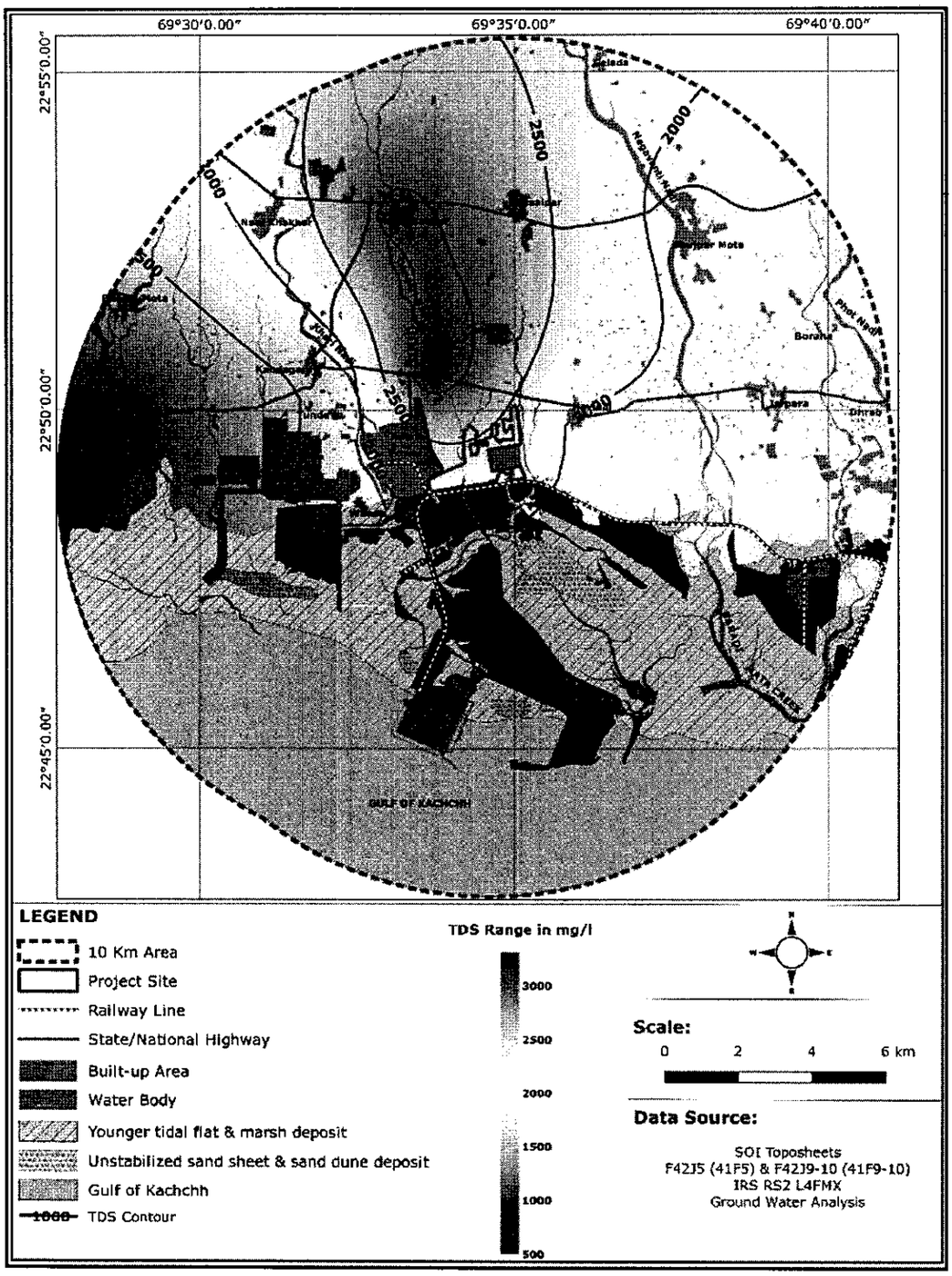


WATER SAMPLING LOCATIONS

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EAC OBSERVATION NO.-27

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TDS DISTRIBUTION IN GROUND WATER IN STUDY AREA

NATIONAL ACCREDITATION BOARD FOR EDUCATION & TRAINING
QUALITY COUNCIL OF INDIA
QCI Office, 6th Floor, ITPI Building, Ring Road, I.P. Estate, New Delhi
Scheme for Accreditation of EIA Consultant Organizations
Accreditation Committee Meeting for Surveillance Assessment held
March 14, 2019

The following members were present during the meeting:

1. Dr. S.R. Wate -Chairman
2. Prof. B.B. Dhar - Member
3. Prof. C. P. Kaushik - Member

Prof. Umesh Kulshrestha and Prof. G.J Chakrapani and expressed their inability to attend the meeting.

Mr. A.K. Jha – Senior Director, Dr. Pawan Kumar Singh – Assistant Director, and Ms. Meenakshi Arora - Accreditation Officer were present in the meeting.

1.0 Case for Surveillance Assessment

The following cases were discussed and decisions were taken as noted below.

1.1 Vimta Labs Pvt Ltd., Hyderabad

The ACO has been assessed as per Version 3 of the Scheme. Result of the Surveillance assessment (SA3) is given below:

1.1.1 Category of Approval:

The ACO has scored more than 60% marks hence it continues to be accredited with Cat. A.

1.1.2 Scope of Accreditation

S.No	NABET Scheme Sectors	Sector Description	Cat.	Sector No. (MoEFCC Notification dated Sep. 14, 2006 and Amendments)
1	1	Mining of minerals including Open cast/ Underground mining	A	1 (a) (i)
2	2	Offshore & Onshore Oil and gas exploration, development & production	A	1 (b)
3	4	Thermal power plants	A	1 (d)
4	6	Coal Washeries	A	2 (a)
5	8	Metallurgical industries- (ferrous & nonferrous) - both primary and secondary	A	3 (a)
6	9	Cement plants	A	3 (b)
7	12	Asbestos milling and asbestos based products	A	4 (c)
8	21	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates	A	5 (f)

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		excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)		
9	27	Oil & gas transportation pipeline (crude and refinery/ petrochemical products), passing through national parks/ sanctuaries/coral reefs /ecologically sensitive Areas including LNG terminal	A	6 (a)
10	28	Isolated storage & handling of hazardous chemicals (As per threshold planning quantity indicated in column 3 of Schedule 2 & 3 of MSIHC Rules 1989 amended 2000)	B	6 (b)
11	29	Air ports	A	7 (a)
12	31	Industrial estates/ parks/ complexes/ Areas, export processing zones (EPZs), Special economic zones (SEZs), Biotech parks, Leather complexes	A	7 (c)
13	33	Ports, harbours, break waters and dredging	B	7 (e)
14	38	Building and construction projects	B	8 (a)
15	39	Townships and Area development projects	B	8 (b)

1.1.3 Sectors approved for EIA Coordinators (ECs)

a. Assessed as per SA norms – for ECs approved earlier:

Sl. No.	Name	Earlier approval status (in RA2/subsequently)		Approval status (after SA)		Remarks
		Sectors approved	Cat.	Sectors approved	Cat.	
In-house						
1	Chandra Sekhar Boddada	4	A	CA	A	With an observation.
		2	A	CA	A	
		1	A	CA	A	
2	Muneeswaran Kamatchi Shinnaraj Naidu	8(Ferrous only)	A	CA	A	*With alert
		31*	A	CWA	A	
		38	B	CA	B	
3	Durga Bhavani Bhimavarapu	4	B	CA	B	Upgraded to Cat A.
		21	B	CA	A	
4	Janardhan Mergoju	1	A	CA	A	None
		4	A	CA	A	
		9	A	CA	A	
		8	A	CA	A	
		29	A	CA	A	
Empanelled						
5	Shashi Shekhar	6	A	CA	A	With an observation.
6	Ramsushil Mishra	28	B	CWA	B	With alert

b. Assessed as per IA norms – for new Sectors of approved ECs and fresh ECs proposed

Sl. No.	Name	Functional Area			Cat.	Remarks
		Applied	Recommended	Approved		
In-house						

Sl. No.	Name	Functional Area			Cat.	Remarks
		Applied	Recommended	Approved		
1	Venkata Raghavarao Gorumuchu	1	Yes	Yes	A	*OC only.
		38	Yes	Yes	B	
2	Durga Bhavani Bhimavarapu	1	Yes	Yes	A	Candidature withdrawn for sector 8.
		6	Yes	Yes	A	
		8	-	-	-	
3	Muneeswaran Kamatchi Shinnaraj Naidu	12	Yes	Yes	A	With an observation.
		39	Yes	Yes	B	
4	Chandra Sekhar Boddada	9	Yes	Yes	A	With an observation.
		27	Yes	Yes	A	
Empanelled						
5	Ramsushil Mishra	33	Yes	Yes	B	With an observation.

1.1.4 Functional Areas (FA) approved for Functional Area Experts (FAEs)

a. Assessed as per SA norms – for FAEs approved earlier:

Sl. No.	Name	Earlier approval status (in RA2/subsequently)		Approval status (after SA)		Remarks
		FAs approved	Cat.	FAs approved	Cat.	
In-house						
1	Sreekanth Bojjagani	AQ	B	CA	A	Upgraded to Cat A.
2	Rajashekar Tummala	EB	A	CA	A	Approved with an observation.
3	Venkatesham Cheruku	SE	A	CA	A	None
4	Narendra Chinta	SE	A	CA	A	None
5	Subbareddy Mallampati	WP	B	CA	B	None
		SHW	B	CA	B	
6	Chandra Sekhar Boddada	AQ	A	CA	A	None
7.	Muneeswaran Kamatchi Shinnaraj Naidu	AP	B	CA	B	None
		NV	B	CA	B	
8.	Durga Bhavani Bhimavarapu	AQ	B	CA	A	Upgraded to Cat A.
		WP	B	CA	A	
9	Venkata Raghavarao Gorumuchu	AP	A	CA	A	None
10	Janardhan Mergoju	AP	A	CA	A	None
		AQ	A	CA	A	
		NV	A	CA	A	
		SHW	A	CA	A	
Empanelled						
11	Balkrishna Shankarrao Lole	SC	A	CA	A	None
12	Meeta Khilnani	HG	A	CA	A	None
13	Rajgopal Krishnan	RH	A	CA	A	None
14	Ramamohan Yeddula	LU	A	CA	A	None
15	Rajendra Prasad Jagabathunl	Geo	A	CA	A	None
		HG	A	CA	A	

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b. Assessed as per IA norms- approved experts for new functional areas and fresh FAEs proposed:

Sl. No.	Name	Functional Area			Cat.	Remarks
		Applied	Recommended	Approved		
In-house						
1	Siva Kumar Madireddy	WP	Yes	Yes	B	None
2.	Sreekanth Bojjagani	AP	Yes	Yes	A	None
3.	Rajeshwar Kota	HG	Yes	Yes	B	Approved with an observation
		Geo	Yes	Yes	B	
4	Subbareddy Mallampati	SHW	Yes	Yes	B	*SW and HW only.
5	Vishnu Teja KS	WP	Yes	Yes	B	None
6	Venkata Raghavarao Gorumuchu	SHW	Yes	Yes	A	Approved with an observation
		NV	Yes	Yes	A	
8	Svega Duriseti	WP	Yes	Yes	B	. None
9	Praveen Kumar Madhanagopal	NV	Yes	Yes	B	None
		AP	Yes	Yes	B	
		AQ	Yes	Yes	B	
Empanelled						
10	Rajendra Prasad Jagabathuni	LU	Yes	Yes	B	None

1.1.5 Functional Area Associates (FAAs)

a. FAAs approved

Sl. No.	Name	Approval status (after SA)		Name of FAE/Mentor	Remarks
		FA	Status		
In-house					
1	Bharatvaj Jayabalasubramaniyan	NV	Continue	Janardhan Mergoju	None
		WP	Continue	Bh. Durga Bhavani	
2	Olive Eunice Peethala	NV	Continue	Janardhan Mergoju	None
		AQ	Continue	Janardhan Mergoju	

Note: The following will be communicated to the ACO by NABET

1. Detailed observations and reasons for alerts
2. Results of balance candidates and details of the assessment.

2.0 Case for Clarification

.

2.1 Earth Protection Group Environmental Consultants Private Limited (EPG), Lucknow

Further details wrt the following candidate was sought from the ACO They submitted the requisite documents such as a valid copy of MoU, declaration by the ACO, leave of absentia during the assessment and minutes of meeting of his last/latest assessment approval. Subsequently, ACO submitted the requisite documents, and accordingly the decision of AC is given below.

2.1.1 Functional Areas (FA) approved for Functional Area Experts (FAEs)

a. Assessed as per SA norms – for FAEs approved earlier

Sl. No.	Name	Earlier approval status (in IA/subsequently)		Approval status (after SA)		Remarks
		FAs approved	Cat.	FAs approved	Cat.	
Empanelled						
1	Ajay Mishra	LU	A	Yes	A	None.
		Geo	A	Yes	A	
		HG	A	Yes	A	

Issued by

A K Jha
Senior Director
QCI-NABET

Abbreviations:

AO	-	Applicant Organization
ACO	-	Accredited Consultant Organization
AC	-	Accreditation Committee
IA	-	Initial Accreditation
SA	-	Surveillance Assessment
EC	-	EIA Coordinator
FA	-	Functional Area

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FAE	-	Functional Area Expert
FAA	-	Functional Area Associate
For sector numbers-		Refer the Scheme
For functional areas-		Refer the Scheme

EAC OBSERVATION:

The compliance of specific conditions of the Environmental Clearance of the SEZ shall be provided.

REPLY:

A copy of the Environmental Clearance of Adani Ports & SEZ Limited (APSEZ) is attached as **Annexure-28(a)** and Certified EC Compliance of APSEZ by the Regional Office, Bhopal of MoEF&CC is also attached as **Annexure-28(b)** for ready reference.

Half yearly Compliance report of Environment Clearance under CRZ notification for the period October 2018 to March 2019 for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat by M/s. Adani Ports & SEZ Limited has been submitted to Ministry of Environment, Forest and Climate Change, Regional Office (WZ), Bhopal dated 23.11.2018 and the same is attached as **Annexure-28(c).**

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ANNEXURE-28(a)

F. No. 10-138/2008-IA.III
Government of India
Ministry of Environment & Forests

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi - 110 003.

Dated: July 15, 2014

To
M/s Adani Port and SEZ Ltd
Adani House, Near Mithakhali Six Roads,
Navarangpura, Ahmedabad,
Gujarat- 380 009.

Subject: EC for proposed Multi- Product SEZ and CRZ clearance for Desalination, sea water intake, outfall facility and pipeline, at Mundra by M/s Adani Port and SEZ Ltd. – Reg.

This has reference to letter No. ENV-10-2010-1601-E dated 27.03.2012 of the Director (Environment) & Additional Secretary, Govt. of Gujarat and your subsequent letters dated 10.05.2012, 14.05.2012, 26.05.2012 and 29.04.2013 seeking prior Environmental and CRZ Clearance for the above project under the EIA Notification, 2006 and Coastal Regulation Zone Notification, 2011. The proposal has been appraised as per prescribed procedure in the light of provisions under the EIA Notification, 2006 and the Coastal Regulation Zone Notification, 2011 on the basis of the mandatory documents enclosed with the application viz., the Questionnaire, EIA, EMP, recommendations of the State Coastal Zone Management Authority and the additional clarifications furnished in response to the observations of the Expert Appraisal Committee constituted by the competent authority in its meetings held on 16th –17th April, 2012, 4th –5th June, 2012 and 9th -10th July, 2012.

2. It is, interalia, noted that the project involves development of multi product SEZ on a plot area of 18,000 ha. of which 6641.2784 ha. is presently notified under Special Economic Zone (SEZ). As per the proponent, the Multi product SEZ at Mundra comprising of various processing zones, non-processing zones, warehousing zones, Road Network (trunk as well as internal), Bridges or culverts over natural drains, Rail Network, IT-Telecommunication network, Electrical Network, Water supply, conservation & drainage Network, Effluent collection network, Desalination Plant with proposed intake & outfall locations, Common Effluent Treatment Plants & Sewage Treatment Plants, Natural Gas line network, Social Infrastructure, Existing Airstrip, Municipal Solid Waste Disposal site, utilities & supporting infrastructure etc. For the first phase of development total water requirement will be 150 MLD. Power requirement will be approx. 360 MW. Desalination plant of 150 MLD output capacity is proposed. 11 MLD water will be sourced through Narmada water pipeline. Two CETP each of capacity 50 MLD and 17 MLD as well as STP of 62 MLD is proposed. This will require 375 MLD of seawater intake and 241 MLD of treated waste water outfall into the sea. For final phase of development total water requirement will be 450 MLD and power requirement will be approx. 1000 MW.

3. A suitable seawater intake point has been identified on the eastern end of the approved East Port Basin at Latitude 22°48'30.76"N; Longitude 69°46'34.06"E where a depth of 6 m below CD would be available after the port development. As per modelling study the combined discharge of 241MLD which includes 16MLD from CETP and 225 MLD from desalination plant as RO reject is expected having 57.57ppt of salinity, 14.41 mg / l of BOD and 94.39 mg/l of COD. After careful consideration of many aspects a suitable outfall location is identified on the west of the Eastern basin at Latitude 22°46'44.04"N; Longitude 69°45'5.51"E taking advantage of the expected 7.5m below CD basin depth. The outfall pipe line length is approximately 5.7 km and diffuser designed to attain a minimum dilution of 40-50 times.

4. The Centre for Earth Science Studies demarcated HTL, LTL and CRZ area. As per the CESS report and GCZMA, out of 6641.2784 ha of SEZ area, 1473.39 ha area falls within CRZ area. No SEZ industrial activity is proposed in the CRZ area. Only the Desalination plant pipeline for intake and outfall is proposed in CRZ areas. The Gujarat SCZMA in their 14th meeting held on 27-02-2012 considered the proposal of intake, outfall facilities, Desalination plant and laying pipeline and recommended the same vide their letter no.ENV-10-2010-1601-E dated 27th March 2012. Gujarat Pollution Control Board has granted Consent to Establishment of Marine outfall (NOC) vide letter dated 10.11.2011. The length of the intake will be approximately 5 Kms. As the sea water intake demand is 15000m3/h, drawal by pipe system is suitable by incorporating a wet well structure at the location. The intake point proposed is within the proposed East Port basin with a depth of 6 m below CD. The projected quantity of water can be transported through a single pipe of 1.3 m dia with a flow velocity of 3 m/ s or with a 1.6 m pipe with flow velocity of 2m/s.

5. The Expert Appraisal Committee, after due consideration of the relevant documents submitted by the project proponent and additional clarifications furnished in response to its observations, have recommended for the grant of Environment and CRZ Clearance for the SEZ in an area of 8481.2784 ha. However, SEZ for 1840 ha has been approved in principle by Ministry of Commerce and Industries.

6. Hon'ble High Court of Gujarat in WP No. 21 of 2013 vide order dated 13.01.2014 has directed that the Ministry to take a decision of its own so far as the issue of grant of environmental clearance is concerned considering the position prevailing as on date and also the aspects which have been highlighted by us in this judgment, within a period of thirty days from the date of this judgment without fail. Further, vide order dated 27.01.2014 Hon'ble Supreme Court in SLP No. 1526 of 2014 which was filed against the Order of High Court by the Respondent-1 has passed order that in case, the MOEF is unable to complete the process within the time stipulated by the High Court, it will be open for them to approach this Court for extension of time. Accordingly, Ministry has filed a petition before the Hon'ble Supreme Court seeking extension of two months time.

7. It is noted from the Judgement dated 13.01.2014 of Hon'ble High Court of Gujarat in PIL 21 of 2013 the Hon'ble Court has construed the grant of lease to units prior to

obtaining EC by M/s APSEZL as violation of EIA, Notification, 2006. Therefore, according to the OMs dated 12.12.2012 and 27.06.2013, PP was addressed for Board Resolution and the State Government was addressed to take credible action against the PP for the violation. Direction under Section 5 of E(P)Act, 1986 was also issued to APSEZ not to take up and allow any further construction activity within SEZ till the grant of clearance.

8. Further, Hon'ble Supreme Court video order dated 02.05.2014 in SLP 1526 of 2013 had ordered for stay of Ministry's letter dated 3.04.2014 addressed to Government of Gujarat to initiate legal action for the violation, also directed that the Ministry to complete the process of EC within eight weeks.

9. M/s APSEZ Ltd. has stated that the Board resolved that since the matter is sub-judice before the Hon'ble Supreme Court of India, will fully abide by the out come of the decision of the Hon'ble Supreme Court.

10. In view of the above and to comply with the orders of Hon'ble Courts, Ministry hereby accords necessary Environment Clearance for proposed Multi- Product SEZ in an area of 6641.2784 ha and CRZ clearance for desalination, seawater intake, outfall facility and pipeline for as per the provisions of Environmental Impact Assessment Notification – 2006 and its subsequent amendments and Coastal Regulation Zone Notification, 2011, subject to strict compliance of the terms and conditions as follows:

11. PART A - SPECIFIC CONDITIONS

(i) *PP shall abide by the final order/decision of Hon'ble Supreme Court in SLP (Civil) no. 1526/2014 and connected matters.*

(ii) *Properly conserve the creeks, river and the mangroves area in the area.*

(iii) *Ensure that mouths of all the creeks are kept open to ensure flushing of the creeks.*

(iv) *Bring the creeks to the condition as was seen in the satellite map of 2005 which will be a "reference" satellite map and a copy of which shall be sent to you separately.*

(v) *Submit once in a year latest satellite map which can be compared with the reference satellite map of 2005 to ensure that no modification in the creeks, rivers, mangroves and mouth of creeks have taken place.*

(vi) *Any direction issued by the MoEF with respect to the report submitted by Ms Sunita Narain Committee shall be complied with by the Proponent as applicable.*

(vii) *At its cost get Inspection study done once in a year by the organizations like NEERI or any organization approved by this Ministry to - (i) ensure compliance of all the EC conditions (ii) development of SEZ meeting of the environment norms, and (iii) advise any mid-term correction that can be introduced depending on the recommendation of the independent Third Party.*

(viii) "Consent for Establishment" for the SEZ shall be obtained from Gujarat Pollution Control Board under Air and Water Act and a copy shall be submitted to the Ministry before start of any construction work at the site.

(ix) PP shall get detailed bathymetry done for all the creeks and rivers within Port and SEZ areas along with mapping of co-ordinates, running length, HTL, CRZ boundary, mangrove areas including buffer zone through NCSCM / NIOT. PP shall also get prepared a detailed action plan for conservation and protection of creeks/ mangrove area etc through NCSCM / NIOT and submit the same to GCZMA for their examination and recommendation. GCZMA will submit its recommendations to MoEF for approval.

(x) PP shall demarcate the CRZ area on land with GPS coordinates in consultation with GCZMA/ the agency which has done the HTL/LTL demarcation for the area. There shall be no allotment of plot/s in CRZ area to industries. No industrial activity within CRZ area except the port and harbor & the foreshore facilities shall be allowed as committed

(xi) Till the approval of action plan for conservation and protection of creeks/ mangrove area, the CRZ area within SEZ shall be demarcated as "No Development Zone". PP shall not allow/ undertake any development in CRZ area of SEZ.

(xii) The implementation of action plan approved by the MoEF shall be monitored by the NCSCM/ NIOT. Compliance with action plan shall be submitted to GCZMA and to MoEF, RO. at Bhopal along with six monthly monitoring report.

(xiii) PP shall earmark separate budget for the implementation of the above action plan. The details of the expenditure shall be submitted to GCZMA and to MoEF, RO. at Bhopal along with six monthly monitoring report.

(xiv) All the industry in SEZ shall be connected through impervious drainage lines to the STP/ CETP for the discharge of their sewage or industrial effluent. There shall not be any discharge to creeks / rivers. PP shall be accountable for implementing this condition and necessary clause shall be incorporated in the MoU while allotting the plot to the individual industries

(xv) PP shall not carry out any river course modification.

(xvi) The individual industrial units shall obtain prior EC under EIA Notification, 2006 as applicable.

(xvii) Proponent shall identify 200 ha of land for mangrove plantation as per the condition laid by SEAC.

(xviii) 50 meter buffer from the existing mangrove area should be provided for any developmental activity,

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(xix) *Proponent shell develop the green belt with 3 layers of canopy all along the periphery.*

(xx) *All the recommendation of the EMP shall be complied with in letter and spirit. All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to MoEF along with half yearly compliance report to MoEF-RO.*

(xxi) *There shall be no disturbance to the sand dunes. The pipelines shall be laid using advanced method viz. Horizontal Directional Drilling (HDD) so as to avoid disturbance to the sand dunes/ creeks/ mangroves.*

PART – B. GENERAL CONDITIONS

Construction Phase.

(i) *Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.*

(ii) *A First Aid Room will be provided in the project both during construction and operation of the project.*

(iii) *All the topsoil excavated during construction activities should be stored for use in horticulture/landscape development within the project site.*

(iv) *Disposal of muck during construction phase should not create any adverse effect on the neighbouring communities and be disposed, taking the necessary precautions for general safety and health aspects of people, only in approved sites with the approval of competent authority.*

(v) *Soil and ground water samples will be tested to ascertain that there is no threat to ground water quality by leaching of heavy metals and other toxic contaminants.*

(vi) *Construction spoils, including bituminous material and other hazardous materials, must not be allowed to contaminate watercourses and the dump sites for such material must be secured so that they should not leach into the ground water.*

(vii) *Any hazardous waste generated during construction phase should be disposed off as per applicable rules and norms with necessary approvals of the Gujarat Pollution Control Board.*

(viii) *The diesel generator sets to be used during construction phase should be low sulphur diesel type and should conform to Environment (Protection) Rules prescribed for air and noise emission standards.*

(ix) The diesel required for operating DG sets shall be stored in underground tanks and if required, clearance from Chief Controller of Explosives shall be taken.

(x) Vehicles hired for bringing construction material to the site should be in good condition and should have a pollution check certificate and should conform to applicable air and noise emission standards and should be operated only during non-peak hours.

(xi) Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase, so as to conform to the stipulated standards by CPCB/GPCB.

(xii) Fly ash should be used as building material in the construction as per the provisions of Fly Ash Notification of September, 1999 and amended as on 27th August, 2003. (The above condition is applicable only if the project site is located within 100 Kms of Thermal Power Stations).

(xiii) Ready mixed concrete must be used in building construction.

(xiv) Storm water control and its re-use should be regulated as per CGWB and BIS standards for various applications.

(xv) Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other referred best practices.

(xvi) Permission to draw ground water shall be obtained from the competent Authority prior to construction/operation of the project.

(xvii) Separation of grey and black water should be done by the use of dual plumbing line for separation of grey and black water.

(xviii) Fixtures for showers, toilet flushing and drinking should be of low flow either by use of aerators or pressure reducing devices or sensor based control.

(xix) Use of glass may be reduced by upto 40% to reduce the electricity consumption and load on air-conditioning. If necessary, use high quality double glass with special reflective coating in windows.

(xx) Roof should meet prescriptive requirements as per Energy Conservation Building Code by using appropriate thermal insulation material to fulfill requirements.

(xxi) Opaque wall should meet prescriptive requirement as per Energy Conservation Building Code which is proposed to be mandatory for all airconditioned spaces while it is aspirational for non-airconditioned spaces by use of appropriate thermal insulation material to fulfil these requirement.

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(xxii) The approval of the competent authority shall be obtained for structural safety of the buildings due to earthquake, adequacy of fire fighting equipments, etc. as per National Building Code including protection measures from lightning etc.

(xxiii) Regular supervision of the above and other measures for monitoring should be in place all through the construction phase, so as to avoid disturbance to the surroundings.

(xxiv) Under the provisions of Environment (Protection) Act, 1986, legal action shall be initiated against the project proponent if it is found that construction of the project has been started without obtaining environmental clearance.

Operation Phase

(i) The PP while issuing the allotment letter to individual member units shall specifically mention the allowable maximum quantity of water usage and effluent generated by each member unit.

(ii) The PP shall establish an environmental monitoring cell with all the potential polluting units as members to review the environmental monitoring data and suggest improvements.

(iii) Treated affluent emanating from STP shall be recycled/reused to the maximum extent possible. Treatment of 100% grey water by decentralised treatment should be done. Discharge of unused treated affluent shall conform to the norms and standards of the Pollution Control Board. Necessary measures should be made to mitigate the odour problem from STP.

(iv) The solid waste generated should be properly collected and segregated. Wet garbage should be composted and dry / inert solid waste should be disposed off to the approved sites for land filling after recovering recyclable material.

(v) Diesel power generating sets proposed as source of back up power for elevators and common area illumination during operational phase should be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Low sulphur diesel should be used. The location of the DG sets may be decided in consultation with the Gujarat Pollution Control Board.

(vi) Noise should be controlled to ensure that it does not exceed the prescribed standards. During night time the noise levels measured at the boundary of the building shall be restricted to the permissible levels to comply with the prevalent regulations.

(vii) Green belt of adequate width and density preferably with local species along the periphery of the plot shall be raised so as to provide protection against particulates and noise.

(viii) Weep holes in the compound walls shall be provided to ensure natural drainage of rain water in the catchment area during the monsoon period.

(ix) Rain water harvesting for roof run- off and surface run- off, as plan submitted should be implemented.

(x) The ground water level and its quality should be monitored regularly in consultation with Central Ground Water Authority.

(xi) Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided. Parking should be fully internalized and no public space should be utilized.

(xii) A Report on the energy conservation measures conforming to energy conservation norms finalised by Bureau of Energy Efficiency should be prepared incorporating details about building materials & technology, R & D Factors etc and submitted to the Ministry along with six monthly monitoring report.

(xiii) Energy conservation measures like installation of CFLs/TFLs for the lighting the areas outside the building should be an integral part of the project design and should be in place before project commissioning. Used CFLs and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/ rules of the regulatory authority to avoid mercury contamination. Solar panels may be used to the extent possible.

(xiv) Adequate measures should be taken to prevent odour problems from solid waste processing plant and STP.

(xv) The buildings should have adequate distance between them to allow movement of fresh air and passage of natural light, air and ventilation.

(xvi) The environmental safeguards contained in the EIA Report should be implemented in letter and spirit.

(xvii) Adequate drinking water facility be provided.

(xviii) Incremental pollution loads on the ambient air quality, noise and water quality should be periodically monitored after commissioning of the project.

(xix) Application of solar energy should be incorporated for illumination of common areas, lighting for gardens and street lighting in addition to provision for solar water heating. A hybrid system or fully solar system for portion of the apartments should be provided.

(xx) Ozone depleting substance (Regulation & Control) Rules should be followed while designing the air conditioning system of the project.

12. Officials from the Regional Office of MOEF, Bhopal who would be monitoring the implementation of environmental safeguards should be given full cooperation, facilities and documents / data by the project proponents during their inspection. A complete set of all the

documents submitted to MoEF should be forwarded to the CCF, Regional office of MOEF, Bhopal

13. In the case of any change(s) in the scope of the project, the project would require a fresh appraisal by this Ministry.

14. The Ministry reserves the right to add additional safeguard measures subsequently, if found necessary, and to take action including revoking of the environment clearance under the provisions of the Environmental (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.

15. All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.

16. These stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and control of Pollution) act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification, 2006.

17. The project proponent should advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Clearance and copies of clearance letters are available with the Gujarat Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forests at http://www.envfor.nic.in. The advertisement should be made within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bhopal.

18. Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.

19. "Any appeal against this clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010".

20. A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parisad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.

21. The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.

22. The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.

23. The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail.

(Lalit Kapur)
Director (IA-III)

Copy to:

1. The Principal Secretary, Forest and Environment Department, Block no. 14/ 8 floor Sachivalaya, Gandhinagar – 382 010 Gujarat.
2. The Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, Delhi – 110 032.
3. The Member Secretary, Gujarat Coastal Zone Management Authority & Director,(Environment) Forests & Environment Department, Block No. 14, 8th Floor, Sachivalaya, GandhiNagar-382.
4. The Chief Conservator of Forests, Ministry of Environment and Forests, Regional Office, Western Region, Kendriya Paryavaran Bhavan, Link Road No. 3, Ravishankar Nagar, Bhopal – 462016 (M.P.)
5. The Member Secretary, Gujarat State Pollution Control Board, Paryavaran Bhawan , Sector 10-A, Gandhi Nagar 382043, Gujarat
6. Director (EI), Ministry of Environment and Forests.
7. Guard File.
8. Monitoring File.

(Lalit Kapur)
Director (IA-III)

ANNEXURE-28(b)

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SPEED POST

भारत सरकार
GOVERNMENT OF INDIA
पर्यावरण, वन एवं जलवायु परिवर्तन
मंत्रालय
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE

सत्यमेव जयते

क्षेत्रीय कार्यालय, पश्चिम क्षेत्र,
Regional Office, Western Region,
"केन्द्रीय पर्यावरण भवन"
"Kendriya Paryavaran Bhavan"
लिन्क रोड नं0-3/Link Road No. 3
E-5, रविशंकर नगर/Ravi Shankar Nagar,
भोपाल (म0प्र0)/Bhopal-462016 (M.P.)
Telefax: 0755-2465054
E-mail: rowz.bpl-mef@nic.in

File No: 6-7/2009(ENV)/172
Dated: 07/06/2018

प्रति,

श्री ज्ञानेश भारती,
संयुक्त सचिव,
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय,
इंदिरा पर्यावरण भवन,
जोर बाग रोड, अलीगंज,
नई दिल्ली – 110003

To,

Shri Gyanesh Bharti ,
Joint Secretary,
Ministry of Environment, Forest and Climate Change
Indira Paryavaran Bhawan,
Jorbagh Road, Aliganj,
NewDelhi-110003

विषय : i. मेसर्स अडानी पोर्ट्स एण्ड स्पेशल इकोनॉमिक जोन लि. द्वारा मुंद्रा, कच्छ, में वाटरफ्रंट विकास परियोजना के लिए पर्यावरण और तटीय विनियमन क्षेत्र निकासी प्रदान के लिए स्वीकृति।
ii. मेसर्स अडानी पोर्ट्स एण्ड स्पेशल इकोनॉमिक जोन लि. द्वारा मुंद्रा, कच्छ, में मल्टी–प्रोडक्ट सेज परियोजना के लिए पर्यावरण और तटीय विनियमन क्षेत्र निकासी प्रदान के लिए स्वीकृति।

Sub. : i. Environmental and Coastal Regulation Zone clearance granted to the waterfront development project (WFDP) at Mundra, Katch, being developed by Adani Ports and Special Economic Zone Ltd. (APSEZL).
ii.Environmental and Coastal Regulation Zone clearance granted to Multi-product SEZ (MSEZ) Project at Mundra, Katch, being developed by Adani Ports and Special Economic Zone Ltd. (APSEZL).

Ref. : i. Ministry's Letter No. 10-47/2008-IA-III dated 12.01.2009, its addendum dated 19.01.2009 and extension dated 07.10.2015
ii. Ministry's Letter No. 10-138/2008-IA.III, dated 15.07.2014

महोदय,

मंत्रालय के उपरोक्त संदर्भित पत्र के संदर्भ में उक्त परियोजनाओं को पर्यावरणीय दृष्टिकोण से अनुमति देते समय अनुबद्ध शर्तों के अनुपालन एवं certification of compliance के निर्देशानुसार, पर्यावरणीय अनुमति दिनांक 12.01.2009 व 15.07.2014 का अनुवीक्षण प्रतिवेदन (मॉनिटरिंग रिपोर्ट) एतद् द्वारा संलग्न कर प्रेषित है।

2.0 यह सक्षम प्राधिकारी द्वारा अनुमोदित है।

संलग्नः उपरोक्तानुसार

भवदीय

GHvary

(डॉ. एच.वी.सी. चारी गून्टुपल्ली)
वैज्ञानिक 'डी'

Cont.....2

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प्रतिलिपि:

1. श्री रघु कुमार, वैज्ञानिक 'एफ', पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, इंदिरा पर्यावरण भवन, जोर बाग रोड, अलीगंज, नई दिल्ली – 110 003 की ओर सूचनार्थ हेतु।
Shri Raghu Kumar, Scientist 'F', Ministry of Environment, Forest and Climate Change Indira Paryavaran Bhawan, Jorbagh Road, Aliganj, NewDelhi-110003 for kind information please.

2. डॉ. सुधीर चिन्तलपति, वैज्ञानिक 'डी', (मॉनीटरिंग सैल), पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, इंदिरा पर्यावरण भवन, जोर बाग रोड, अलीगंज,नई दिल्ली–110 003 की ओर सूचनार्थ हेतु।
Dr. Sudheer Chintalapati, Scientist 'D', Monitoring Cell, Ministry of Environment, Forest and Climate Change Indira Paryavaran Bhawan, Jorbagh Road, Aliganj, New Delhi-110003 for kind information please.

3. मेसर्स अडानी पोर्ट्स एण्ड स्पेशल इकोनॉमिक जोन लि., अडानी हाउस, पीओ बाक्स नं. 1, मुंद्रा, कच्छ– 370 421 गुजरात, की ओर सूचनार्थ हेतु।
M/s Adani Ports and Special Economic Zone Limited, Adani House, PO Box No. 1, Mundra, Kutch- 370 421 Gujarat, for kind information please.

(डॉ. एच.वी.सी. चारी गून्टुपल्ली)
वैज्ञानिक 'डी'

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Monitoring the Implementation of Environmental Safeguards
Ministry of Environment, Forest & Climate Change
Western Region, Regional Office, Bhopal
MONITORING REPORT
PART – I
DATA SHEET

1.	Project type: River- valley/ Mining/ Industry / Thermal / Nuclear/Other (specify)	:	Other (CRZ Port & Harbour)
2.	Name of the project	:	Waterfront Development Project at Mundra, District Kutchh, Gujarat
3.	Clearance letter (s)/OM No. & date	:	F. No. 10-47/2008-IA-III dated 12.01.2009 F. No. 10-47/2008-IA-III dated 19.01.2009 F. No. 10-47/2008-IA-III dated 18.09.2015 F. No. 10-47/2008-IA-III dated 07.10.2015
4.	Location: a) District (s) b) State (s) c) Latitude/Longitude	: : : :	 Kutchh Gujarat 69°41'37.58" E 22°44'15.95 N (South port) 69°34'11.88" E 22°45'20.12 N (West port)
5.	Address for correspondence a. Address of the Concerned Project Chief Engineer (with Pin Code & telephone/ telex/ fax numbers) b. Address of the Executive Project Engineer / Manager (with Pin Code & telephone/ telex/ fax numbers).	 : :	 Chief Operating Officer, Mundra and Tuna port, Adani Ports and SEZ Ltd., Adani House, Navinal Island, Mundra Kutchh, Gujarat Pin – 370 421, Tel: 02838 – 255 000 Head, Environment dept., APSEZL, Infrastructure House, Nr. Adani House, Nr. Mithakhali circle, Navrangpura, Ahmedabad, Gujarat Pin – 380 009, Tel: 079 – 2555 5362
6.	Salient features a. Of the project	:	**Salient Feature of the Project are as under** 1. West Port 2. South Port 3. East Port 4. North Port 5. Two Shipyards (near West port and East port) 6. Sea water Intake channel 7. Desalination plant 8. Combined outfall for safe disposal of power plant and desalination reject 9. Dredging and Reclamation 10. Backup facilities like rail sidings, rail and truck loading facilities, open paved areas and associated buildings, utilities and other amenities

	b. Of the Environment Management Plan	:	**Salient Feature of the EMP are as under** 1. Strategy should be to prevent spillages of petroleum through proper design and dependable construction materials and components. 2. The basin structures, jetty structures, bunds, breakwaters, intake water channel, navigational channels, should be designed and oriented in a manner that it does not restrict the prevailing tidal ingress in the creek and mangroves habitats in the vicinity to ensure their health. 3. It should be insured that reclamation, dredging, widening and slope stabilization measures do not significantly alter the stabilized erosional-accretion regime of the intricate creek system as well as the free flow of tidal water, to protect the mangroves 4. Temporary colonies of workforce should be established sufficiently away from the HTL and proper sanitation including toilets and bathrooms should be provided to the inhabitants to prevent abuse of the intertidal area. 5. Wastewater such as generated during cleaning of jetties, floor washings, domestic use etc should be collected in a settling pond and released to marine environment only after ascertaining that it is free from oil and SS. 6. Corrective measures such as water sprinkling should be practiced if the SS increases beyond permissible limits. 7. It should be ensured that the effluent released into the Gulf meets the prescribed GPCB criteria at all times.
7.	Breakup of the project area a. Submergence area: forest & non-Forest b. Others	: :	No forest land involved. Reclaimed land - 2193 ha.
8.	Breakup of the project affected population with enumeration of those losing houses/dwelling units only agricultural land only, both dwelling units & agricultural land & landless laborers/artisans. a) SC, ST, Adivasi b) Others (please include weather these figures are based on any scientific and systematic survey carried out. Give details and year of survey)	:	Nil
9.	Financial details: a) Project cost as originally planned and subsequent revised estimates and the year of price reference b) Allocation made for EMP with item wise and year wise break-up c) Benefic Cost ratio/Internal Rate of Return and the year of assessment (if applicable) d) Whether (c) includes the cost of Environment Management as shown in the above	: : : :	a) Rs. 5000 crores (block estimate) b) Please Refer Annexure – I c) -- d) Yes

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	e) Actual expenditure incurred on project so far f) Actual expenditure incurred on EMP so far	: :	e) Rs. 12,947 crores Approx. (as on 30.09.2017) f) Please Refer Annexure – 1
10.	Forest land requirement a. The status of approval for diversion of forest land for non-forestry use b. The status of cleaning felling c. Comments on the viability & sustainability of compensatory afforestation programmer in the light of actual field experience so far	: : :	Forest land not involved Nil 200 ha mangrove afforestation is completed at Jakhau village, Kutchh and 50 ha gap filling is also completed during the year 2012 – 15. It may be noted that in totality, APSEZ has completed mangrove afforestation in over 2800 ha area to enhance the biodiversity of coastal stretches of Gujarat. Please Refer Annexure – 2 for further details.
11.	The status of clear felling in non-forest areas (Such as submergence area or reservoir, approach Roads.), if any with quantitative information required.	:	Not Applicable (No clearing/felling trees is involved in the project).
12.	Status of construction (Actual &/or planned) a. Date of commencement b. Date of completion	: : :	Construction activities as per the Environmental & CRZ clearance are ongoing. Please refer Annexure - 3 for the status of the same. January 2009 Ongoing
13.	Reason for the delay if the project is yet to start.	:	Not Applicable
14.	Dates of site visits a. The dates on which the project was monitored by the MoEF&CC, RO on previous occasions, if applicable b. Date of site visits for this monitoring report	: :	21- 23, Jan 2013 21 – 22, December, 2016 02 – 03, May, 2018
	Details of correspondence with project authorities for obtaining act on plans/ information on status of compliance to safeguards other than the routine letters for logistic support for site visits. (The first monitoring report may contain the details of all the letters issued so far, but the later reports may cover only the letter issued subsequently)		
	Date **Letter from RO**		**Date** **Letter from PA**
	10.05.2018: PAs have been directed to submit comprehensive compliance report vide letter dated 10.05.2018		**14.05.2018** Comprehensive CR received vide letter dated 11.05.2018 received in MoEFCC, RO Bhopal on 14.05.2018

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Cost of Environmental Protection Measures

Sr. No.	Activity	Cost incurred (INR in Lacs)			Budgeted Cost (INR in Lacs)
		2015 – 16	2016 – 17	2017 – 18	2017 – 18
1.	Environmental Study / Audit and Consultancy	45.45	36.78	9.0	21.00
2.	Legal & Statutory Expenses	3.30	4.76	5.07	16.00
3.	Environmental Monitoring Services	26.80	27.95	27.02	36.00
4.	Hazardous / Non Hazardous Waste Management & Disposal	34.56	12.52	65.62	90.84
5.	Environment Day Celebration	7.18	6.71	2.85	10.00
6.	Treatment and Disposal of Bio-Medical Waste	1.22	1.27	1.13	1.44
7.	Mangrove Plantation, Monitoring & Conservation	73.64	72.38	60.0	60.0
8.	Other Horticulture Expenses	434.72	555.00	547.0	547.0
9.	O&M of Sewage Treatment Plant and Effluent Treatment Plant (including STP, ETP of Port & SEZ & Common Effluent Treatment Plant)	18.18	61.50	70.02	69.35
10.	Expenditure of Environment Dept. (Apart from above head)	135.90	131.83	102.15	104.91
	Total	837.73	910.70	889.86	956.54

Further year wise breakup of the cost is mentioned in table below:

Year	Environment	Horticulture	Total
2013-2014	250.00	433.75	683.75
2014-2015	462.87	380.27	843.14
2015-2016	346.23	434.72	780.95
2016-2017	355.70	555.00	910.7
2017-2018	342.86	547.00	889.86
Total	1757.66	2350.74	4108.4

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Monitoring the Implementation of Environmental Safeguards
Ministry of Environment, Forest & Climate Change
Western Region, Regional Office, Bhopal
MONITORING REPORT
PART – I
DATA SHEET

1.	Project type: River- valley/ Mining/ Industry / Thermal / Nuclear/Other (specify)	:	Other (Infrastructure and miscellaneous projects + CRZ)
2.	Name of the project	:	Multi-product SEZ and sea intake and outfall pipelines for desalination plant
3.	Clearance letter (s)/OM No. & date	:	F. No. 10-138/2008-IA-III dated 15.07.2014 F. No. 10-47/2008-IA-III dated 18.09.2015
4.	Location: a) District (s) b) State (s) c) Latitude/Longitude	: : : :	 Kutchh Gujarat 22^0 47' 56.12 N 69^0 40' 38.02" E (one random co-ordinate within SEZ)
5.	Address for correspondence a. Address of the Concerned Project Chief Engineer (with Pin Code & telephone/ telex/ fax numbers) b. Address of the Executive Project Engineer / Manager (with Pin Code & telephone/ telex/ fax numbers).	 : :	 Chief Operating Officer, SEZ, Adani Ports and SEZ Ltd., Adani House, Navinal Island, Mundra Kutchh, Gujarat Pin – 370 421. Tel: 02838 – 255 000 Head, Environment dept., APSEZL, Infrastructure House, Nr. Adani House, Nr. Mithakhali circle, Navrangpura, Ahmedabad, Gujarat Pin – 380 009, Tel: 079 – 2555 5362 Shalinm.shah@adani.com
6.	Salient features a. Of the project	:	**Salient Features of the Project are as under** • Rail and Road Network (Trunk as well as Internal) having Bridges or Culverts over natural drains, • IT-Telecommunication Network and Electric Network, • Municipal Solid Waste Disposal Site • Water and Power Supply • Storm Water Drainage Network, • Effluent Collection Network • Common Effluent Treatment Plant • Sewage Treatment Plant • Other Utilities & Supporting Infrastructure within SEZ area. • Social infrastructure facilities • Air strip • Desalination plant • Sea water Intake channel • Combined outfall for disposal of treated effluent and desalination reject • Level raising of the SEZ developable areas

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	b. Of the Environment Management Plan	:	**Salient Feature of the EMP are as under** • Water sprinkling in vulnerable areas • Enforce proper maintenance of vehicles and construction equipment. Allowing only PUC approved vehicles in the site. • Enforce usage of covered trucks for transport of construction material. • Enforce use of earmuffs / earplugs to workers in high noise level areas. • Good quality non-corrosive type pipeline should be used. Regular checking of the pipelines for early detection of any possible leakage and damage. Regular ground water monitoring should be done within the SEZ. • The waste should be transported in covered trucks. Vermi-composting is highly recommended for treatment and disposal of biodegradable and kitchen wastes. • Other domestic solid waste (garbage) shall be disposed through MSW facility or as per prevailing norms.
7.	Breakup of the project area a. Submergence area: forest & non-Forest b. Others	: :	No forest land involved.
8.	Breakup of the project affected population with enumeration of those losing houses/dwelling units only agricultural land only, both dwelling units & agricultural land & landless laborers/artisans. a) SC, ST, Adivasi b) Others (please include weather these figures are based on any scientific and systematic survey carried out. Give details and year of survey)	:	Nil
9.	Financial details: a) Project cost as originally planned and subsequent revised estimates and the year of price reference b) Allocation made for EMP with item wise and year wise break-up c) Benefic Cost ratio/Internal Rate of Return and the year of assessment (if applicable) d) Whether (c) includes the cost of Environment Management as shown in the above e) Actual expenditure incurred on project so far f) Actual expenditure incurred on EMP so far	: : : : : :	a) Rs. 9000 crores (block estimate) b) Please Refer Annexure – I c) Details not mentioned by the PP d) Yes e) Rs. 806 crores Approx. (as on 30.09.2017) f) Please Refer Annexure – I
10.	Forest land requirement a. The status of approval for diversion of forest land for non-forestry use b. The status of cleaning felling c. Comments on the viability & sustainability of compensatory afforestation programmer in the light of actual field experience so far	: : :	Forest land not involved Nil 100 Ha. Mangrove plantation is carried out by SAVE at Tala Tadav village of Khambhat Taluka of Anand district. 100 Ha. Mangrove plantation is being carried out

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			by GEC. Out of 100 ha., 38 ha. Plantation is completed at Tala Tadav village of Khambhat Taluka of Anand district. Remaining 62 ha. Plantation is being carried out at Aliya Bet of Bharuch district. It may be noted that in totality. APSEZ has completed mangrove afforestation in over 2800 ha area to enhance the biodiversity of coastal stretches of Gujarat. Please Refer Annexure – 2 for further details.
11.	The status of clear felling in non-forest areas (Such as submergence area or reservoir, approach Roads.), if any with quantitative information required.	:	Not Applicable (No clearing/felling trees is involved in the project).
12.	Status of construction (Actual &/or planned) a. Date of commencement b. Date of completion	: : :	Construction activities as per the Environmental & CRZ clearance are ongoing. Please refer Annexure - 3 for the status of the same. July 2014 Ongoing
13.	Reason for the delay if the project is yet to start.	:	Not Applicable
14.	Dates of site visits a. The dates on which the project was monitored by the MoEF&CC, RO on previous occasions. if applicable b. Date of site visits for this monitoring report	: :	21- 23, Jan 2013 02 – 03, May, 2018

Details of correspondence with project authorities for obtaining act on plans/ information on status of compliance to safeguards other than the routine letters for logistic support for site visits. (The first monitoring report may contain the details of all the letters issued so far, but the later reports may cover only the letter issued subsequently)

Date	Letter from RO	Date	Letter from PA
10.05.2018:	PAs have been directed to submit comprehensive compliance report vide letter dated 10.05.2018	14.05.2018	Comprehensive CR received vide letter dated 11.05.2018 received in MoEFCC, RO Bhopal on 14.05.2018

Cost of Environmental Protection Measures

Sr. No.	Activity	Cost incurred (INR in Lacs)			Budgeted Cost (INR in Lacs)
		2015 – 16	2016 – 17	2017 – 18	2017 – 18
1.	Environmental Study / Audit and Consultancy	45.45	36.78	9.0	21.00
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4.	Hazardous / Non Hazardous Waste Management & Disposal	34.56	12.52	65.62	90.84
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9.	O&M of Sewage Treatment Plant and Effluent Treatment Plant (including STP, ETP of Port & SEZ & Common Effluent Treatment Plant)	18.18	61.50	70.02	69.35
10.	Expenditure of Environment Dept. (Apart from above head)	135.90	131.83	102.15	104.91
	Total	837.73	910.70	889.86	956.54

Further year wise breakup of the cost is mentioned in table below:

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2017-2018	342.86	547.00	889.86
Total	1757.66	2350.74	4108.4

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PART - II & III

DESCRIPTIVE REPORT ON STATUS OF COMPLIANCE TO CONDITIONS OF ENVIRONMENTAL CLEARANCE AND ENVIRONMENTAL MANAGEMENT

i. Compliance Status of Environmental Clearance for the period October 2017 to March 2018 issued by MoEF&CC, New Delhi vide letter No.: 10-47/2008-IA-III dated 12.01.2009

(Details of the project: Environmental and CRZ clearance granted to the Waterfront Development Project (WFDP) at Mundra, Kutch being developed by Adani Ports and Special Economic Zone Ltd. (APSEZL) (Formerly, M/s. Mudra Port and SEZ Ltd.))

As per the information furnished by the PP, the details of Activities/facilities approved, major components completed and proposed future activities as per Environment and CRZ Clearance are as below:

Description (Type of Facility or Berth*)	Approved Berths or Length as per Environmental & CRZ Clearance	So far Developed and In Operation	To be Developed as per Environmental & CRZ Clearance
	Nos. of Berths or Length	Nos. of Berths	Nos. of Berths/Facilities
Multipurpose	4 (550 m + 2 Berths)	4	-
Container	16 (2680 m + 2000 m)	7 (2110 m)	9
Ro-Ro	2	-	1
Coal	6	4	2
Dry-Bulk Cargo	5	-	5
Liquid/POL	9*	-	9
LNG	2	Progressive towards commissioning (being developed by GSPC LNG Limited as per NOC given by APSEZ)	-
Light & Heavy Engineering	2	-	2
Port Craft	1 (330 m)	-	1
Shipyard	2	-	2

* Liquefied Petroleum Gas (LPG) Terminal is being developed under Waterfront Development Project and will be handled at existing Multipurpose Terminal. LPG terminal is being developed by M/s. Mundra LPG Terminal Pvt. Ltd., which is 100% subsidiary of APSEZ.

In addition to above berths or facilities, following components were also approved.

1. Dredging Quantity: 210 Mm^3. Overall dredging to the tune of 123 Mm^3 is completed till date
2. Back-up area, back-up facilities like railway line, rail slidings, rail truck loading, open paved areas, associated buildings, utilities, amenities, etc. and connectivity to rail and road corridor for each port

were approved and majority of them are constructed and in operation. Remaining facilities will be developed based on future requirements.

3. Seawater intake channel and outfall channel for power plants, desalination plants (47 MLD is operational out of 300 MLD) and other industrial requirements approved and is already in operation.

Further, the point-wise compliance status of Environmental / CRZ Clearance granted to the Waterfront Development Project (WFDP) at Mundra, Kutch being developed by Adani Ports and Special Economic Zone Ltd. (APSEZL) is furnished below:

Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
Specific Conditions		
i	No existing mangroves shall be destroyed during construction / operation of the Project.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Project is being developed as per permissions granted. Conservation of mangroves: • In and around APSEZ, approx. 1800 ha. mangrove area was identified by NIO in an EIA report prepared the year 1998. • Out of this 1800 ha area, 1254 ha area was further demarcated as potential mangrove conservation by NIO in the year 2008 (as part of the EIA report of WFDP). • It may be noted that the entire area of 1254 ha is not covered with mangroves. • Entire area is being conserved and there is no disturbance to the mangroves in this area. Measures such as restricted entry and regular surveillance have resulted in overall growth of mangroves within this area. • As per MoEF&CC directive, APSEZ entrusted NCSCM to demarcate mangroves in and around APSEZ area. As per their study, presently, mangrove cover in and around APSEZ is over 2340 ha. The analysis of the comparison between 2011 and 2016-17 has shown an overall growth of 246 ha. Please refer **Annexure – 1 in the main report** for a copy of the report. **In view of the information furnished by the PP supported by the study report of NCSCM, the stipulated condition is considered complied.** **COMPLIED**
ii	There shall be no filling up of the creek and reclamation of the creeks.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Conservation of creeks: • The prominent creek system (main creeks and small branches of creeks) in and around APSEZ are: (1) Kotdi (2) Baradimata (3) Navinal (4) Bocha (5) Mundra (Oldest port (Juna Bandar) leading to Bhukhi river).

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Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
		• All above creek mouths are open allowing free flow of water in to the creeks and surrounding areas and there is no filling or reclamation of any creek area. • This aspect is also confirmed from the recent study of NCSCM **(Annexure – 1 in the main report)** which highlights the bathymetry data of the entire coast around APSEZ. • From the bathymetry data it can be concluded that there are sufficient depths at the creek mouths and all creek mouths are open allowing flushing of water. • APSEZ has so far constructed 19 culverts having total length of approx. 1100 m with total cost of INR 20 Crores. Three RCC Bridges have also been constructed over Kotdi creek with total length of 230 m and cost of INR 10 Crores. Photographs of the same are attached as **Annexure – 2 in the main report**. • From the APSEZ operations, there is no discharge of any sewage or effluent to the water streams **In view of the information furnished by the PP supported by the study report of NCSCM showing the bathymetry data, the stipulated condition is considered complied.** **COMPLIED**
iii	The Project proponent shall comply with all the Orders/directions of the Honorable High Court of Gujarat and Supreme Court in the matter.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. There are two ongoing matters pending (one pending at High Court and other pending at Supreme Court). Details regarding both the matters including their status are mentioned below. 1) Kheti Vikas Seva Trust (an association of 200 villagers) has filed a writ petition dated 24th January 2011 before the Gujarat HC against the state of Gujarat, our Company, Adani Power Limited and others alleging that the power plant set up by Adani Power Limited, on the land allotted to our Company for the setting up of a special economic zone, is in violation of the necessary requirements for setting up such plants, including environmental laws. The writ petition has been dismissed by the Gujarat High Court on 17th April 2015. The Hon'ble Supreme Court of India on 18.3.2016 dismissed the appeal against the said order dated 17th April, 2015 of the Gujarat High Court. However, an application filed by the petitioner alleging non-compliance of an order of the Gujarat HC dated 12th July 2011 prohibiting the cutting of mangroves and other forests during the pendency of the petition without permission of the state forest and environment department in relation to the writ petition is still pending. 2) Pravinsingh Bhurabha Chauhan filed a public interest litigation by way of a writ petition before the High Court of Gujarat alleging that a certain plot of land known as 'Mor Dhuva' was not allotted to our Company and accordingly that our Company should be restrained from carrying out any activity, including ship recycling activities, without any prior

Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
		permission or authorization in and around sand dunes including 'Mor Dhuva' in Tunda and Vandh villages, Kutch, Gujarat. In view of the affidavits filed by MOEF, and Govt of Gujarat the High Court dismissed the petition on 18.2.2015. The petitioner filed a special leave to appeal before the Supreme Court of India, challenging the order dated 18.2.2015 of Gujarat High Court and the same is pending. As a law abiding company, we have been regularly complying with all the directions/orders issued by Hon'ble Courts from time to time. Similarly, as both the matters are still pending in the Hon'ble Courts, we agree to comply with all the orders/directions, if any, issued by the Honorable High Court of Gujarat and Supreme Court at any later stages of the cases. **In view of the information furnished by the PP, the condition is considered as agreed to comply by the PP.** **AGREED TO COMPLY**
iv	Adequate safety measures for the offshore structure and ship navigation shall be taken in view of the High Current in the area.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. The hydrodynamic study for the waterfront area has been carried out by HR Wallingford, a maritime design expert. As per the recommendations in their report, the following safety measures are implemented. 1. The alignment of the berth has been kept in line with the current flow in order to reduce the effect of current on vessels moored alongside. 2. The breasting dolphins have been designed in such a configuration so as to provide appropriate lead to the vessels mooring ropes. 3. The berth being in line with the current flow will facilitate Pilotage operation and provide better maneuverability of vessels. 4. The strength of the berth structure has been calculated to absorb the energy transferred to fenders while berthing of tanker vessels at the terminal. 5. Navigational buoys and lead lights marking the channel and clearing distance off the breakwater are installed. 6. The strength of the fenders at the berth and the SWL of the bollards / winches are sufficient to absorb the forces of vessels alongside keeping in mind the monsoon weather conditions. 7. Sufficient depths are maintained at all times to ensure 10% UKC at the time of berthing / un-berthing. 8. The capstans / winches / bollards are of adequate strength with respect to the vessels being handled. 9. The berth has been designed at an appropriate distance from the existing berths at MMPT-1 in order to safely allow berthing / un-berthing of vessels at MMPT-1 with vessels berthed at the South Port tanker terminal. 10. Berths have been planned close to the breakwater as there is a reduced

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Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
		strength of current along the coastline. **In view of the information furnished by the PP, the stipulated condition is considered complied.** COMPLIED
v	The shore line changes in the area shall be monitored periodically and the report submitted every 6 months to Regional Office Bhopal.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. The shore line change aspect of the project area is monitored periodically and the report of the same is submitted every 6 months to Regional Office Bhopal. Please refer below details in this regard. Shoreline change study for the entire coast of Gujarat was carried out by Anna University, Chennai and same is published by MoEF&CC, Govt. of India in 2011. APSEZ has carried out CRZ mapping of development areas through MoEF&CC authorized agencies in June, 2011 (National Centre of Earth Science Studies) and January, 2013 (National Institute of Oceanography). Same are submitted to MoEF&CC as part of compliance. Shore line change aspect has been studied in detail as part of following two studies; • Bathymetry & Topography study, preparation of plan for protection of creeks/ mangrove area including buffer zone, mapping of co-ordinates, running length, HTL, CRZ boundary. • A Regional Impact Assessment study to identify impacts of all the existing as well as proposed project activities in Mundra region. As per the outcome of these studies, no erosion is observed on the coast of the project area. As part of the Regional Impact Assessment study, the possible changes in shoreline that may occur due to the proposed developments in 10 km area on either side of the waterfront development project have been predicted. It has been inferred from the modelling study that the shift in the shoreline will be less than 0.5 m/year, which reconfirms that the APSEZ facility would pose insignificant impact on the Mundra shoreline. Accretion is observed at South port and at West port due to approved reclamation activities. Based on the study outcome, it is recommended to map the coastal morphology (shoreline change) at least once in three years. The said recommendation will be implemented and the next shoreline change assessment will be carried out during 2020-21. Please refer **Annexure – A in the main report** (Compliance of MoEF&CC Order dated 18th Sep, 2015) for further details regarding the mentioned studies.

Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
		The updated status on monitoring report on shoreline changes is being submitted to MoEF&CC, RO, Bhopal on a six monthly basis. **In view of the information furnished by the PP and the six-monthly reporting of shoreline changes in the compliance reports, the stipulated condition is considered complied.** **COMPLIED**
vi	The recommendations of the risk assessment shall be implemented; any change in the design of the project shall come before the committee for seeking necessary approval.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Risk Assessment was carried out at the time of preparation of the EIA report for the Liquid Berths and LNG terminal. However, it may be noted that liquid berths are not yet developed. Hence recommendations of Risk Assessment will be implemented once the liquid berths & pipelines are developed by APSEZ. The LNG terminal is being constructed by GSPC LNG Ltd. and a separate Environment and CRZ clearance is obtained by them. Please refer general condition no ix below for details regarding the same. LPG is proposed to be handled from the existing multipurpose terminal and storage tanks are being constructed in the back up area. A detailed risk assessment study as per MoEF&CC letter no. F. No. 10-47/2008-IA-III dated 31st May, 2016 is carried out by iFluids Engineering for handling as well as storage activities. Recommendations of the risk assessment are being implemented as part of the construction activity. Some of the recommendations are mentioned below. For a detailed list of the recommendations please refer **Annexure – 3 in the main report.** • Selection of the loading arms and commissioning checks to ensure proper operation of the PERC in the event of ESD actuation (maximum time shall not exceed more than 2 min for complete isolation, loading arm release and ship pumps stop in case of hydrocarbon leak) • All flanges shall be connected for bonding for electrical continuity • Kerb wall height shall be minimum 30 cm but shall not exceed 60 cm. • Leak detection systems based on pressure, temperature and flow • A suitable continuous back-up power supply shall be provided for the control system and operation of ROVs both at jetty end and tank end • Consider HAZOP and SIL study before commissioning the facility and concerns addressed • Ensure CCTV coverage of critical locations and remote monitoring is done continuously There are no other activities which attract requirement of Risk Assessment. **In view of the information furnished by the PP and the detailed compliance of recommendations mentioned in the Annexure-3 in the main report, the stipulated condition is considered as compliance in**

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Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
		progress. **COMPLIANCE IN PROGRESS**
vii	Mangrove plantation of 200 ha to be done in consultation with GEER / GEC of Forest Department, a detailed plan shall be submitted within six months from the date of receipt of this letter.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. APSEZ has consulted Gujarat Institute of Desert Ecology (GUIDE) as they are one of the authorized agencies of Dept. of Forest & Env., Govt. of Gujarat for carrying out mangrove afforestation. GUIDE has completed mangrove plantation in an area of 200 ha at Jakhau, Gujarat during the year 2012-13. Copy of the mangrove plantation completion certificate is attached as **Annexure – 5 in the main report.** Total expenditure for the said work was INR 40 lakh. It may be noted that to enhance the marine biodiversity, till date APSEZ has carried out mangrove afforestation in more than 2800 ha. area across the coast of Gujarat. Total expenditure for the same till date is INR 782 lakh. Please refer **Annexure – 6 in the main report** for green belt development and mangrove afforestation efforts done by APSEZ and the Master Plan of Greenbelt development at APSEZ. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
viii	It shall be ensured that during construction and post construction of the proposed jetty the movement of fishermen vessel of the local communities are not interfered with.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. During project proposal, APSEZ proposed to provide four (4) dedicated accesses at Juna Bandar, Luni, Bavdi Bandar and Zarpara for the fishermen to approach the sea for fishing activity. However, during construction as well as operation, through fishermen consultative process, so far APSEZ has provided seven (7) access roads instead of four (4). Total length of all the approach roads is approx. 23 Kms and expenditure involved is Rs. 637 Lacs. There is no hindrance to the movement of fisherman boats. Further, APSEZ is actively working with local community (including fishermen community) around the project area and provides required support for their livelihood and other concerns through the CSR arm – Adani Foundation. Following activities have been carried out during the period FY 2017-18. **Area:** Sustainable Livelihood – Fisher folk **Activity:** • Average 118 KL of water was supplied to 983 households from different settlements on a daily basis under Machhimar Shudhh Jal Yojana. • Computer Training: **20 Fisherman Youth** • Sewing Training: **20 Women** • RTG Crane Operator: **02 Fisherman Youth** • Dori Work Training: **60 Women** • Mangrove Plantation: **4526 Man-days**

<table>
<tr><th>Sr. No.</th><th>Condition as per clearance letter</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td>• Painting Labour: 47 Fisherman
• AF has started poly culture project with consultancy of GUIDE In this system we stocked 6000 fingerlings fishes of 3 gm weight in six different cages. There was 80% survival with 100 to 150 gm each weight after 5 month culture period.
• We have facilitated 560 daughters with Kit (Small Bed sheet, Mosquito net, Soap and Cream with nutritious food for mother) under Beti Vadhavo Programme.</td></tr>
</table>
Please refer Annexure – 7 in the main report for full details of CSR activities carried out by Adani Foundation in the Mundra region. Budget for CSR Activity for the FY 2017-18 is to the tune of INR 1565 lakh. Out of which, Approx. INR 1399 lakh are spent during the year.
In view of the information furnished by the PP and the access roads provided at several locations, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>ix</td><td>Relocation of the fishermen community if any shall be done strictly in accordance with the norms prescribed by the State Government.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Not Applicable

The project was conceptualized in such a way that there are no fishermen settlements in the project proposal. Hence there is no relocation of fishermen communities required.
In view of the information furnished by the PP, the stipulated condition is considered as not applicable to PP.
COMPLIANCE NOT APPLICABLE TO PP</td></tr>
<tr><td>x</td><td>Marine ecology monitoring shall be done regularly during construction of breakwater and dredging /disposal operation.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Constructions as well as dredging operations are ongoing activities. Marine monitoring is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for duration from Oct'17 to March'18 is mentioned below.

Total Sampling Locations & frequency: 09 Nos. (once a month)
<table>
<tr><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Surface</th><th colspan="2">Bottom</th></tr>
<tr><th>Max</th><th>Min</th><th>Max</th><th>Min</th></tr>
<tr><td>pH</td><td>--</td><td>8.28</td><td>7.1</td><td>8.4</td><td>7.2</td></tr>
<tr><td>TSS</td><td>mg/L</td><td>55</td><td>14</td><td>47</td><td>18</td></tr>
<tr><td>BOD (3 Days @ 27 °C)</td><td>mg/L</td><td>8.6</td><td>0</td><td>10</td><td>3</td></tr>
<tr><td>DO</td><td>mg/L</td><td>6.6</td><td>4.8</td><td>8</td><td>4.2</td></tr>
<tr><td>Salinity</td><td>ppt</td><td>44.72</td><td>30.6</td><td>4209</td><td>37.8</td></tr>
<tr><td>TDS</td><td>mg/L</td><td>538320</td><td>34120</td><td>56780</td><td>35330</td></tr>
</table>
Please refer Annexure – 8 in the main report for detailed analysis reports. Approx. INR 27 Lakh is spent for all environmental monitoring activities during the FY 2017-18. Marine monitoring for west port area has been</td></tr>
</table>

Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
		carried out by M/s. Adani Power Limited. Monitoring reports are also enclosed as **Annexure – 8 in the main report.** Summary of ecological parameters is given below: **Plankton Diversity:** A total of five stations were distributed throughout the sampling effort. Samples were collected during September 2017. A maximum 24 genera of Amphidinium, Amphora, Bacteriastrum, Cerataulina, Ceratium, Chaetoceros, Coscinodiscus, Cylindrotheca, Ditylum, Fragilaria, Gunardia, Hemialus, Lauderia, Melosira, Navicula, Odontella, Pleurosigma, Pseudonitzschia, Rhizosolenia, Scrippsiella, Skeletonema, Surirella, Thalassionema and Thalassiosira identified from station 3 during the period of investigation and a minimum 18 genera of phytoplankton Cerataulina, Chaetoceros, Coscinodiscus, Cylindrotheca, Ditylum, Dinophysis, Fragilaria, Leptocylindrus, Melosira, Meuneria, Navicula, Odontella, Pleurosigma, Protoperidinium, Rhizosolenia, Skeletonema, Thalassionema and Thalassiosira identified from station 2 & 4. The phytoplankton abundance in the study region was ranged from 10000 to 41952 cells L-1. Highest phytoplankton abundance was observed at the ST-3 Surface water. However, lowest phytoplankton abundance was observed at the ST-5 Surface water. The maximum number of groups (24) found at ST-3. **Benthic Diversity:** Benthic invertebrates in the present study area were distributed on the surface of bed forms i.e. sandy and Silty clay in nature. The abundance and diversity, species composition of benthic invertebrates were recorded which is the indicators of changing environmental conditions. A total 5 sub tidal stations and 3 intertidal transect were distributed throughout the sampling effort. Samples were collected during December 2017. Sub tidal: A maximum 4 group of Bivalvia, Polychaeta, Amphipoda, and Sipuncula identified from station 1 & 5 during the period of investigation and a minimum 2 Polychaeta and Amphipoda Benthic fauna recorded from station 2. In the sub tidal region macro benthos abundance was higher at ST-1 (575 no. m-2), whereas lowest abundance was recorded at ST-2 (100 no. m-2). Benthic group count was ranged from 2 to 4, with maximum groups at ST-1&5. High biomass was recorded at ST-5 (8.63mg. m-2) as compared to other stations. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xi	Regular Monitoring of air quality shall be done in the settlement areas around the Project site and appropriate safeguard measures shall be taken.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Ambient Air Quality and Noise monitoring are being carried out by NABL accredited and MoEF&CC authorized agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 is mentioned below.

<table>
<tr><th>Sr. No.</th><th>Condition as per clearance letter</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>
Air sampling locations & frequency: 8 nos. (twice a week) & Noise sampling locations & frequency: 5 nos. (once in a month)
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit[$]</th></tr>
<tr><td>PM_{10}</td><td>$\mu g/m^3$</td><td>96.3</td><td>41.7</td><td>100</td></tr>
<tr><td>$PM_{2.5}$</td><td>$\mu g/m^3$</td><td>56.4</td><td>12.4</td><td>60</td></tr>
<tr><td>SO_2</td><td>$\mu g/m^3$</td><td>29.4</td><td>5.0</td><td>80</td></tr>
<tr><td>NO_2</td><td>$\mu g/m^3$</td><td>45.8</td><td>13.3</td><td>80</td></tr>
<tr><th>Noise</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit</th></tr>
<tr><td>Day Time</td><td>dB(A)</td><td>73.4</td><td>57.1</td><td>75</td></tr>
<tr><td>Night Time</td><td>dB(A)</td><td>69.4</td><td>53.8</td><td>70</td></tr>
</table>
[$] as per NAAQ standards, 2009
Values recorded confirms to the stipulated standards.

Please refer Annexure – 8 in the main report for detailed analysis reports. Approx. INR 27 Lakh is spent for all environmental monitoring activities during the FY 2017-18. Ambient air quality monitoring in surrounding villages is being carried out by M/s. Adani Power Limited, Mundra and monitoring reports of the same are also enclosed in Annexure – 8 in the main report.

Following safeguard measures are taken for abatement of dust emissions.
• Regular sprinkling on road and other open area
• Regular cleaning of roads
• Dry fog Dust Suppression System (DSS) in hopper, transfer towers and conveyor belts
• Use of water mist canon
• Closed type conveyor belts
• Regular sprinkling on coal heaps
• Covering other types of dry bulk cargo heaps
• Installation of wind breaking wall
• Development of greenbelt along the periphery of the storage yards/back up area
• Mechanized handling system for coal and other dry bulk cargo
• Wagon loading and truck loading through closed silo
In view of the information furnished by the PP and the monitoring data complying the stipulated norms, the stipulated condition is considered complied.
COMPLIED
</td></tr>
<tr><td>xii</td><td>Sewage arising in the Port area shall be disposed off after adequate treatment to conform to the standards stipulated by Gujarat State Pollution Control Board and shall be utilized / recycled</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Entire quantity of sewage generated is being treated in designated ETP / STP and treated sewage is used for Horticulture purposes.</td></tr>
</table>

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<table>
<tr><th>Sr. No.</th><th>Condition as per clearance letter</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>for Gardening, Plantation and Irrigation.</td><td>
<table>
<tr><th>Location</th><th>Capacity</th><th>Quantity of Wastewater</th><th>Type of ETP / STP</th></tr>
<tr><td>LT</td><td>265 KLD</td><td>85 KLD</td><td>Activated Sludge</td></tr>
<tr><td>West port</td><td>55 KLD</td><td>12 KLD</td><td>FAB</td></tr>
</table>

Third party analysis of the treated water is being carried out once in a month at Liquid Terminal (LT) & twice in a month at West Port by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 is mentioned below.
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit*</th></tr>
<tr><td colspan="5">Industrial Effluent</td></tr>
<tr><td>pH</td><td>--</td><td>7.75</td><td>6.19</td><td>6.5 to 8.5</td></tr>
<tr><td>TSS</td><td>mg/L</td><td>90</td><td>22</td><td>100</td></tr>
<tr><td>TDS</td><td>mg/L</td><td>2060</td><td>1032</td><td>2100</td></tr>
<tr><td>COD</td><td>mg/L</td><td>96</td><td>72</td><td>100</td></tr>
<tr><td>BOD (3 Days @ 27°C)</td><td>mg/L</td><td>27</td><td>19</td><td>30</td></tr>
<tr><td colspan="5">Domestic Sewage</td></tr>
<tr><td>pH</td><td>--</td><td>7.23</td><td>6.34</td><td>6.5 – 8.5</td></tr>
<tr><td>TSS</td><td>mg/L</td><td>28</td><td>11</td><td>100</td></tr>
<tr><td>BOD (3 Days @ 27 °C)</td><td>mg/L</td><td>18</td><td>8</td><td>30</td></tr>
<tr><td>Residual Chlorine</td><td>ppm</td><td>0.8</td><td>0.5</td><td>Min 0.5</td></tr>
<tr><td>Fecal Coliform</td><td>Nos.</td><td>920</td><td>84</td><td><1000</td></tr>
</table>
* as per CC&A granted by GPCB
Values recorded confirms to the stipulated standards.

Please refer Annexure – 8 in the main report for detailed analysis reports. Approx. INR 27 Lakh is spent for all environmental monitoring activities during the FY 2017-18.

In view of the information furnished by the PP and the monitoring data complying the stipulated discharge norms, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>xiii</td><td>Adequate Plantation shall be carried out along the roads of the Port premises and a green belt shall be developed.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

APSEZ has developed its own "Dept. of Horticulture" which is taking measures/ steps for terrestrial greening as well as mangrove plantation.

The species such as Ficus Infectoria, Ficus religiosa, Terminalia arjuna, Cocos nucifera, Washingtonia fillifera, Casurina spp., Azadirachta Indica, Eucalyptus spp., Jatropha curacus, Ficus bengalensis, Subabool spp., Casia fistula, Date Palm and Delonix regia are grown within APSEZ area.

Within the port areas approx. 122 hectare of greenbelt having 28,119 trees with the density of 2303 trees per hectare is developed till date. So, far more than 400 ha. area is developed as greenbelt with plantation of more</td></tr>
</table>

Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
		than 8.0 Lacs trees within the entire APSEZ area. Please refer **Annexure – 6 in the main report** for further details regarding greenbelt development, mangrove afforestation and updated green belt development plan. Total expenditures of the horticulture dept. during the FY 2017-18 are INR 607 lakh. **In view of the information furnished by the PP and as per the site observation of excellent greenbelt developed in the saline soils which is commendable, the stipulated condition is considered compliance in progress in light of the proposed phase-wise green belt development.** **COMPLIANCE IN PROGRESS**
xiv	There shall be no withdrawal of Ground Water in CRZ area for this Project.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. APSEZ does not draw any ground water for the water requirement. Present source of water for various project activities is desalination plant of APSEZ and/or Narmada water through Gujarat Water Infrastructure Limited. Average water consumption for entire APSEZ area is average 5.2 MLD in the year 2017-18. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xv	Specific arrangements for rain water harvesting shall be made in the Project design and the rain water so harvested shall be optimally utilized. Details in this regard shall be furnished to this Ministry's Regional Office at Bhopal within 3 months.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Groundwater recharge cannot be done at the project site since the entire project is in the intertidal / sub tidal areas. Rain water within project area is managed through storm water drainage. However, APSEZ has carried out rainwater harvesting activities in the nearby villages for benefit of the locals. Following measures are taken for the same during the year 2011 – 13 and the same have benefited to the local farmers. 1. Pond deepening activities at villages 2. 18 check dams were constructed under the 'Sardar Patel Sahbhagi Jalsanchay Yojna' Total cost of these efforts was approx. INR 320 lakh. During FY 2017-18, pond deepening work is completed in Mota Bhadiya, Vadala and Bhujpur villages. The total cost incurred for this work was INR 16.7 Lakhs. Adani foundation has started participatory ground water management project. The objective of the project was to reduce the salinity ingress in and around the coastal regions of Mundra, Kutchh and mitigate the ill-

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Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
		effects of this manmade problem to improve the livelihoods of the rural people. The Project will help to get water table high, also it will help in agricultural activities. – as part of this initiative, below listed activities are initiated: • Ground Water Recharge activities at Jharpara, Navinal, Siracha, Nana Kapaya and Baroi villages • Monitoring of 109 wells by sample collection and analysis of the same (analysis is under progress) to measure the quality of water Please refer **Annexure – 7 in the main report** for full details of CSR activities carried out by Adani Foundation in the Mundra region. Budget for CSR Activity for the FY 2017-18 is to the tune of INR 1565 lakh. Out of which, Approx. INR 1399 lakh are spent during the year. **In view of the information furnished by the PP, the stipulated condition is considered complied subject to clarity on the details submission to Ministry's regional office within 3 months.** **COMPLIED SUBJECT TO CONDITION**
xvi	Land Reclamation shall be carried out only to the extent that it is essential for this Project.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Out of approved reclamation area of 1138 ha for west port, 695 ha area is reclaimed and out of approved reclamation area of 700 ha for south port, 665 ha area is reclaimed. A map showing the reclamation areas is attached as **Annexure – 9 in the main report.** **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xvii	No Product other than those permissible in the Coastal Regulation Zone Notification, 1991 shall be stored in the Coastal Regulation Zone area.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. No products other than those permissible in the CRZ Notification 1991 are stored in the CRZ area. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
General Conditions		
i	Construction of Proposed structures, if any in the Coastal Regulation Zone area shall be undertaken meticulously confirming to the existing Central/local rules and regulations	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. All construction activities are carried out confirming to the existing rules and regulation and as per the CRZ notification.

<table>
<tr><th>Sr. No.</th><th>Condition as per clearance letter</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>including Coastal Regulation Zone Notification 1991 and its amendments. All the construction designs/ drawings relating to the proposed construction activities must have approvals of the concerned State Government Departments/ Agencies.</td><td>Further, the requisite permissions from Gujarat Maritime Board (GMB), for carrying out construction activities are taken from time to time. Details of the same are mentioned below:
• Permission for starting construction work for South port vide letter no GMB/N/PVT/711/870 dated 26.02.2009
• Permission for starting construction work for West port vide letter no GMB/N/PVT/711/871 dated 26.02.2009

Consent to Establish (CtE) and Consent to Operate (CtO) are obtained from GPCB and renewed/amended from time to time as per the progress of the project activity. The present in-force CTE & CtO are mentioned below.

<table>
<tr><th>Permission</th><th>Project</th><th>Ref. No. / Order No.</th><th>Valid till</th></tr>
<tr><td>CtE – Amendment</td><td>Waterfront Development Project</td><td>PC/CCA-KUTCH-582(3)/GPCB ID: 35427/170294</td><td>01.07.2018</td></tr>
<tr><td>CtE – Amendment</td><td>Waterfront Development Project – West Port</td><td>CTE - 88318</td><td>01.07.2018</td></tr>
<tr><td>CtO – Renewal</td><td>Mundra Port Terminal</td><td>AWH-83561</td><td>20.11.2021</td></tr>
<tr><td>CtO – Renewal</td><td>West Port – WFDP</td><td>AWH-79241</td><td>23.06.2021</td></tr>
<tr><td>CtO - Amendment</td><td>Mundra Port Terminal</td><td>WH-88317</td><td>20.11.2021</td></tr>
<tr><td>CtE – Fresh</td><td>LPG Terminal</td><td>CTE – 88079</td><td>04.07.2022</td></tr>
<tr><td>CtO – Amendment</td><td>West Port – WFDP</td><td>AWH-91678</td><td>01.02.2022</td></tr>
</table>
Copy of updated / amendment in CtO and CtE are attached as Annexure – 10 in the main report.

In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>ii</td><td>Adequate provision for infrastructure facilities such as water supply, fuel, sanitation etc. shall be ensured for construction workers during the construction phase of the project so as to avoid felling of trees/mangroves and pollution of water and the surroundings.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Not applicable

Most of the construction labours reside in the nearby villages where all basic facilities are easily available. There are no housing requirements for labours inside the project area.

In view of the information furnished by the PP, the stipulated condition is considered not applicable to PP.
COMPLIANCE NOT APPLICABLE TO PP</td></tr>
<tr><td>iii</td><td>The project authorities must make necessary arrangements for disposal of solid wastes and for the</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.</td></tr>
</table>

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<table>
<tr><th>Sr. No.</th><th>Condition as per clearance letter</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>treatment of effluents by providing a proper wastewater treatment plant outside the CRZ area. The quality of treated effluents, solid waste, and noise level etc. must conform to the standards laid down by the competent authorities including the Central/ State Pollution Control Board and the Union Ministry of Environment and Forests under the Environment (Protection) Act, 1986, whichever are more stringent.</td><td>Constructions as well as dredging operations are ongoing activities. Marine monitoring is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for duration from Oct'17 to March'18 is mentioned below.

Total Sampling Locations & frequency: 09 Nos. (once a month)
<table>
<tr><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Surface</th><th colspan="2">Bottom</th></tr>
<tr><th>Max</th><th>Min</th><th>Max</th><th>Min</th></tr>
<tr><td>pH</td><td>--</td><td>8.28</td><td>7.1</td><td>8.4</td><td>7.2</td></tr>
<tr><td>TSS</td><td>mg/L</td><td>55</td><td>14</td><td>47</td><td>18</td></tr>
<tr><td>BOD (3 Days @ 27 °C)</td><td>mg/L</td><td>8.6</td><td>0</td><td>10</td><td>3</td></tr>
<tr><td>DO</td><td>mg/L</td><td>6.6</td><td>4.8</td><td>8</td><td>4.2</td></tr>
<tr><td>Salinity</td><td>ppt</td><td>44.72</td><td>30.6</td><td>4209</td><td>37.8</td></tr>
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</table>
Please refer Annexure – 7 in the main report for detailed analysis reports and accreditation certificate. Approx. INR 27 Lakh is spent for all environmental monitoring activities during the FY 2017-18. Marine monitoring for west port area has been carried out by M/s. Adani Power Limited. Monitoring reports are also enclosed as Annexure – 7 in the main report.

Summary of ecological parameters is given below:
Plankton Diversity: A total of five stations were distributed throughout the sampling effort. Samples were collected during September 2017. A maximum 24 genera of Amphidinium, Amphora, Bacteriastrum, Cerataulina, Ceratium, Chaetoceros, Coscinodiscus, Cylindrotheca, Ditylum, Fragilaria, Gunardia, Hemialus, Lauderia, Melosira, Navicula, Odontella, Pleurosigma, Pseudonitzschia, Rhizosolenia, Scrippsiella, Skeletonema, Surirella, Thalassionema and Thalassiosira identified from station 3 during the period of investigation and a minimum 18 genera of phytoplankton Cerataulina, Chaetoceros, Coscinodiscus, Cylindrotheca, Ditylum, Dinophysis, Fragilaria, Leptocylindrus, Melosira, Meuneria, Navicula, Odontella, Pleurosigma, Protoperidinium, Rhizosolenia, Skeletonema, Thalassionema and Thalassiosira identified from station 2 & 4. The phytoplankton abundance in the study region was ranged from 10000 to 41952 cells L-1. Highest phytoplankton abundance was observed at the ST-3 Surface water. However, lowest phytoplankton abundance was observed at the ST-5 Surface water. The maximum number of groups (24) found at ST-3.

Benthic Diversity: Benthic invertebrates in the present study area were distributed on the surface of bed forms i.e. sandy and Silty clay in nature. The abundance and diversity, species composition of benthic invertebrates were recorded which is the indicators of changing environmental conditions. A total 5 sub tidal stations and 3 intertidal</td></tr>
</table>

Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018

transect were distributed throughout the sampling effort. Samples were collected during December 2017. Sub tidal: A maximum 4 group of Bivalvia, Polychaeta, Amphipoda, and Sipuncula identified from station 1 & 5 during the period of investigation and a minimum 2 Polychaeta and Amphipoda Benthic fauna recorded from station 2. In the sub tidal region macro benthos abundance was higher at ST-1 (575 no. m-2), whereas lowest abundance was recorded at ST-2 (100 no. m-2). Benthic group count was ranged from 2 to 4, with maximum groups at ST-1&5. High biomass was recorded at ST-5 (8.63mg. m-2) as compared to other stations.

Ambient Air Quality and Noise monitoring are being carried out by NABL accredited and MoEF&CC authorized agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 is mentioned below.

Air sampling locations & frequency: 8 nos. (twice a week) & Noise sampling locations & frequency: 5 nos. (once in a month)

Parameter	Unit	Max	Min	Perm. Limit[$]
PM_{10}	$\mu g/m^3$	96.3	41.7	100
$PM_{2.5}$	$\mu g/m^3$	56.4	12.4	60
SO_2	$\mu g/m^3$	29.4	5.0	80
NO_2	$\mu g/m^3$	45.8	13.3	80
Noise	**Unit**	**Max**	**Min**	**Perm. Limit**
Day Time	dB(A)	73.4	57.1	75
Night Time	dB(A)	69.4	53.8	70

[$] as per NAAQ standards, 2009

Values recorded confirms to the stipulated standards.

Following safeguard measures are taken for abatement of dust emissions.

- Regular sprinkling on road and other open area
- Regular cleaning of roads
- Dry fog Dust Suppression System (DSS) in hopper, transfer towers and conveyor belts
- Use of water mist canon
- Closed type conveyor belts
- Regular sprinkling on coal heaps
- Covering other types of dry bulk cargo heaps
- Installation of wind breaking wall
- Development of greenbelt along the periphery of the storage yards/back up area
- Mechanized handling system for coal and other dry bulk cargo
- Wagon loading and truck loading through closed silo

Entire quantity of sewage generated is being treated in designated ETP / STP and treated sewage is used for Horticulture purposes.

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Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018

Location	Capacity	Quantity of Wastewater	Type of ETP / STP
LT	265 KLD	85 KLD	Activated Sludge
West port	55 KLD	12 KLD	FAB

Third party analysis of the treated water is being carried out once in a month at Liquid Terminal (LT) & twice in a month at West Port by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 is mentioned below.

Parameter	Unit	Max	Min	Perm. Limit[$]
Industrial Effluent				
pH	--	7.75	6.19	6.5 to 8.5
TSS	mg/L	90	22	100
TDS	mg/L	2060	1032	2100
COD	mg/L	96	72	100
BOD (3 Days @ 27°C)	mg/L	27	19	30
Domestic Sewage				
pH	--	7.23	6.34	6.5 – 8.5
TSS	mg/L	28	11	100
BOD (3 Days @ 27°C)	mg/L	18	8	30
Residual Chlorine	ppm	0.8	0.5	Min 0.5
Fecal Coliform	Nos.	920	84	<1000

[$] as per CC&A granted by GPCB

Values recorded confirms to the stipulated standards.

Please refer **Annexure – 7 in the main report** for detailed analysis reports and accreditation certificate. Approx. INR 27 Lakh is spent for all environmental monitoring activities during the FY 2017-18.

Liquid Effluent & Sewage – It is being treated at decentralized treatment plants and treated water confirming the stipulated norms is being utilized for horticulture purposes within APSEZ. Please refer specific condition no xii above for details regarding the same.

Waste Management – APSEZ has adopted 5R concept for environmentally sound management of different types of solid & liquid wastes. Please refer below details about management of each type of waste.

Municipal Solid Waste: A well-established system for segregation of dry & wet waste is in place. All wet waste (Organic waste) is being segregated & utilized for compost manufacturing. The compost is further used by in house horticulture team for greenbelt development. Whereas dry recyclable waste is being sorted in various categories. Presently manual sorting is being done for sorting of different types of solid waste. Segregated recyclable materials such as Paper, Plastic, Cardboard, PET Bottles, Glass etc. are then sent to respective recycling units, whereas remaining non-recyclable waste is bailed and sent to

<table>
<tr><th>Sr. No.</th><th>Condition as per clearance letter</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>cement plant (M/s. Sanghi Industries Ltd.) for Co-processing as RDF (Refused Derived Fuel).

Hazardous Waste:
• E – Waste & Used Batteries are being sold to GPCB registered recyclers namely M/s. e-Processing House.
• Solid Hazardous Waste is being disposed through common facility i.e. M/s. Recycling Solutions Pvt. Ltd., Panoli and/or co-processing at Sanghi Industries Ltd., Kutch. Used/Waste Oil is being sold to GPCB authorized recyclers / re-processors namely M/s.Western India Petrochem Industry, Bhavnagar.
• Downgrade chemicals generated from cleaning of storage tanks / pipelines are being sold to authorized solvent recovery facilities namely M/s. Acquire Chemicals, Ankleshwar however during the compliance period, there was no disposal of downgrade chemicals.
• Slop Oil received from vessels is treated to separate water and oil particles in Oil Water Separator system. Separated oil from the same is being sold to authorized recycler / reprocessor namely M/s.Western India Petrochem Industry, Bhavnagar and water is sent to ETP for further treatment. However during the compliance period, there was no disposal of Slope Oil.

The following table summarizes the waste management practice (for Oct'17 to March'18) for different types of wastes at APSEZ:
<table>
<tr><th>Waste</th><th>Quantity in MT</th><th>Disposal method</th></tr>
<tr><td colspan="3">Hazardous Waste</td></tr>
<tr><td>Pig Waste</td><td>5.4</td><td>Co-processing at common facility and/or cement industry</td></tr>
<tr><td>Tank Bottom Sludge</td><td>33.4</td><td>Co-processing at common facility</td></tr>
<tr><td>Oily Cotton waste</td><td>55.2</td><td>Co-processing at Cement Industry</td></tr>
<tr><td>Used / Spent Oil</td><td>86.1</td><td>Sell to GPCB approved recycler</td></tr>
<tr><td>Discarded Containers</td><td>8.7</td><td>Sell to GPCB approved recycler</td></tr>
<tr><td>E-Waste</td><td>2.32</td><td>Sell to GPCB approved recycler</td></tr>
<tr><td colspan="3">Municipal Solid Waste</td></tr>
<tr><td>Dry Waste</td><td>105.6</td><td>After recovery sent for recycling</td></tr>
<tr><td>Wet Waste</td><td>467.4</td><td>Converted to Manure for horticultural use</td></tr>
</table>
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>iv</td><td>The Proponent shall obtain the requisite consents for discharge of effluents and emissions under the Water (Prevention and Control of</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Consent to Establish (CtE) and Consent to Operate (CtO) are obtained from</td></tr>
</table>

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<table>
<tr><th>Sr. No.</th><th>Condition as per clearance letter</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>pollution) Act, 1974 and the Air (Prevention and Control of pollution) Act, 1981 from the Gujarat Pollution Control Board before commissioning of the Project and copy of each of these shall be sent to this Ministry.</td><td>GPCB and renewed/amended from time to time as per the progress of the project activity. The present in-force CTE & CtO are mentioned below.

<table>
<tr><th>Permission</th><th>Project</th><th>Ref. No. / Order No.</th><th>Valid till</th></tr>
<tr><td>CtE – Amendment</td><td>Waterfront Development Project</td><td>PC/CCA-KUTCH-582(3)/GPCB ID: 35427/170294</td><td>01.07.2018</td></tr>
<tr><td>CtE – Amendment</td><td>Waterfront Development Project – West Port</td><td>CTE - 88318</td><td>01.07.2018</td></tr>
<tr><td>CtO – Renewal</td><td>Mundra Port Terminal</td><td>AWH-83561</td><td>20.11.2021</td></tr>
<tr><td>CtO – Renewal</td><td>West Port – WFDP</td><td>AWH-79241</td><td>23.06.2021</td></tr>
<tr><td>CtO - Amendment</td><td>Mundra Port Terminal</td><td>WH-88317</td><td>20.11.2021</td></tr>
<tr><td>CtE – Fresh</td><td>LPG Terminal</td><td>CTE – 88079</td><td>04.07.2022</td></tr>
<tr><td>CtO – Amendment</td><td>West Port – WFDP</td><td>AWH-91678</td><td>01.02.2022</td></tr>
</table>
Copy of updated / amendment in CtO and CtE are attached as Annexure – 10 in the main report.

In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>v</td><td>The sand dunes, corals, and mangroves, if any, on the site shall not be disturbed in any way.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied

There are no sand dunes and corals at the project site. 1254 ha area identified as potential mangrove conservation is being conserved and there is no disturbance to the mangroves in this area. Please refer specific condition no i above for details regarding the same.

In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>vi</td><td>A copy of the clearance letter will be marked to the concerned Panchayat / Local NGO, if any from whom any suggestions /representations has been received while processing the proposal.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Copy of the clearance letter was marked to the concerned panchayats. A typical proof of the same submitted to Mundra village Panchayat on 21.03.2009 is attached as Annexure – 11 in the main report.

In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>vii</td><td>The funds earmarked for environment protection measures shall be</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.</td></tr>
</table>

<table>
<tr><th>Sr. No.</th><th>Condition as per clearance letter</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>maintained in a separate account and there shall be no diversion of these funds for any other purpose. A year wise expenditure on environmental safeguards shall be reported to this Ministry's Regional Office at Bhopal and the State Pollution Control Board.</td><td>Separate budget for the Environment protection measures is earmarked every year. All environment and horticulture activities are considered at corporate level and budget allocation is done accordingly. All the expenses are recorded in advanced accounting system of the organization.

Budget for environmental management measures (including horticulture) for the FY 2017-18 is to the tune of INR 957 lakh. Out of which, Approx. INR 890 lakh are spent during the FY 2017-18. Detailed breakup of the expenditures for the past 3 years as well as a summary of expenditures for the past 5 years is attached as Annexure – 11 in the main report.

Details regarding the past six compliance report submissions are mentioned below:

<table>
<tr><th>Sr. no.</th><th>Compliance period</th><th>Date of submission</th></tr>
<tr><td>1</td><td>April 15 to September 15</td><td>31.12.2015</td></tr>
<tr><td>2</td><td>October 15 to March 16</td><td>30.05.2016</td></tr>
<tr><td>3</td><td>April 16 to September 16</td><td>01.12.2016</td></tr>
<tr><td>4</td><td>October 16 to March 17</td><td>07.06.2017</td></tr>
<tr><td>5</td><td>April 17 to September 17</td><td>01.12.2017</td></tr>
<tr><td>6</td><td>October 17 to March 18</td><td>01.05.2018</td></tr>
</table>

In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>viii</td><td>Full support shall be extended to the Officers of this Ministry's Regional Office at Bhopal and the Officers of the Central and State Pollution Control Boards by the Project Proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental Protection activities.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied

APSEZ is always extending full support to the regulatory authorities during their visit to the project site. All necessary documents are submitted as per the request of the visiting authorities.

In view of the information furnished by the PP and the information furnished from time to time, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>ix</td><td>In case of deviation or alteration in the Project including the implementing agency, a fresh reference shall be made to this</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

LNG terminal was initially approved under the Waterfront Development</td></tr>
</table>

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Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
	Ministry for modification in the clearance conditions or imposition of new ones for ensuring environmental protection.	Project. However the same is now being developed by GSPC LNG Ltd. for which, separate EC and CRZ clearance has already been obtained from MoEF&CC by them. Copy of the same is attached as **Annexure – 13 in the main report**. LPG terminal was initially approved under the Waterfront Development Project of Adani Ports and SEZ Limited and the same is being developed by M/s. Mundra LPG Terminal Pvt. Ltd., which is 100% subsidery of APSEZ. Other than this, there is no change in the approved project proposal. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
x	The Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted. **COMPLIANCE NOT APPLICABLE TO PP**
xi	This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection which shall be complied with.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied As part of the directions given by MoEF&CC vide order dated 18th Sep, 2015, following studies were proposed. • Bathymetry & Topography study, preparation of plan for protection of creeks/ mangrove area including buffer zone, mapping of co-ordinates, running length, HTL, CRZ boundary. • A Regional Impact Assessment study to identify impacts of all the existing as well as proposed project activities in Mundra region. Please refer **Annexure – A in the main report** for further details regarding the mentioned studies. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xii	The project proponent shall advertise at least in two local newspapers widely circulated in the region around the Project, one of which shall be in the vernacular language of the locality concerned informing that the Project	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. The original copy of the EC and CRZ clearance was obtained on 10.03.2009 and advertisement (containing informing that the EC and CRZ clearance is accorded to the proposed project and a copy of clearance letter is available with the SPCB and may also be seen at the website of MoEF&CC) was given in The Indian Express newspaper dated 18.03.2009. Copy of the same

Sr. No.	Condition as per clearance letter	Compliance Status as on 31-03-2018
	has been accorded Environmental Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen at the website of the Ministry of Environment & Forest at http://www.envfornic.in. The advertisement shall be made within 7 days from the date of issue of the clearance letter and a copy of the same shall be forwarded to the Regional Office of this Ministry at Bhopal.	is attached as **Annexure – 14 in the main report.** **In view of the information furnished by the PP, the stipulated condition is considered partly complied till the submission of another copy of advertisement in vernacular language.** **PARTLY COMPLIED**
xiii	The Project proponent shall inform the Regional Office at Bhopal as well as the Ministry the date of financial closure and final approval of the Project by the concerned authorities and the date of start of land development work.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. APSEZ had informed the Regional Office of MoEF&CC at Bhopal as well as MoEF&CC, New Delhi regarding the date of financial closure and the date of start of land development work vide letter sent in August, 2009. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xiv	Any appeal against this environmental clearance shall lie with the National Environment Appellate Authority, if preferred, within period of 30 days as prescribed under section 11 of the National Environment Appellate Act, 1997.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted and agreed. This EC and CRZ clearance was challenged in National Environment Appellate Authority. In this matter, Order has also been passed in favour of APSEZ. Copy of the same is attached as **Annexure – 15 in the main report.** **In view of the information furnished by the PP, the stipulated condition is noted for compliance.** **NOTED AND AGREED**

ii. Compliance Status of Environmental Clearance for the period October 2017 to March 2018 issued by MoEF&CC, New Delhi vide letter no. 10-138/2008-IA.III, dated 15th July, 2014

(Details of the project: Environmental and CRZ clearance granted to the Multi Product SEZ, Desalination, Sea Water Intake, Outfall Facility and Pipeline project at Mundra, Kutch being developed by Adani Ports and Special Economic Zone Ltd. (APSEZL) (Formerly, M/s. Mudra Port and SEZ Ltd.))

As per the information furnished by the PP, the status details of Activities/facilities approved, major components completed and proposed future activities as per Environment and CRZ Clearance are as below:

Facilities / Components Approved	Capacity	Status as on 31.03.2018
Desalination Plant	150 MLD	Construction has not been started.
Sea water Intake & Outfall Facility	375 MLD: Intake 241 MLD: Outfall	Construction has not been started.
Common Effluent Treatment Plant	17 MLD	MPSEZ Utilities Pvt. Ltd. (MUPL) has been granted environmental clearance for CETP having 17.0 MLD capacities. Out of which at present one module of CETP having 2.5 MLD capacities has been constructed and is in operation.
	50 MLD	Construction has not been started.
Social Infrastructure Projects	--	Adani Mundra SEZ Infrastructure Pvt. Ltd. (AMSIPL) has granted environmental clearance for township and area development project in 255 Ha. Out of 10,000 no. of residential units, 1368 units are constructed.
Sewage Treatment Plant	62 MLD	APSEZ has installed Sewage Treatment Plant @ 150 KLD Capacities within SEZ for treatment of sewage generated from port user buildings.
Airstrip	--	Airstrip has been developed within SEZ area after obtaining requisite permissions.
Municipal Solid Waste Site	--	Material Recovery site is provided for the management of Municipal Solid Waste.
Free Trade & Ware House Zone (FTWZ)	--	Construction is completed and in operation.

Note:

Environmental / CRZ clearance has been granted for additional facilities like Processing Zones, Non-processing Zones, Warehousing Zones, Road Network (Trunk as well as Internal), Bridges or Culverts over natural drain, Rail Network, IT-Telecommunication Network, Electric Network, Water Supply, Conservation & Drainage Network, Effluent Collection Network and Utilities & Supporting Infrastructure within SEZ area.

Boundary wall is constructed along the project periphery. In some of areas level raising and area development of SEZ area, wherever required is also under progress.

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The list of Industrial Units within SEZ area are as given below:

Sr. No.	Name of Unit	Nature of Business	Status
1	SKAPS INDUSTRIES	Textile	Operation
2	TERRAM EOSYNTHETICS	Textile	Operation
3	AHLSTROM	Textile	Operation
4	ASHAPURA GARMENTS	Textile	Not in Operation
5	THERMAX	Engineering	Operation
6	OWS	Ware House	Operation
7	DORF KETAL	Chemical	Operation
8	OCCL	Chemical	Operation
9	MUNDRA OIL	Oil	Operation
10	GARG TUBES LLP	Steel	Operation
11	EMPEZAR LOGISTICS	Ware House	Operation
12	SEABIRD CFS	CFS	Operation
13	HONEYCOMB CFS	CFS	Operation
14	ALL CARGO CFS	CFS	Operation
15	MUNDHRA CFS	CFS	Operation
16	SAURASHTRA CFS	CFS	Operation
17	FORBES CFS	CFS	Operation
18	TRANSWORLD CFS	CFS	Operation
19	MICT CFS	CFS	Operation
20	MARUTI SUZUKI INDIA LIMITED	Pre Delivery Inspection Yard	Operation
21	MSTPL (Mundra Solar Technopark Pvt. Ltd.)	Electronics Manufacturing Cluster	Operation
22	STEINWEIGE	FTWZ	Operation
23	KERRY INDEV LOGISTIC	FTWZ	Operation
24	BRITANNIA INDUSTRIES LIMITED	Food Products	Construction work completed
25	ADANI POWER LIMITED	Thermal Power Plant	Operation

During the site visit, following industries were randomly visited to check the compliance of EC conditions at individual industry level:

- Oriental Carbon & chemicals Ltd.
- Garg Tubes Exports LLP
- Britannia Industries Ltd.
- Terram Geosynthetics Pvt. Ltd.
- Dorf Ketal Chemicals Pvt. Ltd.
- Adani Mundra SEZ Infrastructure Pvt. Ltd.-Samudra Township STP
- MPSEZ Utilities Pvt. Ltd.(CETP)
- Mundra Solar PV Limited

Based on the site visit and information furnished by the PP, the point-wise compliance status of Environmental / CRZ Clearance granted to the Multi Product SEZ, Desalination, Sea Water Intake, Outfall Facility and Pipeline project at Mundra, Kutch being developed by Adani Ports and Special Economic Zone Ltd. (APSEZL) is prepared and furnished below:

Sr. No.	Conditions	Compliance Status as on 31-03-2018
Part – A: Specific Conditions		
i.	PP shall abide by the final order/decision of Hon'ble Supreme Court in SLP (Civil) no. 1526/2014 and connected matters.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted and will be complied. Vide order dated 14.07.2014, the Hon'ble Supreme Court directed MoEF&CC to complete the process of environmental clearance to the MSEZ project of APSEZ within eight weeks. MoEF&CC issued EC and CRZ clearance to the proposed project vide letter dated 15.07.2014. Hence, the SLP (Civil) no. 1526/2014 is deemed closed. Copy of the order is attached as **Annexure – 1 in the main report.** **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
ii.	Properly conserve the creeks, river and the mangroves area in the area.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. This reply covers condition no ii, iii, ix, x, xi, xii & xiii. Conservation of creeks and rivers: • The prominent creek system (main creeks and small branches of creeks) in and around APSEZ are: (1) Kotdi (2) Baradimata (3) Navinal (4) Bocha (5) Mundra (Oldest port (Juna Bandar) leading to Bhukhi river). • Rivers passing through the APSEZ area are: (1) Khari (2) Nagmati (3) Phot (4) Bhukhi (5) Dhaneshwari (6) Buchiya (7) Jidal. • All the rivers passing through the SEZ area are dry throughout the year except for monsoon season. • All creeks as well as rivers are in existence allowing free flow of water and there is no filling or reclamation of any creek or river area. APSEZ has so far constructed 19 culverts having total length of approx. 1100 m with total cost of INR 20 Crores. Three RCC Bridges have also been constructed over Kotdi creek with total length of 230 m and cost of INR 10 Crores. Photographs of the same are attached as **Annexure – 2.** • From the APSEZ operations, there is no discharge of any sewage or effluent to the water streams Conservation of mangroves: • In and around APSEZ, approx. 1800 ha. mangrove area was identified by NIO in an EIA report prepared the year 1998. • Out of this 1800 ha area, 1254 ha area was further demarcated as potential mangrove conservation by NIO in the year 2008 (as part of the EIA report of WFDP).

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		• It may be noted that the entire area of 1254 ha is not covered with mangroves. • Entire area is being conserved and there is no disturbance to the mangroves in this area. Measures such as restricted entry and regular surveillance have resulted in overall growth of mangroves within this area. • As per MoEF&CC directive, APSEZ entrusted NCSCM to demarcate mangroves in and around APSEZ area. As per their study, presently, mangrove cover in and around APSEZ is over 2340 ha. The analysis of the comparison between 2011 and 2016-17 has shown an overall growth of 246 ha. Please refer **Annexure – 3 in the main report** for a copy of the report. **In view of the information furnished by the PP supported by the study report of NCSCM, the stipulated condition is considered complied.** **COMPLIED**
iii.	Ensure that mouths of all the creeks are kept open to ensure flushing of the creeks.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. • The prominent creek system (main creeks and small branches of creeks) in and around APSEZ are: (1) Kotdi (2) Baradimata (3) Navinal (4) Bocha (5) Mundra (Oldest port (Juna Bandar) leading to Bhukhi river). • All above creek mouths are open allowing free flow of water in to the creeks and surrounding areas and there is no filling or reclamation of any creek area. • This aspect is also confirmed from the recent study of NCSCM **(Annexure – 3 in the main report)** which highlights the bathymetry data of the entire coast around APSEZ. • From the bathymetry data it can be concluded that there are sufficient depths at the creek mouths and all creek mouths are open allowing flushing of water. **In view of the information furnished by the PP supported by the study report of NCSCM, the stipulated condition is considered complied.** **COMPLIED**
iv.	Bring the creeks to the condition as was seen in the satellite map of 2005 which will be a "reference" satellite map and a copy of which shall be sent to you separately.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Not applicable This reply covers condition no iv, v, vi. The stated conditions were stipulated in the EC and CRZ clearance with respect to the pending SCNs and based on Ms. Sunita Narain committee report. In continuation to the SCNs and subsequent submissions by APSEZ, MoEF&CC issued a final order vide letter dated 18.09.2015 (which disposed the pending Show Cause Notices). Full compliance of the directions issued vide the said order is provided as **Annexure – A in the main report.** It may be noted that the stated conditions related to the satellite image

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		of 2005 are not imposed to APSEZ as part of the said order. Hence, APSEZ has made submission to MoEF&CC vide letters dated 23.05.2016 and 07.11.2016. Copies of the said letters are attached as **Annexure – 4 in the main report.** Further there are no directions from MoEF&CC. **In view of the submission by the PP, the stipulated condition is considered complied subject to acceptance by MoEF&CC, New Delhi.** **COMPLIED SUBJECT TO ACCEPTANCE BY MOEF& CC, New Delhi.**
v.	Submit once in a year latest satellite map which can be compared with the reference satellite map of 2005 to ensure that no modifications in the creeks, rivers, mangroves and mouth of creeks have taken place.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Not applicable This reply covers condition no iv, v, vi. The stated conditions were stipulated in the EC and CRZ clearance with respect to the pending SCNs and based on Ms. Sunita Narain committee report. In continuation to the SCNs and subsequent submissions by APSEZ, MoEF&CC issued a final order vide letter dated 18.09.2015 (which disposed the pending Show Cause Notices). Full compliance of the directions issued vide the said order is provided as **Annexure – A in the main report.** It may be noted that the stated conditions related to the satellite image of 2005 are not imposed to APSEZ as part of the said order. Hence, APSEZ has made submission to MoEF&CC vide letters dated 23.05.2016 and 07.11.2016. Copies of the said letters are attached as **Annexure – 4 in the main report.** Further there are no directions from MoEF&CC. **In view of the submission by the PP, the stipulated condition is considered complied subject to acceptance by MoEF&CC, New Delhi.** **COMPLIED SUBJECT TO ACCEPTANCE BY MOEF& CC, New Delhi.**
vi.	Any direction issued by the MoEF with respect to the report submitted by Ms Sunita Narain Committee shall be complied with by the Proponent as applicable.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Not applicable Based on Ms. Sunita Narain Committee report and subsequent submissions from APSEZ, MoEF&CC disposed the pending Show Cause Notices and issued 10 specific directions. Full compliance of the directions issued vide the said order is provided as **Annexure – A in the main report.** **In view of the information furnished by the PP and the detailed compliance submitted against the 10 directions issued by the MoEF&CC, the stipulated condition is considered complied.** **COMPLIED**
vii.	At its cost get Inspection study done once in a year by the organizations like NEERI or any organization	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. NEERI has been appointed to carry out the inspection study up to the

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	approved by this Ministry to - (i) ensure compliance of all the EC conditions (ii) development of SEZ meeting of the environment norms, and (iii) advise any mid-term correction that can be introduced depending on the recommendation of the independent Third Party.	year 2020 at a cost of INR 12 Lacs. Compliance report of the period from April'17 to Sept'17 was submitted to NEERI. Based on the site visit during period Oct'17 to Mar'18 as well as the said compliance report NEERI has given their feedback. No non-compliance is observed by NEERI. Copy of the same is annexed as **Annexure – 5 in the main report.** **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
viii.	"Consent for Establishment" for the SEZ shall be obtained from Gujarat Pollution Control Board under Air and Water Act and a copy shall be submitted to the Ministry before start of any construction work at the site.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Consent to Establish (CtE) is obtained for the project from Gujarat Pollution Control Board vide their letter no. GPCB/CCA-KUTCH-1044/ GPCB ID 31463/ 109800, dated 16.04.2012. Copy of the same was submitted to MoEF&CC, Regional Office, Bhopal vide our letter dated 05th Aug, 2014. APSEZ has been granted Consent to Operate (CtO) from GPCB for common infrastructure facilities developed vide Order No. AWH-88998, dated 26.10.2017. Copy of the CtE and CtO are attached as **Annexure – 6 in the main report.** **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
ix.	PP shall get detailed bathymetry done for all the creeks and rivers within Port and SEZ areas along with mapping of co-ordinates, running length, HTL, CRZ boundary, mangrove area including buffer zone through NCSCM /NIOT. PP shall also get prepared a detailed action plan for conservation and	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied Based on the MoEF&CC directions, APSEZ has entrusted NCSCM to carry out the detailed study. Scope of the study include the following: • Detail bathymetry and topography survey of creeks • Demarcation of mangrove areas and buffer zone • Demarcation of HTL and CRZ areas with co-ordinates • Preparation of a comprehensive and integrated conservation plan for protection of creeks and mangroves In order to complete the study, NCSCM has carried out number of site surveys which are mentioned below:

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	protection of creeks /mangrove area etc through NCSCM/NIOT and submit the same to GCZMA for their examination and recommendation. GCZMA will submit its recommendations to MoEF for approval.	• Bathymetry survey of creeks • Topography survey of intertidal areas • Mangrove survey (health and area demarcation) • Sampling of soil and water for analysis of physico-chemical and biological parameters • Tide and currents data collection (including residence time of tidal water) study Based on the study, the following points can be summarized: • There is no obstruction to any water stream (creeks / branches of creeks / rivers) • Presently, mangrove cover in and around APSEZ is over 2340 ha. There is substantial growth in mangrove cover to the tune of 246 ha (comparison between 2011 and 2016-17) • Majority of the development at Mundra has happened between this tenure. Hence it can be interpreted that the infrastructure development has not left any adverse impacts on ecology. The study report is submitted to GCZMA (with a copy to MoEF&CC) for their examination and recommendation. Copy of the same is attached as **Annexure – 3 in the main report**. Please refer the survey maps in the report for interpretation of the details mentioned above. Cost of the study as per the NCSCM proposal is 315.5 Lakh. 90% of the payment against the proposal value is already paid to NCSCM. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
x.	PP shall demarcate the CRZ area on land with GPS coordinates in consultation with GCZMA/ the agency which has done the HTL /LTL demarcation for the area. There shall be no allotment of plot/s in CRZ area to industries. No industrial activity within CRZ area except the port and harbor & the foreshore facilities shall be allowed as committed.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Being complied Based on the MoEF&CC directions and in consultation with GCZMA, APSEZ has entrusted NCSCM for demarcation of HTL and CRZ areas. NCSCM has prepared the draft maps. Once the maps are finalized, they will be submitted to GCZMA and MoEF&CC for their examination and recommendation. In addition to that please note that • There is no allotment of plot(s) in CRZ area to any industry. • Only those activities which are allowed within CRZ area are being carried out (with due approvals from concerned authorities) • No industrial activity within CRZ area except the port and harbor & the foreshore facilities are carried out. **In view of the information furnished by the PP and the progress made w.r.t. demarcation of HTL/LTL maps, the stipulated condition is**

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		considered compliance in progress. **COMPLIANCE IN PROGRESS**
xi.	Till the approval of action plan for conservation and protection of creeks /mangrove area, the CRZ area within SEZ shall be demarcated as "No Development Zone". PP shall not allow / undertake any development in CRZ area of SEZ.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied The action plan for conservation of creeks and mangrove areas is prepared by NCSCM and the same is submitted to GCZMA and MoEF&CC for their examination and recommendation. The main action plan as per the study are mentioned summarized below: • Monitoring of mangrove cover in Jan/Mar, 2020 using latest satellite images and validation with field observations • Monitoring of tidal range in the mangrove areas and comparison with the data collected during 2017 • Removal of silt / sand spits from the central part of navinal creek • Dredging of shallow area off Bocha Island to reduce current velocity. These measures will be discussed with GCZMA and the same will be implemented after obtaining their approval. No development is carried out in the 'No Development Zone' (i.e. CRZ area of SEZ) **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xii.	The implementation of action plan approved by the MoEF shall be monitored by the NCSCM/NIOT. Compliance with action plan shall be submitted to GCZMA and to MoEF, RO at Bhopal along with six monthly monitoring report.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted and will be complied The action plan for conservation of eco sensitive areas prepared by NCSCM is submitted to GCZMA and MoEF&CC for their approval. Implementation of the action plan will be carried out by APSEZ and same will be monitored by NCSCM and compliance report in this regard will be submitted to all the concerned authorities as part of the six monthly compliance report. **In view of the information furnished by the PP, the stipulated condition is considered as agreed to comply by the PP.** **AGREED TO COMPLY**
xiii.	PP shall earmark separate budget for the implementation of the above action plan. The details of the expenditure shall be submitted to GCZMA and to MoEF, RO at	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted and will be complied A separate budget will be allocated for implementation of this action plan and details of the same will be submitted as part of the six monthly compliance report.

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	Bhopal along with six monthly monitoring report.	**In view of the information furnished by the PP, the stipulated condition is considered as agreed to comply by the PP.** **AGREED TO COMPLY**
xiv.	All the industry in SEZ shall be connected through impervious drainage lines to the STP/CETP for the discharge of their sewage or industrial effluent. There shall not be any discharge to creeks / rivers. PP shall be accountable for implementing this condition and necessary clause shall be incorporated in the MoU while allotting the plot to the individual industries.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. As per the Lease Deed agreement, all existing industries are well connected with impervious pipeline to discharge their effluent / sewage after confirming to the inlet norms of CETP. Typical copy of the Lease Deed (Agreement) is attached as **Annexure – 7 in the main report**. Entire quantity of treated wastewater from CETP is being utilized for horticulture purpose within SEZ area. No discharge is allowed in to creeks / rivers. Same practice will be continued in future as well and capacity enhancement of CETP will be carried out based on requirement. List of CETP member units discharging their effluent and details regarding effluent characteristics are submitted as **Annexure – 8 in the main report**. The industries which treat the sewage / effluent within their premises comply the stipulated norms of discharge given by GPCB. Through regular monitoring it is ensured by APSEZ that the treated water is used for gardening within the respective industries and there is no discharge to any water body including rivers or creeks. **In view of the information furnished by the PP and the site observation that 2 industries (namely, M/s. Dorf Katl, M/s. Ahlstorm) have been connected to CETP and the remaining industries (located in SEZ) discharging their treated effluents as per the consent guidelines of GPCB after complying to the discharge norms, the stipulated condition is considered complied subject to acceptance by MOEF&CC, New Delhi.** **COMPLIED SUBJECT TO ACCEPTANCE BY MOEF&CC, New Delhi.**
xv.	PP shall not carry out any river course modification.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied The project was conceptualized in such a way that no river course modification is required to be carried out. All the river passing through SEZ are maintained through proper path for area drainage. **In view of the information furnished by the PP, the stipulated condition is considered complied.**

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Sr. No.	Conditions	Compliance Status as on 31-03-2018
		COMPLIED
xvi.	The individual industrial units shall obtain prior EC under EIA Notification, 2006 as applicable.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. All industrial units coming up in within the SEZ are informed and aware about the said requirement. Out of total units established within SEZ, only APL & Dorf Ketal falls under purview of EIA Notification 2006 and they have obtained their specific EC as applicable. During the compliance period of Oct'17 to Mar'18, no new such industry has been established at SEZ which requires EC under EIA Notification, 2006. The condition is being followed on case to case basis as applicable. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xvii.	Proponent shall identify 200 ha of land for mangrove plantation as per the condition laid by SEAC.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. 100 Ha. Mangrove plantation is carried out by SAVE at Tala Tadav village of Khambhat Taluka of Anand district. 100 Ha. Mangrove plantation is carried out by GEC. Out of 100 ha., 38 ha. plantation is completed at Tala Tadav village of Khambhat Taluka of Anand district during 2017-18. Remaining 62 ha. plantation is carried out at Aliya Bet of Bharuch district during 2017-18. Completion report of SAVE and GEC are enclosed as **Annexure – 9 in the main report.** **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xviii.	50 meter buffer from the existing mangrove area should be provided for any developmental activity.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. 50 meter buffer from the existing mangrove area as per the CRZ notification is being maintained and all developmental activities are being carried out as per the approval only. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xix.	Proponent shall develop	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	the green belt with 3 layers of canopy all along the periphery.	Bhopal on 14.05.2018 submitted the following: Being complied. APSEZ has developed "Dept. of Horticulture" which is taking measures/ steps for terrestrial greening as well as mangrove plantation. Development of greenbelt at various locations within the SEZ is an ongoing activity. Green belt of 3 layer canopy will be developed as part of the development of SEZ. The species such as Ficus Infectoria, Ficus religiosa, Terminalia arjuna, Cocos nucifera, Washingtonia fillifera, Casurina spp., Azadirachta Indica, Eucalyptus spp., Jatropha curacus, Ficus bengalensis, Subabool spp., Casia fistula, Date Palm and Delonix regia were grown in SEZ area. Width of the green belt varies from 2 m to 8 m and density varies from 2000 to 2500 trees per hectare at various locations. Total 99.5 hectares of land with approx. 2.2 Lacs trees is developed within SEZ area till date. So, far more than 400 ha. area is developed as greenbelt with plantation of more than 8.0 Lacs trees within the entire APSEZ area. Please refer **Annexure – 10 in the main report** for further details regarding greenbelt development and mangrove afforestation. An updated green belt development plan is also attached as part of the said annexure. Total expenditures of the horticulture dept. for the F.Y. 2017-18 periods are INR 607 lakh. It may be noted that individual industrial units will also developed the greenbelt within their premises based on their planning & approvals and new industries coming up any will also comply as per their approvals. The same will be ensured by the environment monitoring committee of APSEZ. For the area where further development is yet to be carried out, APSEZ will ensure that greenbelt with 3 layer canopy is developed by either APSEZ or the industrial unit to whom the land is allotted. **In view of the information furnished by the PP and as per the site observation of excellent greenbelt developed in the saline soils which is commendable, the stipulated condition is considered compliance in progress in light of the proposed phase-wise green belt development.** **COMPLIANCE IN PROGRESS**
xx.	All the recommendation of the EMP shall be complied with in letter and spirit. All the mitigation measures submitted in the EIA report shall be prepared	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Compliance report of environmental management plan and mitigation measures proposed as part of the EIA repot is summarized below. The same is submitted to the concerned authorities including MoEF&CC, RO,

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<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>in a matrix format and the compliance for each mitigation plan shall be submitted to MoEF along with half yearly compliance report to MoEF-RO.</td><td>
Bhopal as part of the six monthly compliance reports. Details of the past six compliance reports are mentioned below.
<table>
<tr><th>Sr. no.</th><th>Compliance period</th><th>Date of submission</th></tr>
<tr><td>1</td><td>Apr'15 to Sep'15</td><td>30.11.2015</td></tr>
<tr><td>2</td><td>Oct'15 to Mar''16</td><td>30.05.2016</td></tr>
<tr><td>3</td><td>Apr'16 to Sep'16</td><td>01.12.2016</td></tr>
<tr><td>4</td><td>Oct'16 to Mar'17</td><td>30.05.2017</td></tr>
<tr><td>5</td><td>Apr'17 to Sep'17</td><td>01.12.2017</td></tr>
<tr><td>6</td><td>Oct'17 to Mar'18</td><td>01.05.2018</td></tr>
</table>
Summary of the compliance to the measures suggested in EMP is mentioned below.
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED
<table>
<tr><th>Suggested Measures</th><th>Compliance Status</th></tr>
<tr><td colspan="2">Construction Phase:</td></tr>
<tr><td colspan="2">Air Environment</td></tr>
<tr><td>Water sprinkling in vulnerable areas</td><td>Water sprinkling on road and other construction area as well as on construction materials is being carried out on regular bases.</td></tr>
<tr><td>Enforce proper maintenance of vehicles and construction equipment. Allowing only PUC approved vehicles in the site.</td><td>Please refer Condition No. ix of Part-B(General Conditions Construction phase) of EC and CRZ Clearance.</td></tr>
<tr><td>Enforce usage of covered trucks for transport of construction material.</td><td>Covered trucks are being used for handling of construction materials.</td></tr>
<tr><td colspan="2">Noise Environment</td></tr>
<tr><td>Enforce proper maintenance of vehicles and construction equipment. Enforce use of earmuffs / earplugs to workers in high noise level areas.</td><td>The vehicles of on-going construction work enter inside the premises after the fitness check. Ear protection device is provided to workers in high noise areas.</td></tr>
<tr><td colspan="2">Water Environment</td></tr>
<tr><td>Provide temporary drinking water supply and proper sanitation facilities within the site</td><td>Provision of drinking water and sanitation facility is being provided.</td></tr>
<tr><td colspan="2">Land / Soil Environment</td></tr>
<tr><td>Proper disposal of construction debris at regular intervals</td><td>Construction debris is being kept at identified temporary storage area and is being</td></tr>
</table>
</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2018	
			utilized for area development.
		Thermal Environment	
		Enforce (i) use of Portland Pozzalano Cement / (ii) use of Portland Slag Cement / (iii) use fly ash as admixture in construction	Part of fly ash generated from Adani Power Limited, Mundra is being utilized by Adani Group to manufacture paver blocks and the same paver blocks are used for development of back up area, footpath, colonies area, parking area, approach road etc. Please refer Condition No. xi of Part-B (General Conditions: Construction phase) of EC and CRZ Clearance.
		Energy	
		Wherever possible, piping shall be along the natural topography to permit gravity flow. Else, energy efficient pumps shall be used. Pipe material shall be such as to minimize friction losses. Wherever possible, natural light shall be used. Energy efficient electrical fittings and fixtures shall be used.	Energy efficient pumps and HDPE Pipelines are used for supply of utilities. Refer point no. xii of EC & CRZ Clearance in Part – B (Operation Phase) for energy efficient electrical fittings. Few of the buildings in MSTPL are designed as green building.
		Operation Phase:	
		Land / Soil Environment	
		Good quality non-corrosive type pipeline should be used. Regular checking of the pipelines for early detection of any possible leakage and damage. Regular ground water monitoring should be done within the SEZ.	HDPE pipelines are used for supply of utility. Regular visual surveillance along the utility lines corridor is being done to check leakage or damage. Third party analysis of the ground water is being carried out at every three month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Please refer Condition No. v of Part-B (General Conditions: Construction phase) of EC and

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Sr. No.	Conditions	Compliance Status as on 31-03-2018	
			CRZ Clearance.
		The waste should be transported in covered trucks. Vermi-composting is highly recommended for treatment and disposal of biodegradable and kitchen wastes. Other domestic solid waste (garbage) shall be disposed through MSW facility or as per prevailing norms.	Please refer Condition No. iv of Part-B (General Conditions: Construction phase) of EC and CRZ Clearance.
		The waste should be transported in covered trucks. Transporter should be informed of remedial measures required to be taken in case of spillage of waste	Waste handling vehicles are being handled through covered trucks only. Details were submitted along with last compliance report submission i.e. Apr'17 to Sep'17.
		Socio-Economic Environment	
		It will encourage development of surrounding areas & further generate employment. People from various cultures shall mingle encouraging a more tolerant society.	Please refer Condition No. vii of Annexure – B (Compliance Status of MoEF & CC Order dated 18.09.2015).
xxi.	There shall be no disturbance to the sand dunes. The pipelines shall be laid using advanced method viz. Horizontal Directional Drilling (HDD) so as to avoid disturbance to the sand dunes/creeks/ mangroves.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. There is no sand dune in the SEZ area. Point noted. No pipelines for intake and outfall of sea water are laid till now and same will be studied as and when required. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**	
Part – B: General Conditions			
	Construction Phase		
i.	Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Not applicable at present. Most of the construction labours reside in the nearby villages where all basic facilities are easily available. There are no housing requirements for labours inside the project area.	

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	health care, creche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	**In view of the information furnished by the PP, the stipulated condition is considered not applicable to PP.** **COMPLIANCE NOT APPLICABLE TO PP**
ii.	A first aid room will be provided in the project both during construction and operation of the project.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. APSEZ has established Occupational Health Center & First Aid facility, which will be utilized during entire construction as well as operation phase of SEZ project. In case of emergency situation requiring higher level of treatment, the facilities at Adani hospital located with SEZ area can be utilized. **In view of the information furnished by the PP and as per the site observation, the stipulated condition is considered complied.** **COMPLIED**
iii.	All the topsoil excavated during construction phase should be stored for use in horticulture/landscape development within the project site.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Excavated topsoil, if any, will be used for the horticulture /landscape development within the project site. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
iv.	Disposal of muck during construction phase should not create any adverse effect on the neighboring communities and be disposed, taking the necessary precautions for general safety and health aspects of people, only in approved sites with the approval of competent authority.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. No excavated muck has been generated and disposed-off. Construction waste, if any, is utilized for area development within the project site. **In view of the information furnished by the PP and as per the site observation, the stipulated condition is considered complied.** **COMPLIED**
v.	Soil and ground water samples will be tested to ascertain that there is no threat to ground water quality by leaching of heavy metals and other	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Environment Monitoring is being carried out on regular basis in Port & SEZ areas through NABL accredited and MoEF&CC approved agency

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Sr. No.	Conditions	Compliance Status as on 31-03-2018
	toxic contaminants.	namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the ground water as well as soil assessment for duration from Oct'17 to Mar'18 is mentioned below.

Bore Hole Water Sampling:

Sampling locations & frequency: 4 nos. (every quarter)

Sr. No.	Parameter	Unit	Max. Value	Min. Value
1	pH	--	8.12	6.93
2	Salinity	ppt	29.51	0.54
3	Oil & Grease	mg/L	4.40	1.06
4	Hydrocarbon	mg/L	BDL*	BDL*
5	Lead as Pb	mg/L	22.20	0.02
6	Arsenic as As	mg/L	BDL*	BDL*
7	Nickel as Ni	mg/L	0.18	0.18
8	Total Chromium as Cr	mg/L	0.022	0.003
9	Cadmium as Cd	mg/L	0.17	0.01
10	Mercury as Hg	mg/L	BDL*	BDL*
11	Zinc as Zn	mg/L	2.74	0.02
12	Copper as Cu	mg/L	50.40	0.03
13	Iron as Fe	mg/L	16.30	0.04
14	Insecticides/Pesticides	mg/L	BDL*	BDL*
15	Depth of Water Level from GL	meter	2.84	1.70

*BDL = Below Detectable Limit

Soil Sampling:

Sampling locations & frequency: 4 nos. (Half Yearly)

Sr. No.	Parameter	Unit	Max. Value	Min. Value
1	pH	--	8.15	7.41
2	Nitrogen as N	%	0.0088	0.0045
3	Phosphorus as P	mg/kg	680	134
4	Potassium as K	mg/kg	52	16
5	Baron as B	mg/kg	3.2	2.1
6	Calcium as Ca	mg/kg	1210	55
7	Magnesium as Mg	mg/kg	1456	6
8	Iron as Fe	%	0.53	0.24
9	Moisture	%	14.8	10.4
10	Organic Matter	%	0.069	0.023
11	CEC	meq/100 gm	8.1	5.9
12	TVC	CFU/gm	2.2 x 10-6	4.0 x 10-7
Heavy Metal				
13	Cadmium as Cd	mg/kg	4.70	1.92
14	Thorium as Th	mg/kg	BDL*	BDL*
15	Antimony as Sb	mg/kg	BDL*	BDL*
16	Arsenic as As	mg/kg	BDL*	BDL*
17	Lead as Pb	mg/kg	30.6	17.8
18	Chromium as Cr	mg/kg	18.2	15.4
19	Cobalt as Co	mg/kg	2.2	0.9
20	Copper as Cu	mg/kg	12.6	10.1
21	Nickel as Ni	mg/kg	136	64
22	Manganese as Mn	mg/kg	490	88
23	Vanadium as V	mg/kg	12.6	7.6

*BDL = Below Detectable Limit

From the above results it can be inferred that

- The ground level in this area is saline in nature due to close proximity to the coast.
- There is no threat to ground water quality by leaching of heavy metals and other toxic contaminants.
- There is no leaching of heavy metals and other toxic contaminants through soil.

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		Please refer **Annexure – 11 in the main report** for detailed analysis reports and accreditation certificates. Approx. INR 27 Lakh is spent for all environmental monitoring activities during the FY 2017-18 period. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
vi	Construction spoils, including bituminous material and other hazardous materials, must not be allowed to contaminate watercourses and the dump sites for such material must be secured so that they should not leach into the ground water.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Construction spoils including bituminous material is being kept at identified temporary storage area outside CRZ and is being utilized for area development purpose as and when required. Hazardous materials such as diesel, lube oil etc. are handled with utmost care and all applicable rules are followed. Storage area is provided with paving and spill kit to ensure there is no contamination to soil or ground water. Used oil is sold to GPCB approved recycler namely M/s. Western India Petrochem Industries, Bhavnagar. Oily rags are being disposed though co-processing at cement industries namely M/s. Sanghi Industries Ltd., Kutch and / or Recycling Solutions Pvt. Ltd., Panoli. Dates of validity of all the vendors and copy of agreement are attached as **Annexure – 12 in the main report.** Necessary approval from GPCB for disposal of hazardous wastes is obtained. Please refer **Annexure – 6 in the main report** for a copy of the same. Individual units within SEZ are handling their hazardous wastes as per Hazardous waste rules – 2016 after obtaining necessary permissions from GPCB. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
vii	Any hazardous waste generated during construction phase should be disposed off as per applicable rules and norms with necessary approvals of the Gujarat Pollution Control Board.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Used oil is sold to GPCB approved recycler namely M/s. Western India Petrochem Industries, Bhavnagar. Oily rags are being disposed though co-processing at cement industries namely M/s. Sanghi Industries Ltd., Kutch and / or Recycling Solutions Pvt. Ltd., Panoli. Dates of validity of all the vendors and copy of agreement are attached as **Annexure – 12 in the**

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<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>main report. Hazardous waste authorization from GPCB for disposal of hazardous wastes is obtained. Please refer Annexure – 6 in the main report for a copy of the same.

Individual units within SEZ are handling their hazardous wastes as per Hazardous waste rules – 2016 after obtaining necessary permissions from GPCB.
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>viii</td><td>The diesel generator sets to be used during construction phase should be low sulphur diesel type and should conform to Environment (Protection) Rules prescribed for air and noise emission standards.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

DG sets are being used only as power back up source in case of power failure. Presently, cumulative capacity of all DG sets installed at APSEZ is 4843 KVA. During the compliance period of Oct'17 to Mar'18, there was no instance of power failure hence it was not required to operate the DG sets. However, for the air and noise emission assessment, the DG sets were turned on. Assessment was carried out by NABL accredited and MoEF&CC approved agency namely M/s. Pollucon Laboratories Pvt. Ltd. The summary of analysis results is mentioned below.

<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit*</th></tr>
<tr><td>PM</td><td>mg/Nm^3</td><td>15.62</td><td>10.84</td><td>150</td></tr>
<tr><td>SO_2</td><td>ppm</td><td>4.53</td><td>2.46</td><td>100</td></tr>
<tr><td>NOx</td><td>ppm</td><td>31.72</td><td>26.69</td><td>50</td></tr>
</table>
*GPCB Permissible Limit

From the above results it can be inferred that the air and noise emissions are well within the stipulated norms. Please refer Annexure – 11 in the main report for detailed analysis reports and accreditation certificate. Approx. INR 27 Lakh is spent for all environmental monitoring activities during the period of FY 2017-18.

All the DG sets are of low sulphur diesel type. Certificate showing Sulphur content in diesel is attached as Annexure – 13 in the main report. DG sets are being used in conformance to the EPA norms and proof for the same is attached as Annexure – 14 in the main report.

In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>ix.</td><td>The diesel required for operating DG sets shall be stored in underground tanks if</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.</td></tr>
</table>

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>required; clearance from Chief Controller of Explosives shall be taken.</td><td>Diesel is stored in the underground tank located in existing port area and approval of the same from Chief Controller of Explosives is obtained from PESO with License no. P/WC/GJ/14/4671 (P291058) dated 18.12.2015 and is valid till 31.12.2018. Copy of Certificate from CCE is attached as Annexure – 15 in the main report.
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>x.</td><td>Vehicles hired for bringing construction material to the site should be in good condition and should have a pollution check certificate and should conform to applicable air and noise emission standards and should operate only during non-peak hours.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

The vehicles of on-going construction work enter inside the premises only after passing through the fitness check at vehicle health-check centre established by APSEZ. At the vehicle health check-up centre, parking light, reverse light, Horne, wheel, breaks, mirror, etc. are checked before allowing the vehicle to enter the site.

APSEZ has also established a licenced PUC station to monitor the compliance with applicable Motor Vehicle Act for vehicles. Photographs of the health check-up centre and PUC station are attached as Annexure – 16 in the main report.

Majority of the vehicles bringing construction materials are operated during non-peak hours.
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>xi.</td><td>Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase, so as to conform to the stipulated standards by CPCB/GPCB.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Ambient Air Quality and Noise monitoring are being carried out by NABL accredited and MoEF&CC authorized agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 is mentioned below.

Air sampling locations & frequency: 8 nos. (twice a week) & Noise sampling locations & frequency: 5 nos. (once in a month)
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit*</th></tr>
<tr><td>PM_{10}</td><td>µg/m³</td><td>98.3</td><td>40.2</td><td>100</td></tr>
<tr><td>$PM_{2.5}$</td><td>µg/m³</td><td>56.6</td><td>12.4</td><td>60</td></tr>
<tr><td>SO_2</td><td>µg/m³</td><td>28.6</td><td>5.3</td><td>80</td></tr>
<tr><td>NO_2</td><td>µg/m³</td><td>45.1</td><td>9.6</td><td>80</td></tr>
<tr><th>Noise</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit</th></tr>
<tr><td>Day Time</td><td>dB(A)</td><td>73.4</td><td>45.9</td><td>75</td></tr>
</table></td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		Night Time | dB(A) | 68.4 | 41.8 | 70 * as per NAAQ standards, 2009 Values recorded confirms to the stipulated standards. Such environmental monitoring is being carried out on continuous basis at stipulated frequencies. The analysis results are being closely observed for incremental pollution load. From the above results and past data, it can be inferred that the emission levels are well within the prescribed standards. All the analysis data collected are submitted to the concerned authorities as part of the six monthly compliance reports. The data is also submitted to GPCB on monthly basis as part of the online submission – Monthly Patrak. Please refer **Annexure – 11 in the main report** for detailed analysis reports and accreditation certificates. Approx. INR 27.0 Lakh is spent for all environmental monitoring activities during the period FY 2017-18. Following safeguard measures are taken for abatement of dust and noise emissions. • Regular sprinkling on road and other open area • Regular cleaning of roads • Development of greenbelt along the periphery of the storage yards/back up area • D.G. Sets having Acoustic enclosures **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xii.	Fly ash should be used as building material in the construction as per the provisions of Fly Ash Notification of September, 1999 and amended as on 27th August, 2003. (The above condition is applicable only if the project site is located within 100 Kms of Thermal Power Stations).	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Part of fly ash generated from Adani Power Limited, Mundra is being utilized by Adani Group to manufacture paver blocks and the same paver blocks are used for development of back up area, footpath, colonies area, parking area, approach road etc. APSEZ has utilized 787 MT of fly ash to manufacture paver block during the period of Oct'17 to Mar'18. Please refer **Annexure – 17 in the main report** for methodology and photographs of manufacturing. Fly ash based PPC cement is used for construction activity. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xiii.	Ready mixed concrete must be used in building construction.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied.

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		Only RMC is used for construction activity. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xiv.	Storm water control and its re-use should be regulated as per CGWB and BIS standards for various applications.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Storm water drainage systems are provided. There are no perennial rivers and the possibility of storm water run off is only during monsoon season. The area is receiving scanty rainfall and there is no continuous flow of water during monsoon. Therefore presently, the storm water drainage is designed to facilitate the area drainage meeting with the downstream part of water area. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xv.	Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other referred best practices.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Only RMC is used for construction activity. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xvi.	Permission to draw ground water shall be obtained from the competent Authority prior to construction /operation of the project.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. No ground water is used during construction & operation stage of the project. Current sources of water are Narmada water through GWIL and desalination plant of APSEZ. Average water requirement is approx. 5.2 MLD. **In view of the information furnished by the PP, the stipulated condition is considered as compliance not applicable to PP.** **COMPLIANCE NOT APPLICABLE TO PP**
xvii.	Separation of grey and black water should be done by the use of dual plumbing line for separation of grey and black water.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Not applicable As per the master planning all types of waste water generated are transferred through common conveying system for providing desired treatment at CETP. Treated waste water is utilized for gardening purpose within the premises of APSEZ / individual industries.

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Sr. No.	Conditions	Compliance Status as on 31-03-2018
		It may be noted that condition number xvi to xxi are imposed on all member industries coming up within the SEZ areas (as part of the Lease Deed agreement). The same practice will continue in future also. As suggested by RO, Bhopal during the site visit, an environment monitoring committee is formed which will ensure strict compliance of the stipulated conditions by individual industries. In view of the information furnished by the PP, the stipulated condition is considered complied subject to needful amendment in EC condition by the EC issuing authority. **COMPLIED SUBJECT TO NEEDFUL AMENDMENT IN EC CONDITION BY THE EC ISSUING AUTHORITY**
xviii.	Fixtures for shower, toilet flushing and drinking should be of low flow either by use of aerators or pressure reducing devices or sensor based control.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Water flow reducers are installed at various locations within APSEZ. The water flow reducers consume approx. 66% less water compared to the normal tap. Water free urinals are also installed at Port User Buildings for water conservation. In phase wise manner, all the fixtures will be replaced with such water efficient devices. It may be noted that condition number xvi to xxi are imposed on all member industries coming up within the SEZ areas (as part of the Lease Deed agreement). The same practice will continue in future also. As suggested by RO, Bhopal during the site visit, an environment monitoring committee is formed which will ensure strict compliance of the stipulated conditions by individual industries. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xix.	Use of glass may be reduced by up to 40% to reduce the electricity consumption and load on air-conditioning. If necessary, use high quality double glass with special reflective coating in windows.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied Majority of the building envelops are constructed with energy efficient building materials. While using glass, wherever required, it is ensured that only high quality glass with reflective coating is used. It may be noted that condition number xvi to xxi are imposed on all member industries coming up within the SEZ areas (as part of the Lease Deed agreement). The same practice will continue in future also. As suggested by RO, Bhopal during the site visit, an environment monitoring committee is formed which will ensure strict compliance of the stipulated conditions by individual industries.

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		In view of the information furnished by the PP, the stipulated condition is considered complied. **COMPLIED**
xx.	Roof should meet prescriptive requirements as per Energy Conservation Building Code by using appropriate thermal insulation material to fulfill requirements.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied Majority of the building envelops (including roofs) are constructed with ECBC compliant building materials having appropriate thermal insulation. It may be noted that condition number xvi to xxi are imposed on all member industries coming up within the SEZ areas (as part of the Lease Deed agreement). The same practice will continue in future also. As suggested by RO, Bhopal during the site visit, an environment monitoring committee is formed which will ensure strict compliance of the stipulated conditions by individual industries. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xxi.	Opaque wall should meet prescriptive requirement as per Energy Conservation Building Code which is proposed to be mandatory for all air-conditioned spaces while it is aspirational for non-air-conditioned spaces by use of appropriate thermal insulation material to fulfil these requirement.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied Majority of the building envelops (including walls) are constructed with ECBC compliant building materials having appropriate thermal insulation. It may be noted that condition number xvi to xxi are imposed on all member industries coming up within the SEZ areas (as part of the Lease Deed agreement). The same practice will continue in future also. As suggested by RO, Bhopal during the site visit, an environment monitoring committee is formed which will ensure strict compliance of the stipulated conditions by individual industries. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xxii.	The approval of the competent authority shall be obtained for structural safety of the buildings due to earthquake, adequacy of firefighting equipments, etc. as per National Building Code including protection measures from lightning etc.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied Mundra falls in seismic zone V. All the building structures are constructed to meet with the requirements of the applicable guidelines for safety. The same practice will continue in future also. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xxiii.	Regular supervision of	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO

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Sr. No.	Conditions	Compliance Status as on 31-03-2018
	the above and other measures for monitoring should be in place all through the construction phase, so as to avoid disturbance to the surroundings.	Bhopal on 14.05.2018 submitted the following: Complied. SEZ industries were visited to check measures taken for Energy Conservation, Water Conservation, Waste and Hazardous waste management and phase out plan of Ozone depleting substance during the compliance period. Various industries shared the data in line with above reference. Such supervision will be undertaken once in every six months. Please refer **Annexure – 18 in the main report** for a typical sample of the data collection sheet from an industry within SEZ. It may be noted that condition number xvi to xxi are imposed on all member industries coming up within the SEZ areas (as part of the Lease Deed agreement). The same practice will continue in future also. As suggested by RO, Bhopal during the site visit, an environment monitoring committee is formed which will ensure strict compliance of the stipulated conditions by individual industries. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xxiv.	Under the provisions of Environment (Protection) Act 1986, legal action shall be initiated against the project proponent if it is found that construction of the project has been started without obtaining environmental clearance.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted. Wherever applicable, construction activities have started only after obtaining environmental clearance. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
	Operation Phase	
i.	The PP while issuing the allotment letter to individual member units shall specifically mention the allowable maximum quantity of water usage and effluent generated by each member unit.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Provisions are made while issuing the allotment letter to individual member units for specifically mentioning the allowable maximum quantity of water usage and effluent generated by each member unit. Sample copy of one of such letter is attached as **Annexure – 7 in the main report**. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
ii.	The PP shall establish an environmental	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	monitoring cell with all the potential polluting units as members to review the environmental monitoring data and suggest improvements.	Complied. APSEZ has a well structured Environment Management Cell, staffed with qualified manpower for reviewing the environmental monitoring data and suggest improvements. Environment Management Cell organogram is attached as **Annexure – 19 in the main report**. SEZ industries were visited to check measures taken for Energy Conservation, Water Conservation, Waste and Hazardous waste management and phase out plan of Ozone depleting substance during the compliance period. Various industries shared the data in line with above reference. Such supervision will be undertaken once in every six months. Please refer **Annexure – 18 in the main report** for a typical sample of the data collection sheet from an industry within SEZ. It may be noted that condition number xvi to xxi are imposed on all member industries coming up within the SEZ areas (as part of the Lease Deed agreement). The same practice will continue in future also. As suggested by RO, Bhopal during the site visit, an environment monitoring committee is formed which will ensure strict compliance of the stipulated conditions by individual industries. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
iii.	Treated effluent emanating from STP shall be recycled / reused to the maximum extent possible. Treatment of 100% grey water by decentralized treatment should be done. Discharge of unused treated effluent shall conform to the norms and standards of the Pollution Control Board. Necessary measures should be made to mitigate the odour problem from STP.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. APSEZ has total installed capacity of 5.6 MLD for treatment of effluent / sewage generated at various locations. Details regarding the same are mentioned below. The treated sewage from these decentralized units meets the norms stipulated by GPCB and it is used for gardening purpose. **Location / Capacity / Technology** CETP — 2.5 MLD — Aerobic Digestion Shantivan Colony STP — 350 KLD — Aerobic Digestion Shantivan Colony STP — 250 KLD — Aerobic Digestion Adani House STP — 150 KLD — PVA Gel Technology Samudra Township STP — 2.0 MLD — MBR Adani Hospital STP — 30.0 KLD — Aerobic Digestion Liquid Terminal ETP — 265 KLD — Aerobic Digestion West Port STP — 55.0 KLD — FAB CETP of 2.5 MLD capacity is also constructed in SEZ area (having a separate independent environmental clearance). Sewage generated from individual industry is treated by individual industry itself. However, some of the industries are giving their sewage to the CETP for treatment and final disposal. List of CETP member units discharging their sewage and

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<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>details regarding sewage characteristics are attached as Annexure – 8 in the main report.

The treated effluent from CETP confirms to the GPCB norms. Treated water is used for gardening / horticulture purpose within CETP premises and SEZ areas. Online monitoring system at the discharge point is provided to get the system alert in case of any deviation from discharge norms.

Assessment of treated sewage is being carried out by NABL accredited and MoEF&CC approved agency namely M/s. Pollucon Laboratories Pvt. Ltd. The summary of analysis results is mentioned below.

Treated Water Analysis (Frequency Twice in a Month)
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit$</th></tr>
<tr><td>pH</td><td>--</td><td>7.28</td><td>6.56</td><td>6.5–8.5</td></tr>
<tr><td>TSS</td><td>mg/L</td><td>26</td><td>14</td><td>100</td></tr>
<tr><td>BOD (3 Days @ 27°C)</td><td>mg/L</td><td>20</td><td>12</td><td>30</td></tr>
<tr><td>Fecal Coliform</td><td>MPN/ 100 ml</td><td>920</td><td>84</td><td>< 1000</td></tr>
</table>
$ as per CC&A granted by GPCB

Please refer Annexure – 11 in the main report for detailed analysis reports and accreditation certificate. Approx. INR 27.0 Lakh is spent for all environmental monitoring activities during the period FY 2017-18.

Greenbelt area developed around the treatment plants act as barrier for odour. In addition to this, regular supervision is done to ensure there is no odour problem from any of the treatment plants.
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>iv.</td><td>The solid waste generated should be properly collected and segregated. Wet garbage should be composted and dry/inert solid waste should be disposed off to the approved sites for land filling after recovering recyclable material.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Waste Management – APSEZ has adopted 5R concept for environmentally sound management of different types of solid & liquid wastes. Please refer below details about management of each type of waste.

<u>Municipal Solid Waste</u>: A well-established system for segregation of dry & wet waste is in place. All wet waste (Organic waste) is being segregated & utilized for compost manufacturing. The compost is further used by in house horticulture team for greenbelt development. Whereas dry recyclable waste is being sorted in various categories. Presently manual sorting is being done for sorting of different types of solid waste. Segregated recyclable materials such as Paper, Plastic, Cardboard, PET Bottles, Glass etc. are then sent to respective recycling units, whereas</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		remaining non-recyclable waste is bailed and sent to cement plant (M/s. Sanghi Industries Ltd.) for Co-processing as RDF (Refused Derived Fuel). Hazardous Waste: • E – Waste & Used Batteries are being sold to GPCB registered recyclers namely M/s. e-Processing House. • Solid Hazardous Waste is being disposed through common facility i. e. M/s. Recycling Solutions Pvt. Ltd., Panoli and/or co-processing at Sanghi Industries Ltd., Kutch. Used/Waste Oil is being sold to GPCB authorized recyclers / re-processors namely M/s.Western India Petrochem Industry, Bhavnagar. • Downgrade chemicals generated from cleaning of storage tanks / pipelines are being sold to authorized solvent recovery facilities namely M/s. Acquire Chemicals, Ankleshwar however during the compliance period, there was no disposal of downgrade chemicals. • Slop Oil received from vessels is treated to separate water and oil particles in Oil Water Separator system. Separated oil from the same is being sold to authorized recycler / reprocessor namely M/s.Western India Petrochem Industry, Bhavnagar and water is sent to ETP for further treatment. However during the compliance period, there was no disposal of Slope Oil. The following table summarizes the waste management practice (for Oct'17 to March'18) for different types of wastes at APSEZ:

Waste	Quantity in MT	Disposal method
Hazardous Waste		
Pig Waste	5.4	Co-processing at common facility and/or cement industry
Tank Bottom Sludge	33.4	Co-processing at common facility
Oily Cotton waste	55.2	Co-processing at Cement Industry
Used / Spent Oil	86.1	Sell to GPCB approved recycler
Discarded Containers	8.7	Sell to GPCB approved recycler
E-Waste	2.32	Sell to GPCB approved recycler
Municipal Solid Waste		
Dry Waste	105.6	After recovery sent for recycling
Wet Waste	467.4	Converted to Manure for horticultural use

SEZ industries were visited to check measures taken for Energy Conservation, Water Conservation, Waste and Hazardous waste management and phase out plan of Ozone depleting substance during the compliance period. Various industries shared the data in line with above reference. Such supervision will be undertaken once in every six months. Please refer **Annexure – 18 in the main report** for a typical sample of the data collection sheet from an industry within SEZ.

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>It may be noted that condition number xvi to xxi are imposed on all member industries coming up within the SEZ areas (as part of the Lease Deed agreement). The same practice will continue in future also. As suggested by RO, Bhopal during the site visit, an environment monitoring committee is formed which will ensure strict compliance of the stipulated conditions by individual industries.
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>v.</td><td>Diesel power generating sets proposed as source of backup power for elevators and common area illumination during operational phase should be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Low sulphur diesel should be used. The location of the DG sets may be decided in consultation with the Gujarat Pollution Control Board.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:

Complied
DG sets are being used only as power back up source in case of power failure. Presently, cumulative capacity of all DG sets installed at APSEZ is 4843 KVA. All the generators are of enclosed type. During the compliance period of Oct'17 to Mar'18, there was no instance of power failure hence it was not required to operate the DG sets. However, for the air and noise emission assessment, the DG sets were turned on. Assessment was carried out by NABL accredited and MoEF&CC approved agency namely M/s. Pollucon Laboratories Pvt. Ltd. The summary of analysis results is mentioned below.

<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit$</th></tr>
<tr><td>PM</td><td>mg/Nm^3</td><td>15.62</td><td>10.84</td><td>150</td></tr>
<tr><td>SO_2</td><td>ppm</td><td>4.53</td><td>2.46</td><td>100</td></tr>
<tr><td>NOx</td><td>ppm</td><td>31.72</td><td>26.69</td><td>50</td></tr>
</table>
$GPCB Permissible Limit

From the above results it can be inferred that the air and noise emissions are well within the stipulated norms. Please refer Annexure – 11 in the main report for detailed analysis reports and accreditation certificate. Approx. INR 27 Lakh is spent for all environmental monitoring activities during the period of FY 2017-18.

All the DG sets are of low sulphur diesel type. Certificate showing Sulphur content in diesel is attached as Annexure – 13 in the main report. DG sets are being used in conformance to the EPA norms and proof for the same is attached as Annexure – 14 in the main report.

Heights of stacks are maintained as needed for the combined capacity of all attached DG Sets. Locations of the DG sets are checked by GPCB officials during the site visits. Details of all DG set stack heights are mentioned below.

<table>
<tr><th>Location</th><th>Capacity (KVA)</th><th>Stack height (m)</th></tr>
<tr><td>Sherkhariya gate</td><td>5</td><td>3</td></tr>
<tr><td>Sherkhariya gate</td><td>5</td><td>3</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Airstip</td><td>140</td><td>4</td></tr>
<tr><td>Airstip</td><td>125</td><td>4</td></tr>
<tr><td>BAROI ROAD</td><td>5</td><td>3</td></tr>
<tr><td>Airport road entry gate</td><td>5</td><td>3</td></tr>
<tr><td>Addi salt</td><td>5</td><td>3</td></tr>
<tr><td>Adani hospital</td><td>500</td><td>3.5</td></tr>
<tr><td>GMB road</td><td>5</td><td>3</td></tr>
<tr><td>East gate</td><td>30</td><td>4</td></tr>
<tr><td>MITAP substation</td><td>62.5</td><td>4</td></tr>
<tr><td>ROB</td><td>320</td><td>5</td></tr>
<tr><td>Zharpara fishermen corridor</td><td>5</td><td>3</td></tr>
<tr><td>Navinal fishermen corridor</td><td>5</td><td>3</td></tr>
<tr><td>109 culvert</td><td>5</td><td>3</td></tr>
<tr><td>Anupam Junction</td><td>5</td><td>3</td></tr>
<tr><td>West gate</td><td>30</td><td>3</td></tr>
<tr><td>MRSS</td><td>250</td><td>3</td></tr>
<tr><td>Agripark</td><td>125</td><td>3</td></tr>
<tr><td>Labour colony</td><td>100</td><td>3</td></tr>
<tr><td>WTP</td><td>380</td><td>4</td></tr>
<tr><td>Mundra guest house</td><td>15</td><td>3</td></tr>
<tr><td>Shantivan colony</td><td>750</td><td>3</td></tr>
<tr><td>Shantivan colony</td><td>250</td><td>3</td></tr>
<tr><td>Shantivan colony</td><td>5</td><td>3</td></tr>
<tr><td>STP plant shantivan</td><td>200</td><td>4</td></tr>
<tr><td>Adani public school</td><td>82.5</td><td>3</td></tr>
<tr><td>Wadhala farm house</td><td>30</td><td>3</td></tr>
<tr><td>Adani house</td><td>750</td><td>4</td></tr>
<tr><td>PUB Building</td><td>500</td><td>4</td></tr>
<tr><td>PMC stores</td><td>82.5</td><td>3</td></tr>
<tr><td>R&D yard</td><td>50</td><td>3</td></tr>
<tr><td>Near DG house(Adani house)</td><td>5</td><td>2.5</td></tr>
<tr><td>Near DG house(Adani house)</td><td>5</td><td>2.5</td></tr>
<tr><td>Near DG house(Adani house)</td><td>5</td><td>2.5</td></tr>
</table>
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED
</td></tr>
<tr><td>vi.</td><td>Noise should be controlled to ensure that it does not exceed the prescribed standards,</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	During night time the noise levels measured at the boundary of the building shall be restricted to the permissible levels to comply with the prevalent regulations.	Noise monitoring is being carried out by NABL accredited and MoEF&CC authorized agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'17 to Mar'18 is mentioned below. **Noise sampling locations & frequency: 5 nos. (once in a month)** | Noise | Unit | Max | Min | Perm. Limit* | | --- | --- | --- | --- | --- | | Day Time | dB(A) | 73.4 | 45.9 | 75 | | Night Time | dB(A) | 68.4 | 41.8 | 70 | * as per NAAQ standards, 2009 Values recorded confirms to the stipulated standards. Noise monitoring is being carried out on regular basis at stipulated frequencies. The analysis results are being closely observed for incremental pollution load. From the above results and past data, it can be inferred that the noise levels are well within the prescribed standards. All the analysis data collected are submitted to the concerned authorities as part of the six monthly compliance reports. The data is also submitted to GPCB on monthly basis as part of the online submission – Monthly Patrak. Please refer **Annexure – 11 in the main report** for detailed analysis reports and accreditation certificates. Approx. INR 27.0 Lakh is spent for all environmental monitoring activities during the period FY 2017-18. Following safeguard measures are taken for abatement of noise emissions. • Development of greenbelt along the periphery of the storage yards/back up area • D.G. Sets having Acoustic enclosures **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
vii.	Green belt of adequate width and density preferably with local species along the periphery of the plot shall be raised so as to provide protection against particulates and noise.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Being complied. APSEZ has developed "Dept. of Horticulture" which is taking measures/ steps for terrestrial greening as well as mangrove plantation. Development of greenbelt at various locations within the SEZ is an ongoing activity. Green belt of 3 layer canopy will be developed as part of the development of SEZ. The species such as Ficus Infectoria, Ficus religiosa, Terminalia arjuna, Cocos nucifera, Washingtonia fillifera, Casurina spp., Azadirachta Indica, Eucalyptus spp., Jatropha curacus, Ficus bengalensis, Subabool spp., Casia fistula, Date Palm and Delonix regia were grown in SEZ area. Width of the green belt varies from 2 m to 8 m and density varies from 2000 to 2500 trees per hectare at various locations. Total 99.5 hectares of

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		land with approx. 2.2 Lacs trees is developed within SEZ area till date. So, far more than 400 ha. area is developed as greenbelt with plantation of more than 8.0 Lacs trees within the entire APSEZ area. Please refer **Annexure – 10 in the main report** for further details regarding greenbelt development and mangrove afforestation. An updated green belt development plan is also attached as part of the said annexure. Total expenditures of the horticulture dept. for the F.Y. 2017-18 periods are INR 607 lakh. It may be noted that individual industrial units will also developed the greenbelt within their premises based on their planning & approvals and new industries coming up any will also comply as per their approvals. The same will be ensured by the environment monitoring committee of APSEZ. For the area where further development is yet to be carried out, APSEZ will ensure that greenbelt with 3 layer canopy is developed by either APSEZ or the industrial unit to whom the land is allotted. **In view of the information furnished by the PP and as per the site observation of excellent greenbelt developed in the saline soils which is commendable, the stipulated condition is considered compliance in progress in light of the proposed phase-wise green belt development.** **COMPLIANCE IN PROGRESS**
viii.	Weep holes in the compound walls shall be provided to ensure natural drainage of rain water in the catchment area during the monsoon period.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Boundary walls are constructed in such a way by keeping weep holes for defined river path to facilitate free flow of water and it is ensured that water is not stagnant at any given point during rainy season. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
ix.	Rain water harvesting for roof run-off and surface run-off, as plan submitted should be implemented.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Ground water recharge may not yield good results due to close proximity to the sea coast. Hence, APSEZ has carried out rainwater harvesting activities in the nearby villages for benefit of the locals. Following measures are taken for the same during the year 2011 – 13 which have benefited to the local farmers. 1. Pond deepening activities at villages 2. 18 check dams were constructed under the 'Sardar Patel Sahbhagi

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>Jalsanchay Yojna'
Total cost of these efforts was approx. INR 320 lakh.

During FY 2017-18, pond deepening work in Mota Bhadiya, Vadala and Bhujpur villages was carried out. The total cost incurred for this work was INR 16.7 Lakhs.

Adani foundation has started participatory ground water management project. The objective of the project was to reduce the salinity ingress in and around the coastal regions of Mundra, Kutchh and mitigate the ill-effects of this manmade problem to improve the livelihoods of the rural people. The Project will help to get water table high, also it will help in agricultural activities. – as part of this initiative, below listed activities are initiated:
• Ground Water Recharge activities at Jharpara, Navinal, Siracha, Nana Kapaya and Baroi villages
• Monitoring of 109 wells by sample collection and analysis of the same (analysis is under progress) to measure the quality of water

For further details please refer Annexure – 20 in the main report for CSR report.

It may be noted that the individual industrial units will also be encouraged for taking various initiatives for rainwater harvesting within their premises / in the villages around the SEZ area.

In view of the information furnished by the PP, the stipulated condition is considered complied subject to acceptance by EC issuing authority.
COMPLIED SUBJECT TO ACCEPTANCE BY EC ISSUING AUTHORITY</td></tr>
<tr><td>x.</td><td>The ground water level and its quality should be monitored regularly in consultation with Central Ground Water Authority.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Environment Monitoring is being carried out on regular basis in Port & SEZ areas through NABL accredited and MoEF&CC approved agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the ground water assessment for duration from Oct'17 to Mar'18 is mentioned below.

<u>Bore Hole Water Sampling:</u>
Sampling locations & frequency: 4 nos. (every quarter)
<table>
<tr><th>Sr. No.</th><th>Parameter</th><th>Unit</th><th>Max. Value</th><th>Min. Value</th></tr>
<tr><td>1</td><td>pH</td><td>--</td><td>8.12</td><td>6.93</td></tr>
<tr><td>2</td><td>Salinity</td><td>ppt</td><td>29.51</td><td>0.54</td></tr>
<tr><td>3</td><td>Oil & Grease</td><td>mg/L</td><td>4.40</td><td>1.06</td></tr>
<tr><td>4</td><td>Hydrocarbon</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>5</td><td>Lead as Pb</td><td>mg/L</td><td>22.20</td><td>0.02</td></tr>
<tr><td>6</td><td>Arsenic as As</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>7</td><td>Nickel as Ni</td><td>mg/L</td><td>0.18</td><td>0.18</td></tr>
<tr><td>8</td><td>Total Chromium as Cr</td><td>mg/L</td><td>0.022</td><td>0.003</td></tr>
</table></td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2018
		9 Cadmium as Cd mg/L 0.17 0.01 10 Mercury as Hg mg/L BDL* BDL* 11 Zinc as Zn mg/L 2.74 0.02 12 Copper as Cu mg/L 50.40 0.03 13 Iron as Fe mg/L 16.30 0.04 14 Insecticides/Pesticides mg/L BDL* BDL* 15 Depth of Water Level from GL meter 2.84 1.70 *BDL = Below Detectable Limit From the above results it can be inferred that • The ground level in this area is saline in nature due to close proximity to the coast. • There is no threat to ground water quality by leaching of heavy metals and other toxic contaminants. Please refer **Annexure – 11 in the main report** for detailed analysis reports and accreditation certificates. Approx. INR 27 Lakh is spent for all environmental monitoring activities during the FY 2017-18 period. It may be noted that the analysis results of ground water quality are submitted to CGWB, West Central region, Ahmedabad. Copy of the last submission is attached as **Annexure – 21 in the main report.** **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xi.	Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided. Parking should be fully internalized and no public space should be utilized.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. The entry and exit gates of SEZ and port are provided with ample parking area (210838 m^2) near the gate. The entry / exit complex is fully equipped with traffic control equipments and round the clock security is provided for seamless support. No public space is utilized for parking of the vehicle. Please refer **Annexure – 22 in the main report** for photographs and area demarcation. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xii.	A report on the energy conservation measures conforming to energy conservation norms finalized by Bureau of Energy Efficiency should be prepared incorporating details about building materials	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied Energy audit of port user buildings (including the details about building materials and technology etc.) is carried out once in three years. Last energy audit was done during Oct-2016. Report of the same is submitted to Chief Electrical officer, Gandhinagar. The said report was submitted to MoEF&CC, RO, Bhopal as part of the compliance report for the period Apr – Sept, 2017. Recommendations of the report are attached as **Annexure –**

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	& technology, R & D Factors etc. and submitted to the Ministry along with six monthly monitoring report.	**23 in the main report**. Some of the recommendations of these reports have already been implemented as follows. • Saving in PAC by overhauling with repairing damage fall ceiling and window curtain • Saving with Improving Power Factor • APFC Panel has already been installed and average PF maintained during last 2 months comes to 0.987 • The system voltage at load end is being maintained 230V and therefore there is no need to install AVC **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xiii.	Energy conservation measures like installation of CFLs/TFLs for the lighting the areas outside the building should be an integral part of the project design and should be in place before project commissioning. Used CFLs and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines / rules of the regulatory authority to avoid mercury contamination. Solar panels may be used to the extent possible.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied Energy Conservation through Installation of Motion Sensor (Occu switch) & AC Temp. controls in few of the buildings are provided. Measures for energy conservation are incorporated at design stage. Few of the buildings in MSTPL are designed as green building. Some features of the same are as below. • Used fly ash based cement and bricks • Special types of glasses were used which gives maximum sunlight and less heat • VOC free paint used certified by CII (Certificate of Indian Industries) • Water flow reducer installed in the entire building CFL / LED lighting are being used at various common areas of SEZ. Used CFL are collected and sent for recycling through authorized e-waste collection agency. APSEZ installed & commissioned 1.5 MW roof top solar plant at residential township. Additional 1.7 MW roof top solar plants at the various locations of SEZ area are ready for commissioning. Please refer **Annexure – 24 in the main report** showing the photographs of the same. It may be noted that the individual industrial units will also be encouraged for taking various initiatives with respect to energy conservation (such as energy audit, installation of renewable energy sources, utilization of energy efficient fixtures etc.) **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xiv.	Adequate measures	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td>should be taken to prevent odour problems from solid waste processing plant and STP.</td><td>Bhopal on 14.05.2018 submitted the following:
Complied

5R principals are adopted for sustainable waste management at APSEZ. Utmost care is being taken during the waste management and sewage /effluent treatment to ensure that there is no odour generation. Proper secondary treatment and disinfection is provided to the domestic sewage and treated sewage and then it is utilized for horticulture purpose. These measures ensure that odor problem is not created in the surrounding area. Furthermore, greenbelt on the periphery of the treatment plant as well as waste management sites help to prevent odour problems.

In view of the information furnished by the PP and as per the site observation during the visit to STP located in township area, the stipulated condition is considered complied.

COMPLIED</td></tr>
<tr><td>xv.</td><td>The buildings should have adequate distance between them to allow movement of fresh air and passage of natural light, air and ventilation.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Presently, all the buildings have adequate distance between them to allow movement of fresh air and passage of natural light, air and ventilation. The same practice will be continued in future also.

It may be noted that the individual industrial units will also be encouraged for consideration of these design parameters.

In view of the information furnished by the PP and as per the site observation, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>xvi.</td><td>The environmental safeguards contained in the EIA Report should be implemented in letter and spirit.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

All the environmental safeguards contained in the EIA report are implemented in letter and spirit.

In view of the information furnished by the PP and as per detailed compliance furnished below, the stipulated condition is considered complied.
COMPLIED
<table>
<tr><th>Suggested Measures</th><th>Compliance Status</th></tr>
<tr><td>Construction Phase:</td><td></td></tr>
<tr><td>Air Environment</td><td></td></tr>
<tr><td>Water sprinkling in vulnerable areas</td><td>Water sprinkling on road and other construction area as well as on</td></tr>
</table></td></tr>
</table>

3925

Sr. No.	Conditions	Compliance Status as on 31-03-2018	
			construction materials is being carried out on regular bases.
		Enforce proper maintenance of vehicles and construction equipment. Allowing only PUC approved vehicles in the site.	Please refer Condition No. ix of Part-B (General Conditions Construction phase) of EC and CRZ Clearance.
		Enforce usage of covered trucks for transport of construction material.	Covered trucks are being used for handling of construction materials.
		Noise Environment	
		Enforce proper maintenance of vehicles and construction equipment. Enforce use of earmuffs / earplugs to workers in high noise level areas.	The vehicles of on-going construction work enter inside the premises after the fitness check. Ear protection device is provided to workers in high noise areas.
		Water Environment	
		Provide temporary drinking water supply and proper sanitation facilities within the site	Provision of drinking water and sanitation facility is being provided.
		Land / Soil Environment	
		Proper disposal of construction debris at regular intervals	Construction debris is being kept at identified temporary storage area and is being utilized for area development.
		Thermal Environment	
		Enforce (i) use of Portland Pozzalano Cement / (ii) use of Portland Slag Cement / (iii) use fly ash as admixture in construction	Part of fly ash generated from Adani Power Limited, Mundra is being utilized by Adani Group to manufacture paver blocks and the same paver blocks are used for development of back up area, footpath, colonies area, parking area, approach road etc. Please refer Condition No. xi of Part-B (General Conditions: Construction phase) of EC and CRZ Clearance.
		Energy	
		Wherever possible, piping shall be along the natural topography to permit gravity flow. Else, energy efficient pumps shall be used. Pipe material shall be such as to minimize friction losses. Wherever possible, natural light	Energy efficient pumps and HDPE Pipelines are used for supply of utilities. Refer point no. xii of EC & CRZ Clearance in Part – B (Operation Phase) for energy efficient electrical

Sr. No.	Conditions	Compliance Status as on 31-03-2018	
		shall be used. Energy efficient electrical fittings and fixtures shall be used.	fittings. Few of the buildings in MSTPL are designed as green building.
		Operation Phase:	
		Land / Soil Environment	
		Good quality non-corrosive type pipeline should be used. Regular checking of the pipelines for early detection of any possible leakage and damage. Regular ground water monitoring should be done within the SEZ.	HDPE pipelines are used for supply of utility. Regular visual surveillance along the utility lines corridor is being done to check leakage or damage. Third party analysis of the ground water is being carried out at every three month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Please refer Condition No. v of Part-B (General Conditions: Construction phase) of EC and CRZ Clearance.
		The waste should be transported in covered trucks. Vermi-composting is highly recommended for treatment and disposal of biodegradable and kitchen wastes. Other domestic solid waste (garbage) shall be disposed through MSW facility or as per prevailing norms.	Please refer Condition No. iv of Part-B (General Conditions: Construction phase) of EC and CRZ Clearance.
		The waste should be transported in covered trucks. Transporter should be informed of remedial measures required to be taken in case of spillage of waste	Waste handling vehicles are being handled through covered trucks only. Details were submitted along with last compliance report submission i.e. Apr'17 to Sep'17.
		Socio-Economic Environment	
		It will encourage development of surrounding areas & further generate employment. People from various cultures shall mingle encouraging a more tolerant society.	Please refer Condition No. vii of Annexure – A (Compliance Status of MoEF & CC Order dated 18.09.2015).
xvii.	Adequate drinking water facility be provided.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied.	

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>Drinking water facility at approx. 200 locations within APSEZ area is provided.

In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>xviii.</td><td>Incremental pollution loads on the ambient air quality, noise and water quality should be periodically monitored after commissioning of the project.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Environment Monitoring (air, noise, water, soil) is being carried out on regular basis in Port & SEZ areas through NABL accredited and MoEF&CC approved agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the assessment for duration from Oct'17 to Mar'18 is mentioned below.

Air sampling locations & frequency: 8 nos. (twice a week) & Noise sampling locations & frequency: 5 nos. (once in a month)
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit*</th></tr>
<tr><td>PM_{10}</td><td>$\mu g/m^3$</td><td>98.3</td><td>40.2</td><td>100</td></tr>
<tr><td>$PM_{2.5}$</td><td>$\mu g/m^3$</td><td>56.6</td><td>12.4</td><td>60</td></tr>
<tr><td>SO_2</td><td>$\mu g/m^3$</td><td>28.6</td><td>5.3</td><td>80</td></tr>
<tr><td>NO_2</td><td>$\mu g/m^3$</td><td>45.1</td><td>9.6</td><td>80</td></tr>
<tr><th>Noise</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit</th></tr>
<tr><td>Day Time</td><td>dB(A)</td><td>73.4</td><td>45.9</td><td>75</td></tr>
<tr><td>Night Time</td><td>dB(A)</td><td>68.4</td><td>41.8</td><td>70</td></tr>
</table>
* as per NAAQ standards, 2009
Values recorded confirms to the stipulated standards.

Following safeguard measures are taken for abatement of dust and noise emissions.
• Regular sprinkling on road and other open area
• Regular cleaning of roads
• Development of greenbelt along the periphery of the storage yards/back up area
• D.G. Sets having Acoustic enclosures

<u>Bore Hole Water Sampling:</u>
Sampling locations & frequency: 4 nos. (every quarter)
<table>
<tr><th>Sr. No.</th><th>Parameter</th><th>Unit</th><th>Max. Value</th><th>Min. Value</th></tr>
<tr><td>1</td><td>pH</td><td>--</td><td>8.12</td><td>6.93</td></tr>
<tr><td>2</td><td>Salinity</td><td>ppt</td><td>29.51</td><td>0.54</td></tr>
<tr><td>3</td><td>Oil & Grease</td><td>mg/L</td><td>4.40</td><td>1.06</td></tr>
<tr><td>4</td><td>Hydrocarbon</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>5</td><td>Lead as Pb</td><td>mg/L</td><td>22.20</td><td>0.02</td></tr>
<tr><td>6</td><td>Arsenic as As</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
<tr><td>7</td><td>Nickel as Ni</td><td>mg/L</td><td>0.18</td><td>0.18</td></tr>
<tr><td>8</td><td>Total Chromium as Cr</td><td>mg/L</td><td>0.022</td><td>0.003</td></tr>
<tr><td>9</td><td>Cadmium as Cd</td><td>mg/L</td><td>0.17</td><td>0.01</td></tr>
<tr><td>10</td><td>Mercury as Hg</td><td>mg/L</td><td>BDL*</td><td>BDL*</td></tr>
</table>
</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2018

11	Zinc as Zn	mg/L	2.74	0.02
12	Copper as Cu	mg/L	50.40	0.03
13	Iron as Fe	mg/L	16.30	0.04
14	Insecticides/Pesticides	mg/L	BDL*	BDL*
15	Depth of Water Level from GL	meter	2.84	1.70

*BDL = Below Detectable Limit

Soil Sampling:

Sampling locations & frequency: 4 nos. (Half Yearly)

Sr. No.	Parameter	Unit	Max. Value	Min. Value
1	pH	--	8.15	7.41
2	Nitrogen as N	%	0.0088	0.0045
3	Phosphorus as P	mg/kg	680	134
4	Potassium as K	mg/kg	52	16
5	Baron as B	mg/kg	3.2	2.1
6	Calcium as Ca	mg/kg	1210	55
7	Magnesium as Mg	mg/kg	1456	6
8	Iron as Fe	%	0.53	0.24
9	Moisture	%	14.8	10.4
10	Organic Matter	%	0.069	0.023
11	CEC	meq/100 gm	8.1	5.9
12	TVC	CFU/gm	2.2 x 10-6	4.0 x 10-7
Heavy Metal				
13	Cadmium as Cd	mg/kg	4.70	1.92
14	Thorium as Th	mg/kg	BDL*	BDL*
15	Antimony as Sb	mg/kg	BDL*	BDL*
16	Arsenic as As	mg/kg	BDL*	BDL*
17	Lead as Pb	mg/kg	30.6	17.8
18	Chromium as Cr	mg/kg	18.2	15.4
19	Cobalt as Co	mg/kg	2.2	0.9
20	Copper as Cu	mg/kg	12.6	10.1
21	Nickel as Ni	mg/kg	136	64
22	Manganese as Mn	mg/kg	490	88
23	Vanadium as V	mg/kg	12.6	7.6

*BDL = Below Detectable Limit

From the above results it can be inferred that

- The ground level in this area is saline in nature due to close proximity to the coast.
- There is no threat to ground water quality by leaching of heavy metals and other toxic contaminants.
- There is no leaching of heavy metals and other toxic contaminants through soil.

Such environmental monitoring is being carried out on continuous basis at stipulated frequencies. The analysis results are being closely observed for incremental pollution load. From the above results and past data, it can be inferred that the emission levels are well within the prescribed standards. All the analysis data collected are submitted to the concerned authorities as part of the six monthly compliance reports. The data is also submitted to GPCB on monthly basis as part of the online submission – Monthly Patrak.

Please refer **Annexure – 11 in the main report** for detailed analysis reports and accreditation certificates. Approx. INR 27.0 Lakh is spent for all environmental monitoring activities during the period FY 2017-18.

In view of the information furnished by the PP, the stipulated

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Sr. No.	Conditions	Compliance Status as on 31-03-2018
		condition is considered complied. **COMPLIED**
xix.	Application of solar energy should be incorporated for illumination of common areas, lighting for gardens and street lighting in addition to provision for solar water heating. A hybrid system or fully solar system for portion of the apartments should be provided.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. APSEZ installed & commissioned 1.5 MW roof top solar plant at residential township. Additional 1.7 MW roof top solar plants at the various locations of SEZ area are ready for commissioning. Entire solar system installations are connected with the grid. Please refer **Annexure – 24** in the main report showing the photographs of the same. It may be noted that the individual industrial units will also be encouraged for taking various initiatives with respect to energy conservation (such as energy audit, installation of renewable energy sources, utilization of energy efficient fixtures etc.) **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
xx.	Ozone depleting substance (Regulation & Control) Rules should be followed while designing the air conditioning system of the project.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. APSEZ is not procuring air conditioning systems which use ozone depleting gases. All the HVAC systems are with Ozone friendly gases within APSEZ. All new air conditioning systems installed, if any, will be designed in line with Ozone depleting substance (Regulation & Control) Rules. It may be noted that the individual industrial units will also be encouraged to follow Ozone depleting substance (Regulation & Control) Rules while designing the air conditioning system of the project. The same will be implemented by individual unit as per project suitability **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
12	Officials from the Regional Office of MOEF, Bhopal who would be monitoring the implementation of environmental safeguards should be given full cooperation,	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Full support is always extended to officers of regulatory authorities (including MoEF&CC and GPCB) visiting the project site. The documents as per their requirements are provided to them.

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	facilities and documents / data by the project proponents during their inspection. A complete set of all the documents submitted to MoEF should be forwarded to the CCF, Regional Office of MOEF, Bhopal.	The communication documents like application Form – 1, ToR received from MoEF&CC, Final EIA report, Public Hearing proceedings and recommendations of GCZMA are submitted to MoEF&CC, RO, Bhopal for necessary records.. **In view of the information furnished by the PP and as per the site observation, the stipulated condition is considered complied.** **COMPLIED**
13	In the case of any change(s) in the scope of the project, the project would require a fresh appraisal by this Ministry.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted and agreed. **In view of the submission by the PP, the stipulated condition is noted and agreed for compliance by the PP.** **NOTED AND AGREED**
14	The Ministry reserves the right to add additional safeguard measures subsequently, if found necessary, and to take action including revoking of the environment clearance under the provision of the Environmental (Protection) Act, 1986, to ensure effective implementation of the safeguard measures in a time bound and satisfactory manner.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted and agreed. **In view of the submission by the PP, the stipulated condition is noted and agreed for compliance by the PP.** **NOTED AND AGREED**
15	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponent from the respective competent authorities.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Not Applicable at present. The mentioned approvals are not applicable to APSEZ since we are the infrastructure support provider. However, the applicable approvals will be availed by the individual member industries prior to construction of work. The environment management committee will ensure strict adherence to the condition by the individual industries. **In view of the submission by the PP, the stipulated condition is considered not applicable to PP.** **COMPLIANCE NOT APPLICABLE TO PP**
16	These stipulations would	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO

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Sr. No.	Conditions	Compliance Status as on 31-03-2018
	be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and control of Pollution) act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification, 2006.	Bhopal on 14.05.2018 submitted the following: Point noted and agreed. **In view of the submission by the PP, the stipulated condition is noted and agreed for compliance by the PP.** **NOTED AND AGREED**
17	The project proponent should advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Clearance and copies of clearance letters are available with the Gujarat Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forests at http://www.envfor.nic.in. The advertisement should be made within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bhopal.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Already complied. Not applicable at present. APSEZ has advertised Environmental and CRZ Clearance in two local newspapers "The Indian Express" (in English language) and "Kutch Mitra" (in vernacular language) on 24.07.14 (within 10 days from the date of receipt of the clearance letter) and copy of the same was submitted vide letter dated 05.08.2014 to Ministry of Environment, Forests & Climate Change, Bhopal. Copy of the said letter is attached as **Annexure – 25 in the main report**. **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
18	Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No. 460 of 2004 as may be applicable to this	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted and agreed. **In view of the submission by the PP, the stipulated condition is noted and agreed for compliance by the PP.** **NOTED AND AGREED**

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	project.	
19	Any appeal against this clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Point noted and agreed. **In view of the submission by the PP, the stipulated condition is noted and agreed for compliance by the PP.** **NOTED AND AGREED**
20	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parishad/ Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Already complied. Not applicable at present. Copy of clearance letter was sent to concerned Panchayats, Zilla Parishad, Urban Local Body, Local NGOs and from whom suggestion/representation received. Typical proof of the same is attached as **Annexure – 26 in the main report.** Clearance letter is also put up on the website of the Adani ports https://www.adaniports.com/ports-downloads **In view of the information furnished by the PP, the stipulated condition is considered complied.** **COMPLIED**
21	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.	Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following: Complied. Compliance report of EC conditions is uploaded regularly. Last compliance report including results of monitoring data for the period of Apr'17 to Sep'17 was submitted to Regional Office of MoEF&CC @ Bhopal, Zonal Office of CPCB @ Baroda, GPCB @ Gandhinagar & Gandhidham and Dept. of Forests & Env., Gandhinagar vide our letter dated 22.11.2017. Copy of the same is also available on our web site https://www.adaniports.com/ports-downloads. A soft copy of the same was also submitted through e-mail on 15.12.2017 to all the authorities. Please refer below for the details regarding past six compliance submissions.

Sr. no.	Compliance period	Date of submission
1	Apr'15 to Sep'15	30.11.2015
2	Oct'15 to Mar''16	30.05.2016
3	Apr'16 to Sep'16	01.12.2016
4	Oct'16 to Mar'17	30.05.2017
5	Apr'17 to Sep'17	01.12.2017
6	Oct'17 to Mar'18	01.05.2018

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<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2018</th></tr>
<tr><td></td><td></td><td>In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>22</td><td>The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Compliance report of EC conditions is uploaded regularly. Last compliance report including results of monitoring data for the period of Apr'17 to Sep'17 was submitted to Regional Office of MoEF&CC @ Bhopal, Zonal Office of CPCB @ Baroda, GPCB @ Gandhinagar & Gandhidham and Dept. of Forests & Env., Gandhinagar vide our letter dated 22.11.2017. Copy of the same is also available on our web site https://www.adaniports.com/ports-downloads. A soft copy of the same was also submitted through e-mail on 15.12.2017 to all the authorities. Please refer below for the details regarding past six compliance submissions.

<table>
<tr><th>Sr. no.</th><th>Compliance period</th><th>Date of submission</th></tr>
<tr><td>1</td><td>Apr'15 to Sep'15</td><td>30.11.2015</td></tr>
<tr><td>2</td><td>Oct'15 to Mar''16</td><td>30.05.2016</td></tr>
<tr><td>3</td><td>Apr'16 to Sep'16</td><td>01.12.2016</td></tr>
<tr><td>4</td><td>Oct'16 to Mar'17</td><td>30.05.2017</td></tr>
<tr><td>5</td><td>Apr'17 to Sep'17</td><td>01.12.2017</td></tr>
<tr><td>6</td><td>Oct'17 to Mar'18</td><td>01.05.2018</td></tr>
</table>
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
<tr><td>23</td><td>The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environmental (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the</td><td>Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted the following:
Complied.

Environmental statement for each financial year is submitted to GPCB. The same for the FY ending 31.03.2018 in Form-V is submitted to GPCB vide our letter dated 10th May, 2018. Acknowledge copy of the same is attached as Annexure – 27. Copy of the same is also available on our web site https://www.adaniports.com/ports-downloads. A soft copy of the same was also submitted through e-mail to all the authorities vide e-mail dated 06.06.2018.
In view of the information furnished by the PP, the stipulated condition is considered complied.
COMPLIED</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2018
	respective Regional Offices of MoEF by e-mail.	

A. Sumary Note for Waterfront Development Project (WFDP)

i. Implementation of Conditions:

Out of 31 total conditions, it may be seen that 22 are fully complied, 1 is agreed to comply, 3 are compliance not applicable to PP, 1 is partly complied, 2 are compliance in progress, 1 is complied subject to condition and 1 is noted and agreed. These have been explained in the foregoing compliance report against each of the conditions, and the PP needs to take necessary and time bound action for early compliance in respect of the relevant conditions.

ii. Court Cases and show cause/closure notices:

Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted that there are two court cases pending against the project (details below) and no show cause /closure notices have been issued by GPCB over the past 3 years.

Court cases:

There are two ongoing matters pending (one pending at High Court and other pending at Supreme Court). Details regarding both the matters including their status are mentioned below:

1) Kheti Vikas Seva Trust (an association of 200 villagers) has filed a writ petition dated 24th January 2011 before the Gujarat HC against the state of Gujarat, our Company, Adani Power Limited and others alleging that the power plant set up by Adani Power Limited, on the land allotted to our Company for the setting up of a special economic zone, is in violation of the necessary requirements for setting up such plants, including environmental laws. The writ petition has been dismissed by the Gujarat High Court on 17th April 2015. The Hon'ble Supreme Court of India on 18.3.2016 dismissed the appeal against the said order dated 17th April, 2015 of the Gujarat High Court.

   However, an application filed by the petitioner alleging non-compliance of an order of the Gujarat HC dated 12th July 2011 prohibiting the cutting of mangroves and other forests during the pendency of the petition without permission of the state forest and environment department in relation to the writ petition is still pending.

2) Pravinsingh Bhurabha Chauhan filed a public interest litigation by way of a writ petition before the High Court of Gujarat alleging that a certain plot of land known as 'Mor Dhuva' was not allotted to our Company and accordingly that our Company should be restrained from carrying out any activity, including ship recycling activities, without any prior permission or authorization in and around sand dunes including 'Mor Dhuva' in Tunda and Vandh villages, Kutch, Gujarat. In view of the affidavits filed by MOEF, and Govt of Gujarat the High Court dismissed the petition on 18.2.2015. The petitioner filed a special leave to appeal before the Supreme Court of India, challenging the order dated 18.2.2015 of Gujarat High Court and the same is pending.

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B. Summary note for Multi Product SEZ, Desalination, Sea Water Intake, Outfall Facility and Pipeline project:

i. Implementation of Conditions:

Out of 77 total conditions, it may be seen that 59 are fully complied, 2 is agreed to comply, 3 are compliance not applicable to PP, 4 are complied subject to acceptance by MoEFCC, New Delhi, 5 are noted and agreed, 3 are compliance in progress, 1 is complied subject to needful amendment in EC by EC issuing authority. These have been explained in the foregoing compliance report against each of the conditions, and the PP needs to take necessary and time bound action for early compliance in respect of the relevant conditions and the general observations mentioned below.

ii. General Observations

Greenbelt needs to be further strengthened at individual industry level (located within the SEZ), which shall be reviewed Monitoring Committee constituted at SEZ level.

iii. Court Cases and show cause/closure notices:

Project Proponent vide letter dated 11.05.2018 received in MOEF&CC, RO Bhopal on 14.05.2018 submitted that there are two court cases pending against the project (details below) and one show cause notice have been issued by GPCB over the past 3 years (details below):

Court cases:

There are two ongoing matters pending (one pending at High Court and other pending at Supreme Court). Details regarding both the matters including their status are mentioned below:

1) Kheti Vikas Seva Trust (an association of 200 villagers) has filed a writ petition dated 24th January 2011 before the Gujarat HC against the state of Gujarat, our Company, Adani Power Limited and others alleging that the power plant set up by Adani Power Limited, on the land allotted to our Company for the setting up of a special economic zone, is in violation of the necessary requirements for setting up such plants, including environmental laws. The writ petition has been dismissed by the Gujarat High Court on 17th April 2015. The Hon'ble Supreme Court of India on 18.3.2016 dismissed the appeal against the said order dated 17th April, 2015 of the Gujarat High Court.
   However, an application filed by the petitioner alleging non-compliance of an order of the Gujarat HC dated 12th July 2011 prohibiting the cutting of mangroves and other forests during the pendency of the petition without permission of the state forest and environment department in relation to the writ petition is still pending.
2) Pravinsingh Bhurabha Chauhan filed a public interest litigation by way of a writ petition before the High Court of Gujarat alleging that a certain plot of land known as 'Mor Dhuva' was not allotted to our Company and accordingly that our Company should be restrained from carrying out any activity, including ship recycling activities, without any prior permission or authorization in and around sand dunes including 'Mor Dhuva' in Tunda and Vandh villages, Kutch, Gujarat. In view of the affidavits filed by MOEF, and Govt of Gujarat the High Court dismissed the petition on 18.2.2015. The petitioner filed a special leave to appeal before the Supreme Court of India, challenging the order dated 18.2.2015 of Gujarat High Court and the same is pending.

Show cause notices:

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Sr. No.	Date of Show Cause Notice issued	Reason	Our Reply / Compliance	Reply submitted vide letter dated
1	01.12.2017	1. Resisted the Natural flow of River by providing of dredging material in Kevadi River 2. Diverted the Naturalflow of River	1. APSEZ has developed 3 culverts on the river Kevli to maintain the flow of the river and thus flow of the river is nowhere blocked. 2. Dredged material is used to provide proper bund so as to maintain the natural flow of Kevli River. No diversion of the Natural flow of River is made, rather it is channelized to meet main stream of Bhukhi River.	13.12.2017

G Hvcchary

(Dr.H.V.C. Chary Guntupalli)
Scientist-D

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adani

ANNEXURE-28(c)

3638

APSEZL/EnvCell/2019-20/015 **Date:** 20.05.2019

To

Additional Principal Chief Conservator of Forests (C),
Ministry of Environment, Forest and Climate Change,
Regional Office (WZ), E-5, Kendriya
Paryavaran Bhawan, Arera Colony,
Link Road No. – 3, Bhopal – 462 016.
E-mail: rowz.bpl-mef@nic.in

Sub : Half yearly Compliance report of Environment Clearance under CRZ notification for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat by M/s. Adani Ports & SEZ Limited."

Ref : Environment clearance under CRZ notification granted to M/s Adani Ports & SEZ Limited vide letter dated 20th September, 2000 bearing no. J-16011/40/99-IA.III

Dear Sir,

Please refer to the above cited reference for the said subject matter. In connection to the same, it is to state that copy of the compliance report for the Environmental and CRZ Clearance for the period of October – 2018 to March – 2019 has been submitted through mail communication and acknowledge of the same is attached here for your records.

Thank you,
Yours Faithfully,
For, **M/s Adani Ports and Special Economic Zone Limited**

Avinash Rai
Chief Executive Officer
Mundra & Tuna Port

Encl: As above
Copy to:

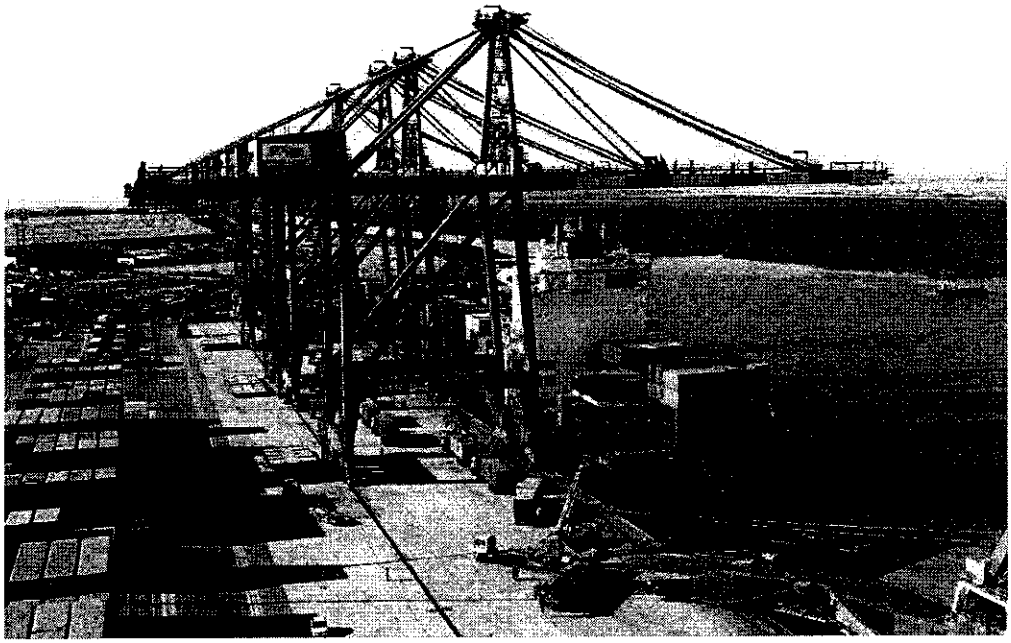
1) The Director (IA Division), Ministry of Environment, Forests & Climate Change, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi-110003
2) Zonal Officer, Regional Office, CPCB – Western Region, Parivesh Bhawan, Opp. VMC Ward Office No. 10, Subhanpura, Vadodara – 390 023
3) Member Secretary, GPCB – Head Office, Paryavaran Bhavan, Sector 10 A, Gandhi Nagar – 382 010
4) Deputy Secretary, Forests & Environment Department, Block – 14, 8th floor, Sachivalaya, Gandhi Nagar – 382 010
5) Regional Officer, Regional Office GPCB (Kutch-East), Gandhidham, 370201

Adani Ports and Special Economic Zone Ltd
Adani House,
PO Box No. 1
Mundra, Kutch 370 421
Gujarat, India

Tel +91 2838 25 5000
Fax +91 2838 25 51110
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www.adani.com

adani

Environmental Clearance Compliance Report



Port Expansion Project including Dry/Break Bulk Cargo Container Terminal, Railway Link and related Ancillary and Back-up facilities at Mundra Port, Dist. Kutch, Gujarat

Adani Ports and SEZ Limited

For the Period of:
October – 2018 to March – 2019

Index

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	Annexure – 3	Details on CSR activities by Adani Foundation	39
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Compliance Report

adani	Adani Ports and SEZ Limited	From : Oct'18 To : Mar'19

Status of the conditions stipulated in Environment Clearance under CRZ notification

Half yearly Compliance report of Environment Clearance under CRZ notification for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat vide letter no. J-16011/40/99-IA.III dated 20th September, 2000"

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2019</th></tr>
<tr><td colspan="3">A. Specific Condition</td></tr>
<tr><td>i</td><td>All the conditions stipulated by the Gujarat Pollution Control Board vide their NOC No. PC/NOC/Kutch/391/18424 dated 10.6.99 and No. PC/NOC/Kutch/222(2)16880 dated 1.5.99 shall be strictly implemented.</td><td>Complied.

Consent to Establish (CtE) and Consent to Operate (CtO) is obtained and renewed/amended from time to time as per the progress of the project activity. The present in-force CTE & CtO summaries are as below.

<table>
<tr><th>Permission</th><th>Project</th><th>Ref. No. / Order No.</th><th>Valid till</th></tr>
<tr><td>CtO – Renewal</td><td>Mundra Port Terminal</td><td>AWH-83561</td><td>20.11.2021</td></tr>
<tr><td>CtO - Amendment</td><td>Mundra Port Terminal</td><td>WH-88317</td><td>20.11.2021</td></tr>
<tr><td>CtO - Amendment</td><td>Mundra Port Terminal</td><td>GPCB/CCA-Kutch -39(5)/ ID-17739/473575</td><td>20.11.2021</td></tr>
<tr><td>CtO - Amendment</td><td>Mundra Port Terminal</td><td>H-98086</td><td>20.11.2021</td></tr>
</table>

Copy of the updated/amended CC&A was submitted as part of compliance report for the duration of Apr'17 to Sep'17.

Copy of updated / amendment in CtO are attached as Annexure – 1.</td></tr>
<tr><td>ii</td><td>The conditions stipulated in the letter No ENV-1098-6477-PI dated October 28, 1999 and No. ENV-1099-2702-PI dated 27.12.99 of shall be strictly implemented.</td><td>Complied.

Point wise compliance report of CRZ recommendations issued vide letter No ENV-1098-6477-PI dated October 28, 1999 and No. ENV-1099-2702-PI dated 27.12.99 is enclosed as Annexure- A.</td></tr>
<tr><td>iii</td><td>The turning circle should be increased from 550 m to 600 m.</td><td>Complied.
Construction activities are completed and project is in operation phase.</td></tr>
<tr><td>iv</td><td>A girdle canal with settlement tanks shall be provided around the coal storage area.</td><td>Not applicable at present.
Coal handling is not practiced at project site.</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2019
v	All efforts shall be made for water conservation and rain water harvesting. Arrangements shall be made for roof top rain water harvesting from various structures.	Complied. Under the Water Conservation and Optimization Drive at APSEZ, various initiatives were taken for conservation of water such as, 1. 100% utilization of treated water for horticultural purpose. 2. Total 128 Water-free urinals are installed and in operation within APSEZ. 3. Recirculation of water from fixed firefighting system to reservoir through flexible pipe during testing of firefighting system. 4. Conservation of Condensate from Air Conditioner and use for gardening. 5. Water flow reducers (total 8740 nos.) are provided in taps of Adani House, Tug Berth, CT2, CT3 & CT4 buildings to reduce the water consumption and are in use. 6. Water Maker machine is installed near Tug Berth jetty which generates drinking water from atmospheric moisture. The capacity of this machine is 250 liters per day. 7. Attending leakages and damages of water lines at various locations of APSEZ. Above initiative have saved substantial amount of water consumption. Groundwater recharge cannot be done at the project site since the entire project is in the intertidal / sub tidal areas. Rain water within project area is managed through storm water drainage. During current year approx. 24 KL of rain water from storm water collected and utilized on land for gardening / plantation purpose. We have also connected roof top rain water duct of operational building (Tug Berth Building within MPT) with u/g water tank for utilization of collected rain water for gardening / horticulture purpose. Photograph showing roof top rain water harvesting system is attached as **Annexure – 2.** However, APSEZ has carried out rainwater harvesting activities in the nearby villages for benefit of the locals. Following measures are taken for the same during the

Sr. No.	Conditions	Compliance Status as on 31-03-2019
		year 2011 – 13 and the same have benefited to the local farmers. 1. Pond deepening activities at villages 2. 18 check dams were constructed under the 'Sardar Patel Sahbhagi Jalsanchay Yojna' Total cost of these efforts was approx. INR 320 lakh. Under Sujlam Suflam project Adani Foundation has successfully completed pond deepening work in Mundra & Abdasa Taluka in record time. 26 pond deepening in Mundra and 7 pond deepening in Abdasa accomplished with all parameters calculated. In Mundra taluka 51723 cum excavation work has been done which increase storage capacity of 51 ML. In Naliya taluka 14550 cum excavation work has been done which increase storage capacity of 15 ML. Total 66 ML storage capacity will be increased. **Participatory Ground Water Management:** Adani foundation has started participatory ground water management project. The objective of the project was to reduce the salinity ingress in and around the coastal regions of Mundra, Kutchh and mitigate the ill-effects of this manmade problem to improve the livelihoods of the rural people. The Project will help to get water table high, also it will help in agricultural activities. As a part of pre monsoon activities with ACT (Arid Communities and Technologies – NGO) under this program, we have carried out following work. But, due to negligible rainfall we are not able to find out outcome of this project. i. Borana – Artificial bore well recharge (work completed) ii. Mangara – Artificial bore well recharge (work completed) iii. Dhrub – Pond deepening work (work completed) iv. Mota Kapaya – abended bore well recharge (work completed) Please refer **Annexure – 3** of detailed CSR activity report for more details upon participatory ground water management initiatives and ground water recharging

Sr. No.	Conditions	Compliance Status as on 31-03-2019
		activities in surrounding villages.
vi	To obviate the problem of coastal erosion due to dredging, the setback distance of at least 50 m from the Chart Datum line of Bocha island would be maintained.	Complied. During Maintenance dredging in this area, it is ensured that at least 50 m distance is maintained.
vii	The dredged material shall be disposed of only in the identified locations outside the CRZ area. While dumping the dredged material, sufficient distance should be ensured from the existing mangroves so that there is no damage to the ecology. During dumping of dredged material the mitigative measures as suggested by NIO shall be implemented. It shall be ensured that there is no dumping of dredged material in the CRZ.	Complied. Capital dredging is completed and only maintenance dredging is being carried out, if required. Dredged material generated by maintenance dredging is used for level rising. The measures recommended by NIO are implemented. In order to ensure no damage to marine ecology Marine water & sediment monitoring is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'18 to Mar'19 is mentioned below. **Total Sampling Locations: 09 Nos.**

Parameter	Unit	Surface		Bottom	
		Max	Min	Max	Min
pH	--	8.37	8.07	8.24	8.03
TSS	mg/L	382	182	364	218
BOD (3 Days @27 °C)	mg/L	12.8	3.0	5.0	2.0
DO	mg/L	6.8	6.0	6.8	5.6
Salinity	ppt	35.7	33.9	36.0	3.0
TDS	mg/L	36734	34327	37434	34218

The results depict that there is no damage to the marine ecology.

Please refer **Annexure – 4** for detailed analysis reports. Approx. INR 20.36 Lakh is spent for all environmental monitoring activities during the FY 2018-19.

viii	The mangrove afforestation shall be	Complied.

Sr. No.	Conditions	Compliance Status as on 31-03-2019
	undertaken at the identified sites and the progress report in this regard shall be submitted to this Ministry regularly. All the recommendations suggested in the NIO report for restoration of the coastal habitat by mangrove afforestation at Navinal island shall be strictly implemented.	All construction activities are completed and project is in operation phase since long time. 24 hectare of mangrove afforestation was carried out at identified sites in consultation with Dr Maity, (Mangrove Consultant of India). Green belt was developed in 78.87 ha. Total 159197 trees were planted with the density of 1993 trees per hectare within the port area. To enhance the marine biodiversity, till date APSEZ has carried out mangrove afforestation in more than 2850 ha. area across the coast of Gujarat. Total expenditure for the same till date is INR 832 lakh. So, far APSEZ has developed more than 455 ha. area as greenbelt with plantation of more than 8.3 Lacs saplings within the APSEZ area. Details on mangroves afforestation & Green belt development carried out by APSEZ till date is annexed as **Annexure – 5**.
ix	No ground water shall be withdrawn for this project.	Complied. Present source of water for various project activities is desalination plant of APSEZ and/or Narmada water through Gujarat Water Infrastructure Limited. Average water consumption for entire APSEZ area is 4.2 MLD during compliance period i.e. Oct'18 to Mar'19.
x	The project proponent shall ensure that the construction workers do not cut the Mangroves for fuel wood etc.	Complied. All construction activities are completed and project is in operation phase since long time.
xi	The project proponent shall ensure that no creeks are blocked and the natural drainage of the area is not affected due to project activities.	Complied. Prominent creek system (main creeks and small branches of creeks) in the study region are: (1) Kotdi (2) Baradimata (3) Navinal (4) Bocha (5) Mundra (Oldest port (Juna Bandar) leading to Bhukhi river) All above creeks are in existence allowing free flow of water and there is no filling or reclamation of any creek area. APSEZ has so far constructed 19 culverts having total length of approx. 1100 m with total cost of INR 20 Crores. Apart from that three RCC Bridges have been constructed over Kotdi creek with total length of 230 m at the cost of INR 10 Crores. Photographs of the same were attached as part of compliance report for the

adani	Adani Ports and SEZ Limited	From : Oct'18 To : Mar'19

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 31-03-2019
		duration of Apr'17 to Sep'17.
xii	The project proponent shall ensure that there will be no disposal of sludge and sewage generated from construction camps, surface run-off from construction sites, and oil and grease spillage from the construction equipment's in the creeks.	Complied. Project is in operation phase. Sewage generated from port is being treated in designated STP and treated sewage is used for horticulture purposes. **Location** / **Capacity** / **Quantity of Wastewater (Avg. from Oct'18 to Mar'19)** / **Type of ETP / STP** LT / 265 KLD / 99 KLD / Activated Sludge Third party analysis of the treated water is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for duration from Oct'18 to Mar'19 is mentioned below. **Parameter** / **Unit** / **Max** / **Min** / **Perm. Limit$** pH / -- / 8.4 / 7.1 / 6.5 to 8.5 TSS / mg/L / 72 / 25 / 100 TDS / mg/L / 1921 / 1024 / 2100 COD / mg/L / 94 / 68 / 100 BOD (3 Days @27°C) / mg/L / 26 / 18 / 30 $ as per CC&A granted by GPCB Please refer **Annexure – 4** for detailed analysis reports. Approx. INR 20.36 Lakh is spent for all environmental monitoring activities during the FY 2018-19.
xiii	The project proponent shall stick to the time bound program submitted to the Department of Environment, Government of Gujarat for the proposed activities including installation of desalination plant for meeting the entire water requirement. They shall coordinate their construction/operations	Complied. Desalination plant has already been installed as per time bound program and is in use. Details regarding water consumption are mentioned in Sr. no. ix above.

Sr. No.	Conditions	Compliance Status as on 31-03-2019
	schedule with the installation schedule of desalination plant.	
xiv	The project proponent shall ensure that the commercial fisheries are not hampered due to presence of barges, vessels and other activities in the region. Necessary plan in this regard shall be prepared in consultation with the NIO and submitted within 3 months.	Complied. No commercial fisheries are prevailing in this area except Pagadia and fishermen with small boat s. Unhindered access is provided to the fishing boats. During project proposal, APSEZ proposed to provide four (4) dedicated accesses at Juna Bandar, Luni, Bavdi Bandar and Zarpara for the fishermen to approach the sea for fishing activity. However, during construction as well as operation, through fishermen consultative process, APSEZ has provided seven (7) access roads. Total length of all the approach roads is approx. 23 Kms and expenditure involved was Rs. 637 Lacs. There is no hindrance to the movement of fisherman boats. Details of the same were submitted along with last EC Compliance report for the period Apr'18 to Sep'18.
xv	The project proponent shall bear the cost of the external agency that may be appointed by the Department of Environment, Government of Gujarat for carrying out the supervision and/or the monitoring of the construction activities.	Complied. Construction activities are completed and project is in operation phase. As part of the directions given by MoEF&CC vides order dated 18th Sep, 2015, following studies were proposed. • NCSCM final report on comprehensive and integrated plan for preservation and conservation of mangroves and associated creeks in and around has been submitted to the concerned authorities i.e. MoEF&CC, New Delhi and GCZMA, Gandhinagar vide our letter dated 04.06.2018 and details of the same were submitted along with last EC Compliance report for the period Apr'18 to Sep'18. • A Regional Impact Assessment study to identify impacts of all the existing as well as proposed project activities in Mundra region. Total cost of the study is approx. INR 1.3 cr. which is financed by APSEZ. The study is recently concluded and the final report is submitted vide our letter dated 30.04.2018 to GCZMA and MoEF&CC for their consideration. Details of the same were submitted along with last EC Compliance report for the period

Sr. No.	Conditions	Compliance Status as on 31-03-2019
		Apr'18 to Sep'18.
xvi	The project proponent shall carry out the post-project monitoring of various environmental parameters in consultation with the Department of Environment, Government of Gujarat and Gujarat Pollution Control Board.	Complied. Monitoring of various environmental parameters for Ambient Air, Noise, Wastewater, ground water, marine water and sediments along with the parameters mentioned in the consent order issued by GPCB is being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. Monitoring reports for the period from Oct'18 to Mar'19 are enclosed as **Annexure – 4**.
xvii	The project proponent shall prepare the detailed traffic control management plan for the port and shall participate in the VTMS to be developed for the Gulf of Kachchh.	Complied. APSEZ is practicing well defined traffic control procedure. A VTS service for Gulf of Kutch is operated by Directorate General of Lighthouses and Lightships (DGLL), Govt. of India. APSEZ is practicing well defined traffic control procedure. Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel-77. Arrival and departure information in Gulf of Kutch is provided to VTS information cell through an agent or directly by sending an e-mail to vtsmanagergulfofkutch @yahoo.com and vtsgok@yahoo.com.
xviii	Action plan shall be prepared by the project proponents to prevent damage to marine life and also to the coastline in case of any oil spillage and the same shall be strictly implemented. Regular mock drills shall be carried out to ensure fitness of the equipment in place.	Complied. Oil spill contingency response plan updated on 01.10.2018 is in place and implemented. Copy of updated plan is enclosed as **Annexure – 6**. A Joint Inspection of Port Oil Spill Response (OSR) capability by Indian Coast Guard (ICG), Gujarat Maritime Board (GMB) & Oil Industry Safety Directorate (OISD) was held on 13 Feb 2018 at APSEZ. The final assessment rating was given as "Very Satisfactory." Mock drills are conducted regularly. Latest mock drill was conducted on 25.08.2018 for overflow of bunkers from vessel during inter tank transfer. Report was submitted along with last EC Compliance report for the period Apr'18 to Sep'18.

Sr. No.	Conditions	Compliance Status as on 31-03-2019
xix	The project proponents shall work out the maximum quantity of spilled material, which can find its way into the coastal waters, under different accident scenarios, and their impact on aquatic life shall be studied after clearly demarcating the impact zones. On the basis of such studies, the necessary action plan to mitigate the likely impacts shall be prepared before commencement of the operations. Action taken report in this regard shall be submitted to the Ministry.	Complied. Oil spill contingency plan is in place to handle Tier 1 level oil spills considering different accident scenarios, and the vulnerable areas are identified and mitigation plan is prepared. Based on the oil spill modeling study, it has been observed that crude oil spill of 700 tons (Tier-I) will spread over an area having radius of around 400 m within 4hr. APSEZ already has facilities for combating a Tier-1 spill. Recommendations of Marine EIA by NIO with respect to pollution emergency contingency plan for Multipurpose Terminal, Container, Dry & Break Bulk Terminal as well as associated facilities are addressed in Oil Spill Response Plan. This action plan prepared by APSEZ to combat the oil spill (LOS-DCP) is in accordance with the NOS DCP, International Petroleum Industry Environmental Conservation Association (IPIECA). A Joint Inspection of Port Oil Spill Response (OSR) capability by Indian Coast Guard (ICG), Gujarat Maritime Board (GMB) & Oil Industry Safety Directorate (OISD) was held on 13 Feb 2018 at APSEZ. The final assessment rating was given as "Very Satisfactory." The copy of updated Oil Spill Contingency Response Plan is attached as **Annexure – 6**.
B. General Condition		
i	Construction of the proposed structures should be undertaken meticulously conforming to the existing Central / local rules and regulations. All the construction designs / drawings relating to the proposed construction activities must have approvals of the concerned	Already complied. Not applicable at present. All construction activities are carried out confirming to the existing rules and regulation and as per the CRZ notification. Approval under the preview of GMB, PESO and Factories act were taken prior to start of construction.

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Sr. No.	Conditions	Compliance Status as on 31-03-2019
	State Government Departments / Agencies.	
ii	The proponent shall ensure that as a result of the proposed constructions ingress of the saline water into the ground water does not take place. Piezometers shall be installed for regular monitoring for this purpose at appropriate locations on the project site.	Complied. To monitor the ground water quality, bore wells are provided at various location in the port and SEZ areas. Third party analysis of the ground water is being carried out twice a year by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'18 to Mar'19 is mentioned below. Monitoring Reports are attached as **Annexure – 4** for the same. **Number of Sampling Locations: 5** **Parameter / Unit / Minimum / Maximum** pH / - / 7.42 / 8.14 Salinity / ppt / 1.26 / 17.33 Oil & Grease / mg/L / 2 / 2.4 Hydrocarbon / mg/L / BDL* / BDL* Lead as Pb / mg/L / 0.031 / 0.96 Arsenic as As / mg/L / BDL* / BDL* Nickel as Ni / mg/L / BDL* / BDL* Total Cromium as Cr / mg/L / BDL* / BDL* Cadmium as Cd / mg/L / 0.014 / 0.058 Mercury as Hg / mg/L / BDL* / BDL* Zinc as Zn / mg/L / 0.072 / 2.1 Copper as Cu / mg/L / 0.84 / 0.92 Iron as Fe / mg/L / 0.25 / 9.8 Insecticides/Pesticides / -- / Absent / Absent Depth of Water Level from GL / meter / 0.9 / 1.05 *BDL = Below Detectable Limit Approx. INR 20.36 Lakh is spent for all environmental monitoring activities during the FY 2018-19.
iii	A comprehensive contingency plan in collaboration with the concerned authorities must be formulated to contain in case of any oil spills. Appropriate devices	Complied. Oil spill contingency plan is in place to handle Tier 1 level oil spills considering different accident scenarios, and the vulnerable areas are identified and mitigation plan is prepared. Updated Oil Spill Contingency Response Plan is enclosed as **Annexure – 6**.

Sr. No.	Conditions	Compliance Status as on 31-03-2019
	such as oil skimmer, oil monitor, oil water separator must be acquired for strengthening the contingency plan. All the service vessels that required for oil spill operations must be equipped with booms and dispersants. The personal onboard of these vessels must be properly trained in operation of these booms and dispersants.	Shoreline Resources available with APSEZ, for deployment during shoreline cleanup/ emergent situation: **Item** / **Quantity** Oil Spill Dispersants — 40250 ltr. Absorbent pads — 1000 Portable dispersant storage tank: 1000 ltr. capacity — 1 no. Portable pumps — 2 nos. Oil discharge hose, 3", 2 x 10 m — 1 set Rachet belt (Eco make) — 10 nos. Tool box (Eco) — 6 nos. Tanker Trucks — 04 nos. Mini Vacuum Pump (30 m3 / hr) — 02 nos. Slurry Pump (60 m3 / hr) — 01 no. 11 Dolphin tugs are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required; out of them 10 Dolphin Tugs are fitted with a fire curtain and remote controlled fire monitors. IMO module course organized by Maritime Training Institute is conducted & 36 personnel have achieved IMO level 1 & 4 personnel have achieved IMO Level 2. Different training modules as Oil Spill, Oil Spill Equipment, Notification exercise, Incident are conducted at different frequency. Detail of resource available at APSEZL is provided in annexure 3 of Oil Spill Contingency Plan.
iv	The operation plan for responding to an oil spill must include clear procedures for notification of a spill, response decision, cleanup operations, communications, and termination of cleanup operations, cleanup cost, oil pollution, damage control and disaster management plan.	Complied. Oil spill contingency plan is in place to handle Tier 1 level oil spills considering different accident scenarios, and the vulnerable areas are identified and mitigation plan is prepared. Updated Oil Spill Contingency Response Plan is enclosed as **Annexure – 6**. Oil Spill Contingency Plan includes procedures for notification of a spill as point no 7.1, response strategy as Point no. 3.0, cleanup operations, Cleanup cost and termination of cleanup in point no. 3.5, communications in point no. 6.0.

adani	Adani Ports and SEZ Limited	From : Oct'18 To : Mar'19

Status of the conditions stipulated in Environment Clearance under CRZ notification

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2019</th></tr>
<tr><td>v</td><td>A well-equipped laboratory with suitable instruments to monitor the quality of air and water shall be set up so as to ensure that the quality of ambient air and water conforms to the prescribed standards. The laboratory will also be equipped with qualified manpower including a marine biologist so that the marine water quality is regularly monitored in order to ensure that the marine life is not adversely affected as a result of implementation of the said project. The quality of ambient air and water shall be monitored periodically in all the seasons and the results should be properly maintained for inspection of the concerned pollution Control agencies.
The periodic monitoring reports at least once in 6 months must be sent to this Ministry as well as its Regional Office at Bhopal.</td><td>Being complied

Site is provided with environment monitoring equipment with sufficient & competent staff of Third Party laboratory accredited by NABL & MoEF&CC.

Ambient Air Quality (twice in a week) and Noise (once in a month) monitoring are being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'18 to Mar'19 is mentioned below.

Total Ambient Air & Noise Sampling Locations: 4 Nos.
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit$</th></tr>
<tr><td>PM_{10}</td><td>$\mu g/m^3$</td><td>99.6</td><td>50.2</td><td>100</td></tr>
<tr><td>$PM_{2.5}$</td><td>$\mu g/m^3$</td><td>59.2</td><td>20.4</td><td>60</td></tr>
<tr><td>SO_2</td><td>$\mu g/m^3$</td><td>27.5</td><td>6.6</td><td>80</td></tr>
<tr><td>NO_2</td><td>$\mu g/m^3$</td><td>46.6</td><td>13.6</td><td>80</td></tr>
<tr><th>Noise</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit</th></tr>
<tr><td>Day Time</td><td>dB(A)</td><td>74.1</td><td>56.0</td><td>75</td></tr>
<tr><td>Night Time</td><td>dB(A)</td><td>72.3</td><td>57.4</td><td>70</td></tr>
</table>
$ as per NAAQ standards, 2009
Values recorded confirms to the stipulated standards
Sewage generated from port is being treated in designated STPs and treated sewage is used for horticulture purposes.

Third party analysis of the treated water is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'18 to Mar'19 is provided above in point No. xii (specific conditions).

<u>Marine Monitoring:</u>
Summary of the marine water monitoring for duration from Oct'18 to Mar'19 is provided above in point No. vii (specific conditions)

Adani group has appointed a marine biologist Mr. Shivanagouda Sanagoudra to monitor marine water quality. Also the third party monitoring of the Marine</td></tr>
</table>

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2019</th></tr>
<tr><td></td><td></td><td>water is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. who has marine biologist to ensure that the marine water quality do not adversely affects the marine life. Monitoring Reports are attached as Annexure – 4 for the same. Approx. INR 20.36 Lakh is spent for all environmental monitoring activities during the FY 2018-19.

Compliance report of EC conditions is uploaded regularly. Last compliance report including results of monitoring data for the period of Apr'18 to Sep'18 was submitted to Regional Office of MoEF&CC @ Bhopal, Zonal Office of CPCB @ Baroda, GPCB @ Gandhinagar & Gandhidham and Dept. of Forests & Env., Gandhinagar vide our letter dated 23.11.2018. Copy of the same is also available on our web site https://www.adaniports.com/ports-downloads. A soft copy of the same was also submitted through e-mail on 30.11.2018 to all the authorities. Please refer below for the details regarding past six compliance submissions.
<table>
<tr><th>Sr. no.</th><th>Compliance period</th><th>Date of submission</th></tr>
<tr><td>1</td><td>Oct'15 to Mar"16</td><td>30.05.2016</td></tr>
<tr><td>2</td><td>Apr'16 to Sep'16</td><td>01.12.2016</td></tr>
<tr><td>3</td><td>Oct'16 to Mar'17</td><td>30.05.2017</td></tr>
<tr><td>4</td><td>Apr'17 to Sep'17</td><td>01.12.2017</td></tr>
<tr><td>5</td><td>Oct'17 to Mar'18</td><td>29.05.2018</td></tr>
<tr><td>6</td><td>Apr'18 to Sep'18</td><td>30.11.2018</td></tr>
</table></td></tr>
<tr><td>vi</td><td>Adequate provision for infrastructure facilities such as water supply, fuel for cooking, sanitation etc. must be provided for the laborers during the construction period in order to avoid damage to the environment. Colonies for the laborers should not be located in the CRZ area. It should also be ensured that the construction workers do not cut trees including mangroves for fuel wood purpose.</td><td>Already complied. Not Applicable at present.

Construction Activity is already completed. Adequate infrastructure facilities as mentioned in the condition were provided during construction phase.

The facility for drinking water, toilet and rest shelter are provided for the dignity of operation labours.

Photographs of the same were provided along with the compliance submission for the duration of Oct'16 to Mar'17.</td></tr>
</table>

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2019</th></tr>
<tr><td>vii</td><td>To prevent discharge of sewage and other liquid wastes in to the water bodies, adequate system for collection and treatment of the wastes must be provided. No sewage and other liquid wastes without treatment should be allowed to enter into the water bodies. The quality of treated effluents, emissions, solid wastes and noise levels must confirm to the standards laid down by the competent authority including the Central/State Pollution Control Board.</td><td>Complied.

Adequate pipelines are provided to ensure the collection and treatment of effluent. Raw sewage is collected from 30 different collection pits at APSEZ locations through browsers and is transferred to ETP/STPs for treatment.

Sewage generated from port is being treated in designated ETP/STPs and treated sewage is used for horticulture purposes. No treated water is discharged into the water bodies. Summary of treated effluent for the duration from Oct'18 to Mar'19 is provided in Specific Condition No. xii above.

Third party analysis of the treated water, Flue Gas, Ambient Air and Noise is being carried out regularly by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd.

Summary of six monthly monitoring of Flue gas emission is provided below.

Total Nos. of Stacks: 16 Nos.
<table>
<tr><th>Parameter</th><th>Unit</th><th>GPCB Limit</th><th>Min</th><th>Max</th></tr>
<tr><td>PM</td><td>mg/Nm^3</td><td>150</td><td>14.28</td><td>24.62</td></tr>
<tr><td>SO_2</td><td>ppm</td><td>100</td><td>2.93</td><td>6.68</td></tr>
<tr><td>NO_x</td><td>ppm</td><td>50</td><td>23.70</td><td>39.45</td></tr>
</table>
Six monthly reports of flue gas emissions for duration from Oct'18 to Mar'19 are attached as Annexure – 4.
Summary of Ambient Air and Noise for duration from Oct'18 to Mar'19 is provided in general condition No. v above.

Waste Management – APSEZ has adopted 5R concept for environmentally sound management of different types of solid & liquid wastes. Please refer below details about management of each type of waste.

<u>Municipal Solid Waste</u>: A well-established system for segregation of dry & wet waste is in place. All wet waste (Organic waste) is being segregated & utilized for</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2019
		compost manufacturing and/or biogas generation for cooking purpose. The compost is further used by in house horticulture team for greenbelt development. Whereas dry recyclable waste is being sorted in various categories. Presently manual sorting is being done for sorting of different types of solid waste. Segregated recyclable materials such as Paper, Plastic, Cardboard, PET Bottles, Glass etc. are then sent to respective recycling units, whereas remaining non-recyclable waste is bailed and sent to cement plant (M/s. Sanghi Industries Ltd., Kutch and/or M/s. Ambuja Cement Ltd., Kodinar) for Co-processing as RDF (Refused Derived Fuel). **Hazardous Waste:** • E – Waste & Used Batteries are being sold to GPCB registered recyclers namely M/s. e-Processing House. • Solid Hazardous Waste is being disposed through co-processing through common facility i.e. M/s. Saurshtra Enviro Projects Pvt. Ltd., Bhachau and/or cement industries of Sanghi Industries Ltd., Kutch and/or Ambuja Cement Ltd., Kodinar. Used/Waste Oil is being sold to GPCB authorized recyclers / re-processors namely M/s. Western India Petrochem Industry, Bhavnagar. • Downgrade chemicals generated from cleaning of storage tanks / pipelines are being sold to authorized solvent recovery facilities namely M/s. Acquire Chemicals, Ankleshwar however during the compliance period, there was no disposal of downgrade chemicals. • Slop Oil received from vessels is treated to separate water and oil particles in Oil Water Separator system. Separated oil from the same is being sold to authorized recycler / reprocessor namely M/s. Western India Petrochem Industry, Bhavnagar and water is sent to ETP for further treatment. However during the compliance period, there was no disposal of Slope Oil. Details of permissions / agreements of hazardous waste authorized vendors were submitted along with last EC Compliance Report for the period Apr'18 to Sep'18.

adani	Adani Ports and SEZ Limited	From : Oct'18 To : Mar'19

Status of the conditions stipulated in Environment Clearance under CRZ notification

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2019</th></tr>
<tr><td></td><td></td><td>The following table summarizes the waste management practice (for Oct'18 to Mar'19) for different types of wastes at APSEZ:
<table>
<tr><th>Type of Waste</th><th>Quantity in MT</th><th>Disposal method</th></tr>
<tr><td colspan="3">Hazardous Waste</td></tr>
<tr><td>Pig Waste</td><td>5.87</td><td rowspan="4">Co-processing at cement industries</td></tr>
<tr><td>Tank Bottom Sludge</td><td>21.59</td></tr>
<tr><td>Oily Cotton waste</td><td>66.22</td></tr>
<tr><td>ETP Sludge</td><td>5.21</td></tr>
<tr><td>Used / Spent Oil</td><td>92.03</td><td rowspan="2">Sell to registered recycler</td></tr>
<tr><td>Discarded Containers</td><td>8.72</td></tr>
<tr><td colspan="3">Municipal Solid Waste</td></tr>
<tr><td>Recyclables</td><td>92.26</td><td>After recovery sent for recycling</td></tr>
<tr><td>Refuse Derived Fuel</td><td>178.24</td><td>Co-processing at Cement Industries</td></tr>
<tr><td>Wet Waste (Food waste + Organic waste)</td><td>188.44 (Manure) & 1938 Cum (Biogas)</td><td>Converted to Manure for Horticulture use / Biogas for cooking purpose</td></tr>
</table></td></tr>
<tr><td>viii</td><td>Appropriate facility should be created for the collection of solid and liquid wastes generated by the barges/vessels and their safe treatment and disposal should be ensured to avoid possible contamination of the water bodies.</td><td>Complied.
• Ships berthing at Mundra Port comply with MARPOL regulations.
• Waste reception facility provided at port collects Solid waste (i.e. Garbage) from vessels and collected waste is being sorted at Material Recovery Facility & it is sent for recycling.
• No discharge such as bilge wastes, sewage or any other liquid wastewater is allowed into marine environment inside port limits and APSEZ does not receive sewage/liquid waste from ship.
• Oily sludge (a mixture of oil, water and dirt) is disposed through authorized recycler / re-processor.
• As a general practice APSEZ provide facility for receiving slop oil from vessels through hose connection with oil tankers. These tankers divert slop oil to Oil water separator system where water and oil particles are separated. Separated oil is being sold to authorized recycler /re-processor. However, no slope oil was received during the compliance period.</td></tr>
<tr><td>ix</td><td>Necessary navigational aids such as channel markers should be provided to prevent accidents.</td><td>Complied.

Navigational aids such as buoys and leading lights have been provided. The rules and regulation of the port</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2019
	Internationally recognized safety standards shall be applied in case of barge /vessel movements.	contributes to the safe, efficient and environmentally responsible handling of shipping traffic. The international rules of IMO, such as SOLAS convention and its amendments and national regulations are in force at APSEZ, Mundra. **APPLICABLE REGULATION** ➢ Port Security Law (ISPS) ➢ Indian Port Act ➢ Gujrat Maritime Board Act 1981 ➢ Navigational Safety Port Committee (NSPC) ➢ All relevant international rules and regulations on MARPOL, Load lines etc.
x	During operation phase proper precautions should be taken to avoid any oil spills and no oily wastes shall be discharged into the water bodies.	Complied. Proper precautions are taken to avoid any oil spills during operation such as pressure checks of oil transfer lines and manual watch during oil cargo transfer. Available mechanisms to avoid oil spills are identified as below <u>At liquid terminal:</u> • Immediate shut off valve from vessel and shore. • Periodical testing of lines • Immediate suction of material by pump. • Emergency operation shut down. <u>At Marine Operations:</u> • Scupper plug, dip tray, absorbent pad, saw dust is provided to address confined spillage/leakage. <u>At Container Terminals:</u> • Leak cart is available for collect spilled chemical. • Spill control materials in place. • Oil drums are stored in covered shed where pellets are used. Tray provided to collection of spillage/leakage if occurred. No oily waste is discharged to water bodies. Oily waste or oil contaminated waste is being disposed as mentioned in General Condition no. vii above.
xi	The project authorities should take appropriate community development and welfare measures for	Complied. APSEZ is actively working with local community around the project area and provides required support for their

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2019</th></tr>
<tr><td></td><td>the villagers in the vicinity of the project site, including drinking water facilities. A separate fund should be allocated for this purpose.</td><td>livelihood and other concerns through the CSR arm – Adani Foundation.

Brief information about activities in the main five persuasions is mentioned below. Please refer Annexure – 3 for full details of CSR activities carried out by Adani Foundation in the Mundra region.

<table>
<tr><th>Area</th><th>Activity</th></tr>
<tr><td>Community Health</td><td>• The Adani Foundation runs two mobile health care units. Main objective of Mobile Van is to reduce travel time, hardships and expenses. Two mobile health care units cover 34 villages and 05 fishermen settlements. Around 109 types of general and lifesaving medicines are available in these units. Total patient was treated under this scheme during the year 2018-19: 19092 Nos. & 22256 Nos. through Rural Clinic
• During the year 2018-19, total 10161 transactions were done by 8599 card holders of 66 villages of Mundra Taluka and they received cash less medical services under this project. The limit for the beneficiary was set to 30000/- within a period of 3 years.
• Total 10161 OPDs were given medical treatment in various villages through rural dispensaries.
• During this year, anthropometry study done for 6548 children. under "Suposhan" Project. Additionally, 965 FGD were conducted during this year.
• During the year 2018-19, Specialty camps were organized and 4384 Patients were benefitted.

<table>
<tr><th>Project Details</th><th>Beneficiaries (Nos.)</th><th>Remarks</th></tr>
<tr><td>Mobile Van</td><td>19092</td><td>OPD Numbers</td></tr>
<tr><td>Rural Clinic</td><td>22256</td><td>OPD Numbers</td></tr>
<tr><td>Senior Citizen</td><td>10161</td><td>Transactions</td></tr>
<tr><td>Medical Camps</td><td>4384</td><td>Patients</td></tr>
<tr><td>Awareness Sessions</td><td>987</td><td>Participants</td></tr>
<tr><td>Needy Patients Support</td><td>1022</td><td>OPD/IPD</td></tr>
<tr><td>Shakti Raksha Project</td><td>624</td><td>Breast n cervix Cancer</td></tr>
<tr><td>Dialysis</td><td>5</td><td>Patients (2 times a week)</td></tr>
<tr><td>Suposhan</td><td>17025</td><td>Mundra and Bitta</td></tr>
</table></td></tr>
<tr><td>Sustainable Livelihood – Fisher folk</td><td>• Average 123 KL of water was supplied to 1086 households from different settlements on a daily basis under Machhimar Shudhh Jal Yojana.
• Adani Foundation constructed four Balwadis for kids between the age group of 2.5 years to 5 years at different settlements under Vidya Deep Yojana.
• Participatory scholarship support for fisherman children studying in SMJ high school Luni and to above 12th standards Students. 80 percentage support given by Adani foundation and 20 percentage support by parents!
• RTG Crane Operator: 03 Fisherman Youth</td></tr>
</table></td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2019	
			• Dori Work & Mud Work Training: **65 Women** • Mangrove Plantation, moss cleaning, etc.: **6261 Man-days.** • In addition to this, employment worth of **35787 man-days** has been provided till date. The Foundation has also supported Pagadiya fishermen as painting labours by providing them with employment and job in various fields. • Total average **560 fishermen** were benefitted by Mobile Dispensary during last half year. Adani Foundation has extended financial assistance to more than **114 financially challenged patients** from the Fisher Folk Community in case of medical urgency during this year. • The project for the senior citizens is popularly known as Vadil Swasthya Yojana and till date **350 senior citizens** from fisher folk community are enrolled in the scheme. **Fisherman Amenities work** 391 Students : Education Support 134 Stunners : Adani Vidya Mandir 16 Fisherman : Alternate livelihood 78 Fisherwomen : Linkages for schemes 1312 Fisherman : Community Engagement 1086 Fisherman : Potable water provision 6261 Mandays : Mangroves Plantation 231 Fisherman : Capacity Building
		Education	• Adani foundation adopted **17 government school** located at Mundra Taluka under the project **'UTTHAN'** a drive of quality education. • To motivate children for schooling by providing the welcome kit / education kit and to create conducive children for " joyful learning" Environment for children for Learning during shala Praveshotsav Govt. has wide spread network of 111 Govt. primary schools in total **62 villages of Mundra Taluka, 3 villages of in Anjar taluka, YMC school, AVMB and two villages of Mandvi Taluka (118 Schools)** every year on an average **2550 to 2700** children gets enrolled in 1st std in Taluka **For 2018-2019 total 2300 children** got enrolled & Adani foundation provided the "Enrollment kit" to all new enrollee in Taluka • Total **3270 educational institutes** has visited Adani Port, Adani Power & Adani Wilmar and **236032 beneficiaries** of the project till date and **33932 beneficiaries** during current year. • Along with quality education, the school also focuses on providing nutritious food, uniforms and other services to the children for free. Currently, **387 students**, from Std. 1 to Std. 10 are studying in the Adani Vidya Mandir. Out of these **134 children** come from the fisher folk community. **Beneficiaries Details** 2598 Students : 17 Schools Utthan 2300 Enrollment Kit : 118 Schools 704 Students : Dignity of Workforce 345 Mothers : Mother's meet

Sr. No.	Conditions	Compliance Status as on 31-03-2019
		<table><tr><td></td><td>↓ 5542 Students : 116 Institute Udaan ↓ 387 Students : Adani Vidya Mandir ↓ 206 Teachers : Guruvandana- I,II,III,IV</td></tr><tr><td>Rural Infrastructure</td><td>• Under Dignity of Drivers Project, Adani Foundation has constructed Resting Shed for Drivers entering in SEZ Premises. Total **50 beds** are constructed, drinking water and sanitation plus recreational – TV Facilities. • Adani Foundation has constructed **45 Toilet block** and proper bathing place for labours. • **Work Completed** ↓ Road repairing various vasahat ↓ Open shed at Juna Bandar ↓ Sand Filling plot at JUNA BANDAR ↓ Concrete Step ladder at Juna Bandar ↓ House construction at Shekhadia ↓ Two approach road 5000 meter Zarpara Fishermen and 5000 meter Luni Pagadiya ↓ Drinking water storage tank 5000 ltr capacity bavdi Bandar -2, Juna Bandar -2, Kutdi Bandar -1 ↓ water pipe line installation at Wandi village 2000meter. ↓ Basic amenities at Rampar Village Paver block 6000 LTR Storage tank and Boundary wall at community place. ↓ Additional civil work in community hall ↓ Open shed Gundiyali ↓ Boundary wall in common place at Tragadi.</td></tr><tr><td>Skill Development</td><td>• Soft skill training – 362 Nos. • Technical Training – 1457 Nos.</td></tr></table> Budget for CSR Activity for the FY 2018-19 is to the tune of INR 1697 lakh. Out of which, Approx. INR 1624 lakh are spent during the year.
xii	The quarrying material required for the construction purpose shall be obtained only from the approved quarries / borrow areas. Adequate safeguard measures shall be taken to ensure that the overburden and rocks at the quarry site does not find their way into water bodies.	Not applicable at present. Construction activities are completed. No such activity is carried out during the compliance period of Oct'18 to Mar'19.
xiii	The dredging operations, if any, to be undertaken with the prior approval of this Ministry, shall be executed with appropriate safeguard measures to prevent turbidity conditions in	Complied Capital dredging is completed and only maintenance dredging is being carried out, if required. Dredged material generated by maintenance dredging is

Sr. No.	Conditions	Compliance Status as on 31-03-2019
	consultation with the expert agencies such as CWPRS / NIO.	used for level rising. The measures recommended by NIO are implemented.
xiv	For employing unskilled, semi-skilled and skilled workers for the project, preference shall be given to local people.	Complied • Adani Skill Development Center (ASDC), Mundra is providing skill development training to the locals for Soft Skill, Technical Training and Carrier Guidance & knowledge based training. • During this year Total 1819 people is given various trainings to enhance socio economic development. Out of which 1294 People are getting employment or Self Employment and average income up to Rs. 5200 per month. Digital literacy training is very helpful in coordinating with today's Digital world. • ASDC-Baroi (Mundra):- Adani skill development Center (ASDC) launched 'SAKSHAM' center at Baroi guest house in Mundra on 16th June 2018 to provide skill development training to youth in the Mundra. An initiative of Adani foundation, the center in the Mundra city will benefit about more than 500 candidates every year in Beauty & Wellness course. • Preference is given to local people for employment based on their qualification and experience. • All Mangrove plantations are done in consultation with GUIDE and Local forest dept. • 24 hectare of mangrove afforestation at Mundra was done through active participation of local fishermen at the cost of INR 25.0 Lac. • During this compliance period, the foundation provided employment to the fishermen equivalent to 6261 man–days for mangrove plantation, moss cleaning, etc. In addition to this, employment worth of 35787 man-days has been provided till date. The Foundation has also supported Pagadiya fishermen as painting labors by providing them with employment and job in various fields. Details on skill development training imparted during financial year of 2018-19 by Adani Foundation are enclosed as **Annexure – 3.**
xv	To meet any emergency situation, appropriate	Complied.

Sr. No.	Conditions	Compliance Status as on 31-03-2019
	firefighting system and water pipelines should be installed. Appropriate arrangements for uninterrupted power supply to the environment protection equipment and continuous water supply for the firefighting system should be made.	Tug (Dolphin-11) has firefighting system of 1200 m^3/hr. along with 20 ton lifting "A" frame and diving support facility for support at offshore. With respect to onshore facilities valve station, pumping station and transportation pipeline, foam base fire tender, fire water network is available. Fire-fighting system has been installed and maintained to meet emergency situations. Additionally for emergency, DG Set is provided for fire water pumps to ensure continuous water supply for firefighting purpose. Detail information on firefighting facility available at APSEZ was submitted as a part of compliance report for the duration of Apr'17 to Sep'17.
xvi	Regular drills should be conducted to check the effectiveness of the on-site Disaster Management Plan.	Complied. Regular drills are being conducted for effectiveness of the system. There were four drills conducted for various scenarios during compliance period (Oct'18 to Mar'19) as mentioned below. **Location / Date / Scenario** CT3 Container Terminal / 23.10.2018 / Fire broke out in Hazardous container MPT / 25.01.2019 / ITV driver got minor injury due to two ITV collisions Liquid Terminal (Encl. 09, Tank No. 117) / 25.01.2019 / MTBE (Methyl Tert-Butyl Ether) leakage from the body valve of T – 117, catches fire and two person found unconscious due to inhalation CT4 Container Terminal / 19.02.2019 / Wharf checker Mr. Tushar fell down into the sea Typical report of mock drill conducted during the compliance period is enclosed as **Annexure – 7.**

adani	Adani Ports and SEZ Limited	From : Oct'18 To : Mar'19

Status of the conditions stipulated in Environment Clearance under CRZ notification

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 31-03-2019</th></tr>
<tr><td>xvii</td><td>The recommendations made in the Environmental Plan and Disaster Management Plan, as contained in the EIA and Risk Analysis Reports of the project, shall be effectively implemented.</td><td>Complied
All the recommendations are being implemented.

Few Marine EIA recommendations:
<table>
<tr><td>Operational protocols and safety procedure should be printed and freely available to concerned staff. The employees must be adequately trained to inculcate a high level of competence not only in day to day operations but also during emergency situations. Periodic refresher courses must also be organized to maintain the level of their competence.</td><td>The company has written the operational protocols and safety procedures as a part of ISO 14001:2015, ISO 45001:2018 and ISO 9001:2015 certifications.
APSEZ has established training department to impart training to its employees.

IMO module course organized by Maritime Training Institute is conducted & 36 personnel have achieved IMO level 1 & 4 personnel have achieved IMO Level 2. Different training modules as Oil Spill, Oil Spill Equipment, Notification exercise, Incident are conducted at different frequency.</td></tr>
<tr><td>Periodic monitoring should be undertaken at the designated sites after the terminals become operational and the results of each monitoring should be carefully evaluated to identify changes if any and to take corrective measures, if warranted.</td><td>Monitoring of various environmental parameters for Ambient Air, Noise, Wastewater, ground water, marine water and sediments is being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd.

Monitoring reports for the period from Oct'18 to Mar'19are enclosed as Annexure – 4.</td></tr>
<tr><td>Adequate vigilance is required to adherence of ships to Marpol protocol and related regulations.</td><td>During the vessel declaration compliances with respect to Air Pollution and Oil are monitored by the Port Authority. The ships are certified with international certification bodies only after complying with the Marpol protocol.</td></tr>
<tr><td>Manual Listing Procedure for conducting ship movement operations in the port area must be available to the concerned staff.</td><td>Berthing Policy & Tariff Structure is made available for conducting ship movement to the concerned staff and made available on web link www.adaniports.com/pdfs/PIB_06122013.pdf
Port Information Booklet is also made available on web link www.adaniports.com/Port_Operations_Port_Tariffs.aspx</td></tr>
</table></td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 31-03-2019
		Few Risk Assessment Recommendations of EIA of Multipurpose Terminal carried out in 1995:
		There should be a provision for activating a fire alarm at the fire control room from various strategic/hazard prone areas in the factory. In areas where there is high level of Noise, It may be necessary to install more than one audible alarm transmitter or flashing lights. — Provision of activating a fire alarm is available at Control Room. Employees are provided with communication system with which they can communicate about any emergency to Control Room. Emergency alarm systems are installed which is audible from any port location. Alarm testing is carried out at a frequency of once in a month.
		Wind sleeves with adequate lightings around them should be provided at various places to guide personnel to escape in a direction perpendicular to the prevailing wind direction. — Wind sleeves with adequate various lighting system around them are available at various places of Port locations to guide personnel to escape in a direction perpendicular to the prevailing wind direction.
		Succession or second line Coordinators should be named for assuming responsibilities in case disaster occurs in the absence of principal coordinators. — Disaster Management Plan for APSEZ is in place and that includes second line coordinators to assume responsibilities in absence of principal coordinators.
xviii	A separate Environment Management Cell with suitably qualified staff to carry out various environment related functions should be set up under the charge of a Senior Executive who will report directly to the Chief Executive of the company.	Complied. M/s APSEZL has a well structured Environment Management Cell, staffed with qualified manpower for implementation of the Environment Management Plan. The Environment Management Cell is headed by Sr. Manager who directly reports to the top management. The organogram of Environment Cell is enclosed as **Annexure – 8**.
xix	The project affected people, if any, should be properly compensated and rehabilitated.	Not applicable. The project was conceptualized in such a way that there are no impacts on the local settlements due to the project proposal. However, the project is already implemented and is in operation phase.
xx	The funds earmarked for environment protection measures should be maintained in a separate	Complied. Separate budget for the Environment protection measures is earmarked every year. All environment and horticulture activities are considered at corporate level

Sr. No.	Conditions	Compliance Status as on 31-03-2019
	account and there should be no diversion of these funds for any other purpose. A year wise expenditure on environmental safeguards should be reported to this Ministry.	and budget allocation is done accordingly. No separate bank account is maintained for the same however, all the expenses are recorded in advanced accounting system of the organization. Budget for environmental management measures (including horticulture) for the FY 2018-19 is to the tune of INR 1069 lakh. Out of which, Approx. INR 1008 lakh are spent during the FY 2018-19. Detailed breakup of the expenditures for the past 3 years is attached as **Annexure – 9**.
xxi	Full support should be extended to the officers of this Ministry's Regional office at Bhopal and the officers of the Central and State Pollution Control Boards by the project proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental protection activities.	Complied APSEZL is always extending full support to the regulatory authorities during their visit to the project site. Last visit of Regional Office, GPCB was done on 20.11.2018 for Main port. APSEZL has submitted the reply to the site visit report vide letter dated 22.11.2018 incorporating details of action taken in respect of the observations of the GPCB representative. The details of the same are attached as **Annexure – 10**.
xxii	In case of deviation or alteration in the project including the implementing agency, a fresh reference should be made to this Ministry for modification in the clearance conditions or imposition of new ones for ensuring environmental protection. The project proponents should be responsible for implementing the suggested safeguard measures.	Point Noted.
xxiii	This Ministry reserves the right to revoke this	Point Noted.

Sr. No.	Conditions	Compliance Status as on 31-03-2019
	clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.	
xxiv	This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which shall be complied with.	Point Noted.
xxv	A copy of the clearance letter will be marked to concerned Panchayat / local NGO. If any, from whom any suggestion / representation has been received while processing the proposal.	Not applicable at present
xxvi	State Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industries centre and Collector's Office/Tehsildar's Office for 30 days	Applicable for State Pollution Control Board.
xxvii	The project proponent should advertise at least in two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letters are available with the State Pollution Control	Already Complied.

Sr. No.	Conditions	Compliance Status as on 31-03-2019
	Board and may also be seen at Website of the Ministry of Environment and Forests at http://www.envfor.nic.in/.	
xxviii	The Project Proponents should inform the Regional Office as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities and the date of start of Land Development Work.	Already Complied.
xxix	The Project Proponent should make specific arrangements for rainwater harvesting in the project design and the rainwater so harvested should be optimally utilized.	Complied Groundwater recharge cannot be done at the project site since the entire project is in the intertidal / sub tidal areas. Rain water within project area is managed through storm water drainage. Please refer specific condition no. v for further details upon ground water recharging and rain water harvesting is being done by Adani Foundation as a part of CSR activity.

Annexure – A

adani	Adani Ports and SEZ Limited	From : Oct'18 To : Mar'19
Status of the conditions stipulated under CRZ Recommendation		

Half yearly Compliance report of CRZ recommendation for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat vide DoEF, GOG letter no. ENV-1098-6477-p1 dated 28th October 1999.

Sr. No.	Conditions	CRZ Compliance Status as on 31-03-2019
A. Specific Condition		
1	The company shall submit comprehensive Environmental Impact Assessment Report and Risk Assessment Report containing worst case scenario and detailed oil spill control management plan before carrying out the construction activities and shall implement all the mitigative measures/suggestions/recommendations given in the report of NIO and Tata AIG Risk Management Services.	Already Complied. Not applicable at present Environmental Clearance was granted based on the submission of said documents. Rapid EIA was submitted on Feb 29, 2000 & Risk Assessment Report containing worst case scenario and detailed oil spill control management plan was submitted on Dec 28, 1999. For more details, please refer to general condition no xvii of the compliance of EC and CRZ clearance
2	The company in no case tap ground water.	Complied. Please refer to Specific Condition no. ix of the compliance of EC and CRZ clearance above for details.
3	The company shall not cut mangroves for the project activities except for stray mangrove seeding required for the railway line only after detailed assessment through NIO and 25 acre of land shall be planted with mangroves in consultation with NIO.	Already Complied. Not applicable at present The company has not cut any mangroves. APSEZ has carried out 24 hectare of mangrove plantation near Navinal creek. To enhance the marine biodiversity, till date APSEZ has carried out mangrove afforestation in more than 2850 ha. area across the coast of Gujarat. Total expenditure for the same till date is INR 832 lakh. So, far APSEZ has developed more than 455 ha. area as greenbelt with plantation of more than 8.3 Lacs saplings within the APSEZ area. Details on mangroves afforestation & Green belt development carried out by APSEZ till date is annexed as **Annexure – 5**. EIA report was prepared by NIO in which all impacts on
4	The company shall carry out the mangroves plantation programme in addition to 25-acre	

adani	Adani Ports and SEZ Limited	From : Oct'18 To : Mar'19

Status of the conditions stipulated under CRZ Recommendation

Sr. No.	Conditions	CRZ Compliance Status as on 31-03-2019
	mangrove plantation to be done with the help of the NIO, in consultation with the forest department.	mangroves and coastal ecology of the region for the proposed design were studied in detail. Please refer to Specific Condition no. viii of the compliance of EC and CRZ clearance above for details.
5	The company shall ensure that the construction labors do not cut mangroves for fuel, etc.	Already Complied. Not applicable at present Construction activity is already completed. Most of the construction labours were residing in the nearby villages where all basic facilities are easily available. However, for those residing near the construction site, infrastructure facilities such as water supply, fuel, sanitation, first aid, ambulance etc. were provided by APSEZ.
6	The company shall ensure that no creek are blocked due to the project activities,	Complied. Please refer to Specific Condition no. xi of the compliance of EC and CRZ clearance above for details.
7	The company shall ensure that there will be no disposal of sullage and sewage generated from construction camps, surface run-off from construction sites, and oil and grease spillage from construction equipment in the creeks.	Already complied. Not applicable at present. Summary of the sewage sample results for duration from Oct'18 to Mar'19 is mentioned in the condition no. xii of EC Compliance report. Project is in operation phase. Sewage and effluent generated from port is being treated in designated ETP and treated water is used for horticulture purposes. Third party analysis of the treated water is being carried out twice in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. The results of the same are attached as **Annexure – 4.**
8	The company shall stick to the time bound programme submitted to this department for the proposed activities including installation of desalination plant for meeting the entire water requirement.	Already complied. Not applicable at present. Construction work was completed on time and project is in operation phase. Desalination plant with the capacity of 47 MLD is installed to meet the water requirement. For detail on present source of water and quantity of water consumption, Please refer to Specific Condition no. ix of the compliance of EC and CRZ clearance above.
9	The company shall ensure that the	Complied. Communication mechanisms have been developed for the

Sr. No.	Conditions	CRZ Compliance Status as on 31-03-2019
	commercial fisheries are not hampered due to the presence of barges, vessels and other activities in the region. Necessary plan in this regards shall be prepared in consultation with the NIO.	smooth movement of fishing boats vis-à-vis shipping activities. Please refer to Specific Condition no. xiv of the compliance of EC and CRZ clearance above for details.
10	The company shall bear the cost of the external agency that may appointed by this department for carrying out the supervision and/or the monitoring of the construction activities.	Complied. Construction activities are completed and project is in operation phase. If at all any study is suggested by Govt. of Gujarat, we will give full co-operation. Please refer to Specific Condition no. xv of the compliance of EC and CRZ clearance above for details.
11	The company shall carry out the post project monitoring of various environmental parameters in consultation with this department and Gujarat Pollution Control Board.	Being complied. Post project monitoring of various environmental parameters is being carried out regularly. Please refer to Specific Condition no. xvi of the compliance of EC and CRZ clearance above for details.
12	The company shall prepare the detailed traffic control management plan for the port and shall participate in the VTMS to be developed for the Gulf of Kachchh.	Complied. APSEZ has participated in VTMS. Please refer to Specific Condition no. xvii of the compliance of EC and CRZ clearance above for details.
13	In order the eliminate adverse impact on the mangroves of Bocha Island and coastal ecology of the region, the company shall carry out construction activities only after the construction design and methodology is	Already complied. Not applicable at present. Construction activity is already completed. EIA report was prepared by NIO in which all impacts on mangroves and coastal ecology of the region for the proposed design were studied in detail.

adani	Adani Ports and SEZ Limited	From : Oct'18 To : Mar'19
Status of the conditions stipulated under CRZ Recommendation		

Sr. No.	Conditions	CRZ Compliance Status as on 31-03-2019
	approved by NIO.	
14	Any other conditions may be stipulated by this department from time to time.	Point noted.

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3971

ANNEXURE – 1

GUJARAT POLLUTION CONTROL BOARD
PARYAVARAN BHAVAN
Sector-10-A, Gandhinagar 382 010
Phone : (079) 23222425
(079) 23232 152
Fax : (079) 23232 156
Website : www.gpcb.gov.in

3675

By R.P.A.D.

CORRECTION OF CONSOLIDATED CONSENT AND AUTHORIZATION (C C & A)

GPCB/CCA-Kutch -39 (5)/ ID-17739/ Date 09.10.2018

To,
M/s. Adani Ports & Special Economic zone Limited,
Plot No: 169/P
At Navinal Island, Taluka: Mundra,
Dist: Kutch – 370 421

Sub: - Correction of Consolidated Consent and Authorization (CC& A) of this Board.

Ref: -

1. Consent Renewal Order No: AWH-83561 dated 9.1.2017 validity up to 20.11.2021 issued vide letter No: GPCB/CCA-Kutch-39 (4)/ID-17739/403658 dated 9.2.2017
2. Your CCA- Amendment Application Inward no-124026 dated 12.7.2017
3. CCA Amendment vide No: GPCB/CCA-Kutch -39 (4)/ID-17739/424578 dated 03.10.2017
4. CCA Amendment vide No: GPCB/CCA-Kutch -582(3)/ID-35427/448701 dated 22.03.2018
5. CTE obtained vide letter No PC/CCA-Kutch-582 (3) / ID-35427/1700294 dated 4.1.2014
6. Your Letter dated 5.09.2018

2. The Products mentioned at Condition No: 2 of the above said CCA issued dated 03.10.2017 corrected as under: -

No.	Name Of Product	Existing Quantity	Proposed Quantity	TOTAL Quantity
1.	General Cargo	4.0 Lac MT/Month	------	4.0 Lac MT/Month
2	Liquid Cargo (Chemical/Poc Products	2.65 Lac MT/Month	--------	2.65 Lac MT/Month
3.	Storage And Distribution Of Bitumen	26,400 MT/Month	------	26,400 MT/Month
4.	Dry Cargo Handling	9 MMT/Month	------	9 MMT/Month
5.	Container Terminal Handling Operation	4.5 Million TEUs/Annum	1.2 Million TEUs/Annum	5.7 Million TEUs/Annum
6.	Waste destruction system for decomposition/destruction of municipal solid waste	3.5 Cubic Meter (MSW Destruction Capacity @ 500 Kg/day)	-----	3.5 Cubic Meter (MSW Destruction Capacity @ 500 Kg/day)
7.	Oil water separate (Flame Proof) to remove –Oil portion from slope oil received from Vessels/Ships	25 M^3/Hr	---	25 M^3/Hr
8.	Import, Storage And Distribution Of Edible Oil	1.25 Lac MT/Month	0.6 Lac MT/ Month	1.85 Lac MT/Month

Outward No: 24-10-2018

3973

3676

3. Earlier, Board has granted CTE with reference to point No 5 of reference and accordingly, certain project activities to be further developed like cargo handling facilities for Adani port and SEZ limited for various commodities like Container, Coal, Iron ore, Steel & Scrap, Dry Bulk, Project and Heavy Engineering, Crude oil (SPM), POL, Chemicals and vegetables oils, automobiles etc.

   The Development for this balance cargo handling capacity will be done in future based on your business requirements and CCA amendment will be applied and issued in their respective PCB IDs as and when specific commodities will be commissioned only after completing the necessary formalities for obtaining of CCA amendment.

4. Remaining all other conditions of Consolidated Consent (CC&A) vides order No: AWH-83561 dated 9.1.2017 validity up to 20.11.2021 issued vide letter No: (1) GPCB/CCA-Kutch-39 (4)/ID-17739/403658 dated 9.2.2017. (2) No: GPCB/CCA-Kutch -39 (4)/ID-17739/424578 dated 03.10.2017 (3) No: GPCB/CCA-Kutch -39 (4)/ID-17739/424578 dated 03.10.2017 shall remains unchanged.

For and on behalf of
Gujarat Pollution Control Board

(Sushil Vegda)
Senior Environmental Engineer

Outward No:473575, 24/10/2018

GPCB

GUJARAT POLLUTION CONTROL BOARD
PARYAVARAN BHAVAN
Sector-10-A, **Gandhinagar** 382 010
Phone : (079) 23222425
(079) 23232152
Fax : (079) 23232156
Website : www.gpcb.gov.in

3677

By R.P.A.D.

AMENDMENT TO CONSOLIDATED CONSENT AND AUTHORIZATION (CC&A)

No. PC/CCA-KUTCH-39(4)/GPCB ID-17739/ 491900 Date: 21/01/19

To,
Adani Ports & Special Economic zone Limited,
Plot No: 169/P
At Navinal Island, Taluka: Mundra,
Dist: Kutch – 370 421

Subject : Amendment to Consolidated Consent and Authorisation (CC&A).

Reference :
1) CCA of the Board issued to your unit vide order No.AWH-83561 dated 09/01/201,No.PC/CCA-KUTCH-39(4)/GPCB ID17739/403658 date 09/02/201 .
2) Correction of CCA of the Board issued to your unit vide order No. PC/CCA-KUTCH-39(5)/GPCB ID17739/473575 date 24/10/2018.
3) Your CCA Amendment Application Inward ID No.146485, dated 24/10/2018.

Sir,

In exercise of the power conferred under section-27 of the Water (Prevention and Control of Pollution) Act-1974, under section-21 of the Air (Prevention and Control of Pollution)-1981 and Authorization under rule 6(2) of the Hazardous & Other Waste (Management & Transboundary Movement) Rules-2016 & as amended framed under the Environmental (Protection) Act-1986 and without reducing your responsibility under the said Acts/Rules in anyway; this Board is empowered to amend consent order conditions. Accordingly, the Consolidated Consent and Authorisation (CC&A) issued vide letter no. Consent order no. AWH-83561, dated 09/01/2018 no. PC/CCA-KUTCH-39(4)/GPCB ID17739/403658 date09/02/2017.which is valid up to 20/11/2021 under reference (1) and (2) stands amended in respect of the following conditions.

1. **Consent Order No.: H-98086 Date of Issue: 25/12/2018.**
2. The consent order shall be valid up to **20/11/2021.**
3. There shall be no change in any manufacturing activity and Air Details.
4. **CONDITIONS UNDER WATER ACT 1974 AMENDED AS FOLLOWS:**
   - The condition no. 3.1 shall be read as;

3.1 The quantity of the industrial effluent from manufacturing process and other ancillary operations shall not exceed 90.31KL/day. further generated waste water of 60 KL/day from washing of tank is treated in exiting ETP & treated waste water shall be used for Gardening and Plantation purpose.

SUBJECT TO THE FOLLOWING SPECIFIC CONDITIONS:

1. Unit shall strictly adhere to provisions of Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016 (H&OW (M&TBM) Rules-2016 and generated waste oil within ship shall be disposed as per the provisions of (H&OW (M&TBM) Rules-2016 only.

Clean Gujarat Green Gujarat

2. Unit shall not import of waste oil/ slope oil as per provisions of Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016.
3. Unit shall provide port reception facility to channelize the disposal of waste oil generated from ships/ vessels in environmentally sound manner.
4. Unit shall submit waste oil records and submit waste oil details with quantity to Board for every six months to this office and also to Regional office, Kutch (East) for its review and inspection.
5. Unit shall dispose of entire waste oil of ships/ vessels to the Registered Recyclers/ Re-processors as per the provisions of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

5. **CONDITIONS OF AUTHORIZATION UNDER HAZARDOUS AND OTHER WASTE (M & TM) RULES – 2016 AMENDED AS FOLLOWS:**

- The conditions no 5.1 shall be read as:

5.1 Adani Ports & Special Economic zone Limited, is hereby granted an authorization to operate facility for following hazardous wastes on the premises situated at Plot No: 169/P At Navinal Island, Taluka: Mundra, Dist: Kutch

Sr. No.	Waste	Quantity per Year			Cat.	Facility
		Existing	Proposed	Total		
1	Used Spent Oil	238 MT	--	238 MT	5.1	Collection, storage, Transportation, Disposal by selling out to registered recyclers
2.	ETP Sludge	1.095 MT	--	1.095 MT	35.3	Collection, storage, Transportation, Disposal at TSDF site of SEPPL/NECL
3.	Contaminated cotton rags or other cleaning materials	31 MT	--	31 MT	33.2	Collection, storage, Transportation, Disposal by Co-processing at cement plant of CHWIF
4	Asbestos Waste	Whatever quantity generated	--	Whatever quantity generated	B-1	Collection, storage, Transportation, Disposal at TSDF site
5	Glass Wool waste (Thermal insulation material)	Whatever quantity generated	--	Whatever quantity generated	H-6.1	Collection, storage, Transportation, Disposal at TSDF site
6	Down grade chemicals	Whatever quantity generated	--	Whatever quantity generated	20.2	Collection, storage, Transportation, Disposal by sending to authorized Solvent
7	Discarded Container/ Barrel/ Contaminated Liners	16 MT/year	--	26 MT/year	33.3	Collection, storage, Transportation, Disposal by selling out to registered decontamination facility

GPCB

GUJARAT POLLUTION CONTROL BOARD
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8	Bottom sludge	Whatever quantity generated		Whatever quantity generated	3.2	Collection, storage, Transportation, Disposal by sending to common facility of SEPPL/NECL and /or sent for co-process at cement industries through recycling solution Pvt Ltd, Panoli
9	Waste Residue containing Oil	100 MT		100 MT	33.2	Collection, storage, Transportation, Disposal by Co-processing at cement industries and / or incineration at CHWIF site.
10	Pig Waste	24 MT		24 MT	3.1	Collection, storage, Transportation, Disposal by sending to common facility of SEPPL/NECL and /or sent for co-process at cement industries through recycling solution Pvt Ltd.Panoli
11	Waste Oil	--	0.18 MT	0.18 MT/ye	5.2	Collection, storage, Transportation, Disposal by selling out to registered recyclers/ Re processors

All other terms and conditions of Consolidated Consent (CC&A) order No.AWH-83561 dated 09/01/2017, No PC/CCA-KUTCH-39(4)/GPCB ID17739/403658 date 09/02/2017 shall remain unchanged.

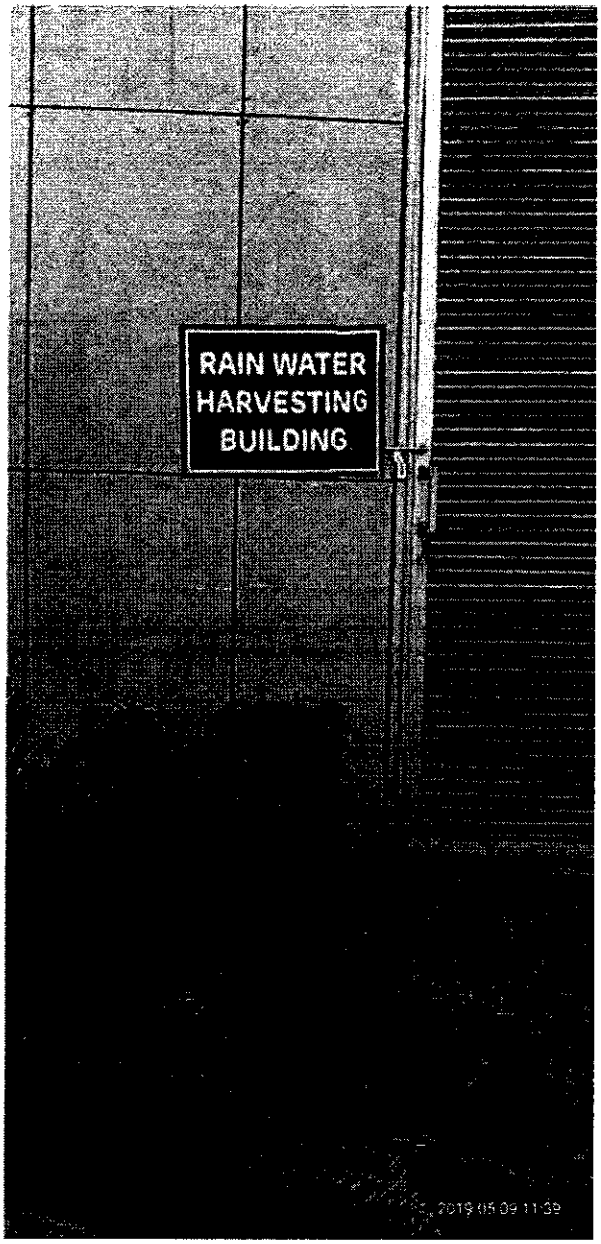
For and on behalf of
Gujarat Pollution Control Board

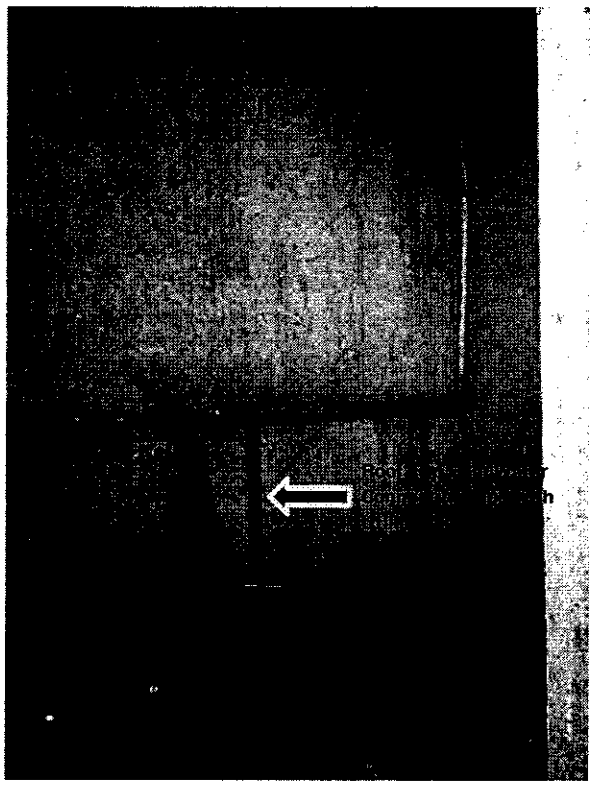
(Sushil Vegda)
Senior Environmental Engineer

Clean Gujarat Green Gujarat

ANNEXURE – 2

❖ Roof Top Rain Water Harvesting System





Location: Tug Berth Building (Mundra Port Terminal)

ANNEXURE – 3

39801

Adani Foundation, Mundra

adani
Foundation



ANNUAL REPORT 2018-19

For a better tomorrow

Adani Foundation
Adani House, Port Road, Mundra - Kutch 370 421
[info@adanifoundation.com] [www.adanifoundation.com]

39801

Our Journey

The year 2018-19 has passed off with passion and courage to work for the commitment given to the community. It is essential that sustained growth is achieved at rural level along with the industrial development. This can be made possible by involving more and more people in the rural development programme.

Since 1996, The Adani Foundation Mundra is committed to the cause of the deprived and underprivileged. It has been working relentlessly across 6 Talukas, covering 81 villages, to uplift the lives of more than 42,000 families with a multi-faceted approach.

This year conceded with more streamline projects of Education i.e. Utthan – to enhance primary education of 17 schools of Mundra, milestone achievement in malnourishment project, Launched Swachhagraha in four talukas and 400 schools of Kutchh, considerable impact created by fisherman amenities projects and new era defined in agriculture projects i.e. tissue culture and fodder sustainability .

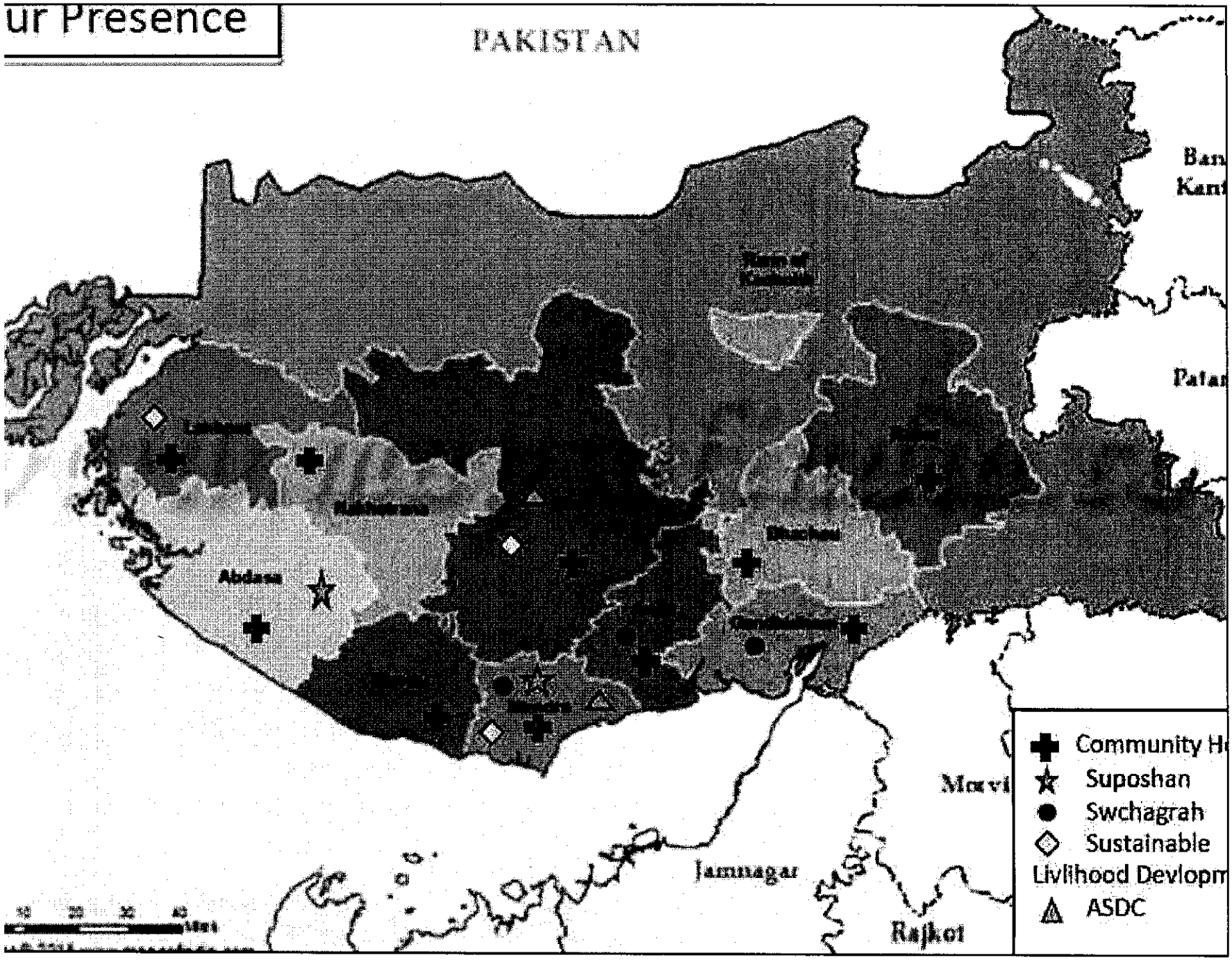
The people of Kutch, especially that of Mundra, have generously supported the activities carried out by the Adani Group or else this wouldn't have been possible. Their determination, understanding and commitment have strengthened the development even more.

Thanks to Mr. Rakshit Shah and Mr. Avinash Rai for being mentor of the team Always !

Our Achievement would not be possible without the ultimate support by Mr. P N Roy Chaudhry, Executive Director - AF and plentiful faith and passionate support by Dr. (Mrs.) Priti G Adani, Chairperson– Adani Foundation

3982

ur Presence



3686

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3647

Education



Beneficiaries Detail

- 2598 Students : 17 Schools Utthan
- 2300 Enrollment Kit : 118 Schools
- 704 Students : Dignity of Workfor
- 345 Mothers : Mother's meet
- 5542 Students : 116 Institute Udaa
- 387 Students : Adani Vidya Mandi
- 206 Teachers : Guruvandana- I,II,II

Project Utthan

Project Utthan : Adani foundation has been promoting various educational and human initiatives in education, community health, sustainable livelihood and Rural Infrastructure.

In this context with an aim to enhance the quality of primary education in Kutch district, Adani foundation adopted 17 government school located at Mundra Taluka under the project 'UTTHAN' a drive of quality education.

Adani foundation is expected to achieve visible and measurable important in scholastic area.

Adani foundation will be focusing to bring the positive evidences of change in the personal, behavior and academic development of the students.



3986

Kick Start of "Utthan"

hool improvement and teachers development is a multilayered approach. Therefore, hool reform and initiative need to be carefully planned and executed by involving all akeholders. In the process of implementing school improvement programme, achers play critical role in institutionalizing change initiative.

number of activities have been taken into account bring about change and enhance ality education in schools by Government, NGO and CSR,

om Year 2018 – Government of Gujrat has given responsibility through memorandum understanding of 17 Schools for academic and overall development of school under oject "Uthhan" to Adani Foundation. Many workshops and training programmes are ganized to improve the quality of education and support government schools.

Utthan, main focus on upbringing of students (Priya Vidhyarthi) to the minimum vel of reading, writing and counting (Vachan, Lekhan and Ganan). For making this ssion successful, para teacher is appointed for each school.

art from this, English is introduced from standard first to create strong base. Also tributed science kit, sports kit, music kit to all 17 schools along with library pboard and 100 books.

art class is given to all 17 schools with proper training to teachers for optimum lization.



3660

bjective of "Utthan"

To improve basic knowledge of Math, Languages, English and Computer among students of Govt. schools.

To Raise Minimum Level of weak students

utput of "Utthan"

Increase enrolment ratio of students to 100%

100% regular present of students in school

To improve their arithmetic, reading capacity in various languages, English etc.

To increase confidence level of students

Involvement of local community, village leaders and local Govt. through various activities

utcome of "Utthan"

Students of class 1th to 7th in government schools will take interest in activity based learning.

Community and teachers will be positive and satisfy from this education project.

Increase interest of students in school, they develop knowledge and understand importance of library.

Education friendly environment development in school as well as in community.



3988

‹pected impact of "Utthan"

/achan, Ganan and Lekhan strengthening in Priya students

Education department of Gujarat government will include activity based earning in regular course curriculum.

ıplementation Partners of "Utthan"

EO/TEPO/BRC will provide guidance for implementation and experts will visit an interval of 6 months to evaluate the project.

'oposed Activities "Utthan"

Training of Government School Staff

Reading, Writing and Maths improvement as per Gunotsav Data

Development of Teaching Learning Material

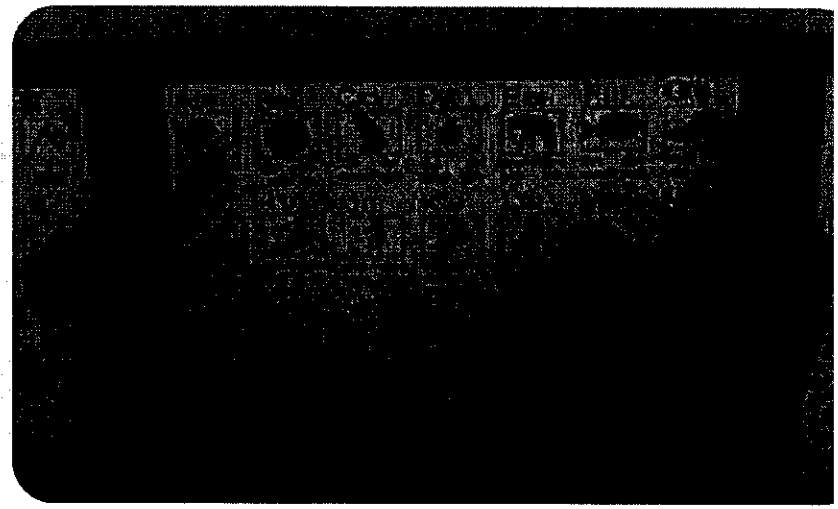
English Language

Role Model Activity in assembly

Reading Corner Activities

Monitoring and Evaluation





3692

Shala Praveshotsav



To motivate children for schooling by providing the welcome kit / education kit and to create conducive children for " joyful learning" Environment for children for Learning during shala Praveshotsav Govt. has wide spread network of 111 Govt. primary schools in total 62 villages of Mundra Taluka, 3 villages of in Anjar taluka, YMC school, AVMB and two villages of Mandvi Taluka (118 Schools) every year on an average 2550 to 2700 children gets enrolled in 1st std in Taluka For 2018-2019 total 2300 children got enrolled & Adani foundation provided the "Enrollment kit" to all new enrollee in Taluka

Mother's Meet

To motivate parents to maintain regularity of school, health hygiene and cleanliness we scheduled 3 mothers meet per week, which is really beneficial for student's overall growth. We arrange quiz completion for mother's to update their general knowledge.

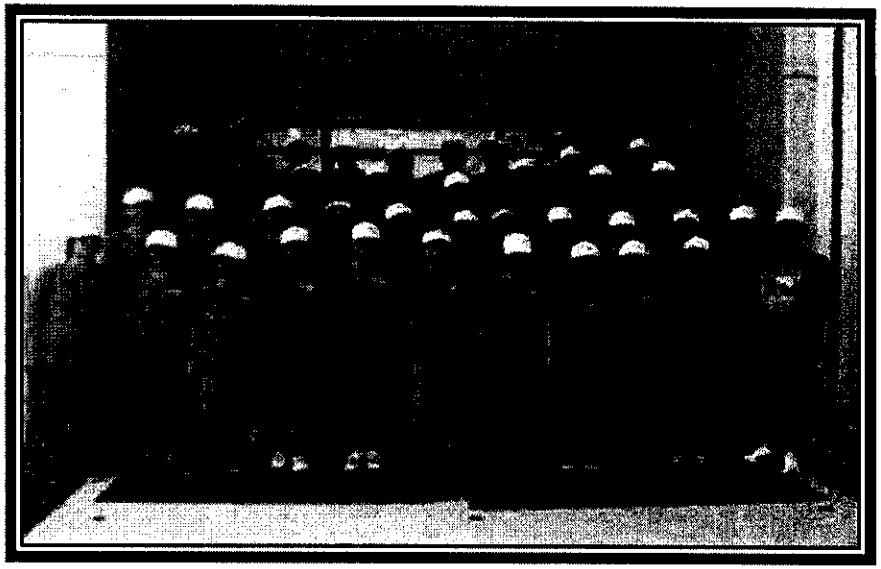


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Udaan

get inspired

Summary of year 2018-19 for Project "UDAAN"						
NO.	MONTH	SCHOOL/ COLLEGE	BOYS	GIRLS	TEACHERS	TOTAL
1	Apr -18	27	1381	515	108	2004
2	May -18	31	1107	827	105	2039
3	June - 18	30	1333	579	107	2019
4	July - 18	29	1280	727	116	2123
5	Aug -18	29	1256	770	109	2135
6	Sep - 18	28	1317	606	107	2030
7	Oct -18	29	1318	682	107	2107
8	Nov - 18	26	1045	575	87	1707
9	Dec - 18	33	1052	928	110	2090
10	Jan - 19	31	1250	763	113	2126
11	Feb - 19	31	1196	577	96	1869
12	Mar - 19	31	1274	585	104	1963
Total		355	14809	8134	1269	24212
	Local 2018-19	201	5543	3710	467	9720
					Total	33932



Project UDAAN

Mundra has created a position for itself by creating capacities in Port Handling, Edible Oil Refining and Power Generation. With a vision to familiarize, educate and inspire the future generation to become successful business leader, engineers, managers and other professionals, the Adani Foundation organizes Education Exposure visits to Mundra for High schools and educational institutes in Various parts of Gujrat.

Total 3270 educational institutes has visited and 236032 beneficiaries of the project till date and 33932 beneficiaries during current year.

3694



Adani Vidya Mandir, Bhadreshwar

s	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
	53	40	45	41	38	40	40
	26	68	46	41	39	37	37
	27	40	73	45	37	39	39
		39	48	70	44	36	36
			37	46	58	39	39
			37	36	46	58	58
			34	37	35	44	44
			39	34	36	34	34
				38	38	30	30
					23	27	30
l	106	187	359	387	394	384	387

In Bhadreshwar, Mundra, the Adani Vidyamandir has completely revolutionized the education scenario. Only the children of families with an income of less than 1.5 lakh are admitted to this school. Along with quality education, the school also focuses on providing nutritious food, uniforms and other services to the children for free. Currently, 387 students, from Std. 1 to Std. 10 are studying in the school. Out of these 134 children come from the fisher folk community. Many students are the first generation in their families to attend school.

3992



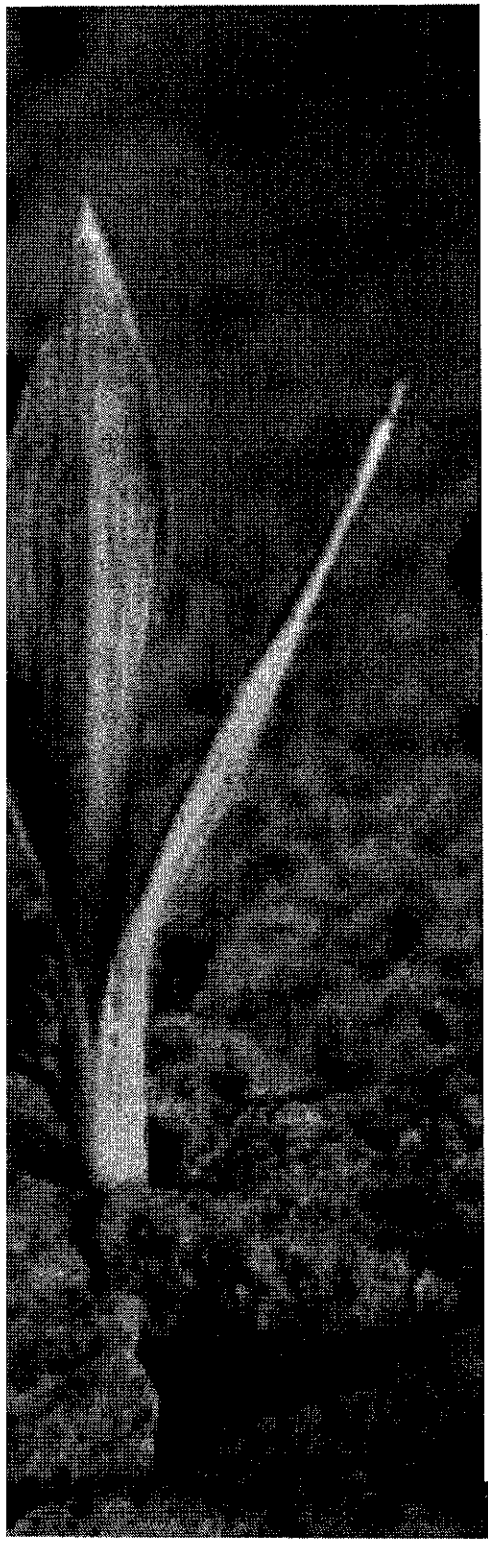
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VMB Std.-10 Second Batch Result 2018-19

dani Vidya Mandir Bhadreshwar achievement in Gujrat Board Standard 10th :amination Result 92% (25 students have passed the examination out of 27). Adani oundation will take all responsibility of further study of students with respect to their terest.

AVMB STD - 10 SECOND BATCH RESULT		
Year 2017-2018		
SR NO	GRADE	STUDENTS
1	Above 80 %	1
2	Above 70 %	3
3	Above 60 %	5
4	Above 50 %	9
5	Above 40 %	7
6	Fail	2
	TOTAL	27

3666



ENVIRONMENT SUSTANABILITY

The Environment Impact Assessment (EIA) Notification, 2006, issued under the Environment (Protection) Act, 1986, as amended from time to time, prescribes the process for granting prior environment clearance (EC) in respect of cevoain development projects/activities listed out in the Schedule to the Notification.

Sustainable development has many important facets/components like social, economic, environmental, etc. these components are closely interrelated and mutually re-enforcing. Under Corporate Environmental responsibility 10 km radious villages from SEZ Boundaries.

To make connections between human actions and the level of biological diversity found within a habitat and/or ecosystem, this year we launch project "Sanrakshan" in coordination with GUIDE. MOU has been signed with Dr. Thivakaran – GUIDE for conservation of five spices of mangroves.





SUJLAM SUFLAM JAL ABHIYAN

The state government announced its 31-day water conservation drive called 'Sujlam Suflam Jal Abhiyan'. The campaign was launched on "Gujarat Gaurav Din" on May 1, which is the foundation day of Gujarat state. Moreover, the government aims to revive 32 rivers in the state and also to create storage capacity in existing village pond.

Inauguration by GOG Hon'ble Minister, MLA and DM Kutch and other guest day on 1st may at Gundala village taluka Mundra by Adani foundation, Mundra

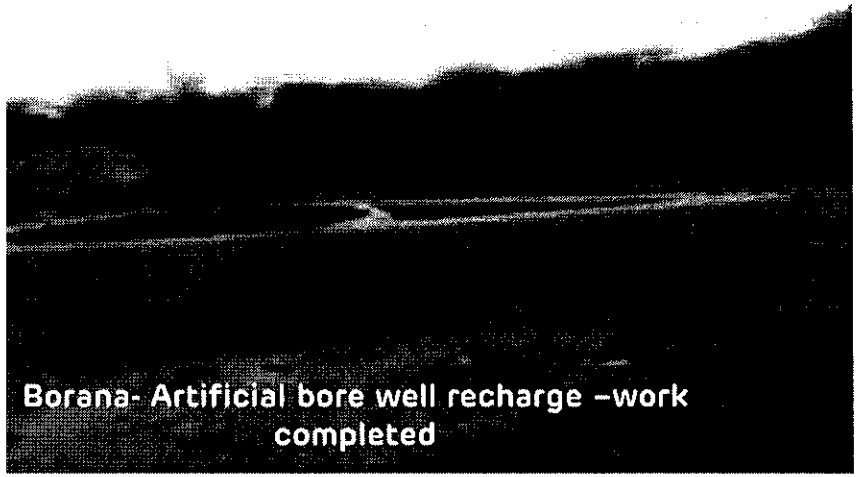
During 1st may to 31st may AF Mundra had completed deepening work in 26 pond works as per given target by District Collector Kutch in 19 villages . Total excavation done 51723 Cum. Total storage capacity created 51.72 million liters. These works done as per government guidelines.



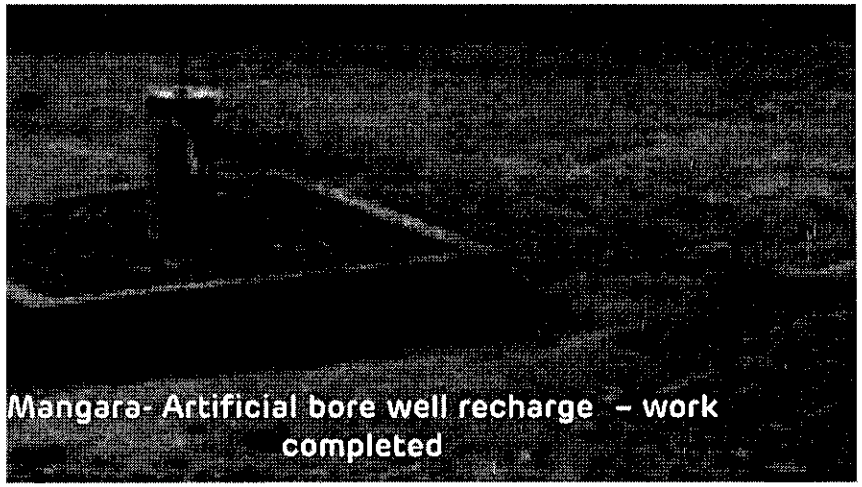




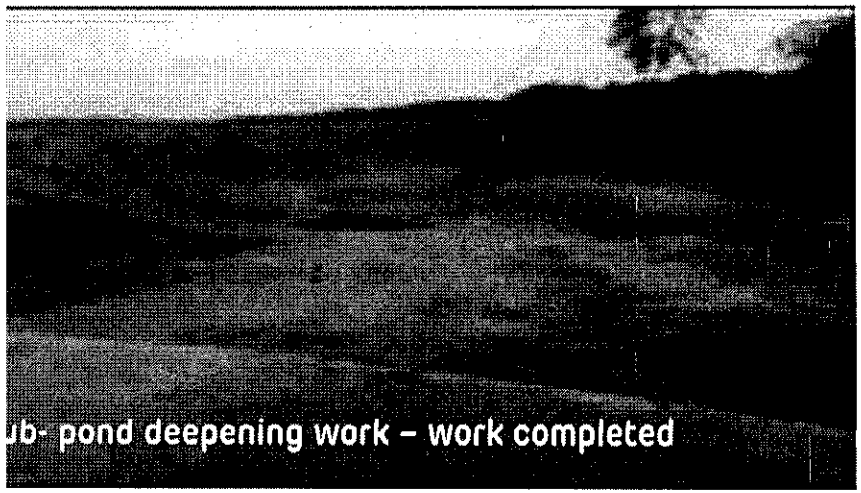
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Borana- Artificial bore well recharge –work completed



Mangara- Artificial bore well recharge – work completed



ub- pond deepening work – work completed

PARTICIPATORY GROUND WATER MANAGEMENT

At the turn of millennium, the state watched with growing alarm the steady depletion of its ground water and launched massive drive to achieve water security in Mundra region. As a part of pre monsoon activities with ACT (Arid Communities and Technologies – NGO) we have carried out following work. But, due to negligible rainfall we are not able to find out outcome of this project.

·3996

PROJECT "SANRAKSHAN" - BIODIVERSITY



ne mangrove biodiversity enrichment project in and around Adani ports special economic zone limited (APSEZL) aims to introduce select ue mangrove species on a pilot scale in suitable coastal belts and assess their survival. Because this project is the first of its kind, the xpected survival rate is between 20-30%.

ne project is currently in its initial stages of establishing nurseries and sowing seeds of several different species brought in from multiple cations in and outside of Gujarat state. These nurseries have been developed in tidal flats near the village of Luni, Kutchh, Gujarat.

ne mangrove seeds/propagules) for the establishment of the nursery were brought in from various locations in India, namely, achilipatnam (Andhra Pradesh), Pondicherry (Tamil Nadu), Parangipettai (Pichavaram Mangroves, Tamil Nadu), Kandla (Gujarat) and amnagar (Gujarat).

most of these locations, there is adequate fresh water supply available due to high/substantial rainfall and/or presence of major rivers lso important river confluences and deltas that give rise to a thriving estuarine environment). Consequently, the mangrove species that uccessfully grow in those regions are adapted to a low-salinity environment (where salinity is approximately 20 ppt) against that of 37-4 ppt prevailing in Kutchh coastal waters. Furthermore, the species selected to establish the biodiversity enrichment project also belong this group of mangrove species. This subsequently creates a challenge for the team heading this project because the Kachchh region oes not provide adequate salinity ranges for survival of most of these species. In fact, it provides an extremely harsh saline environment alinity can range up to as high as 44 ppt during summer).

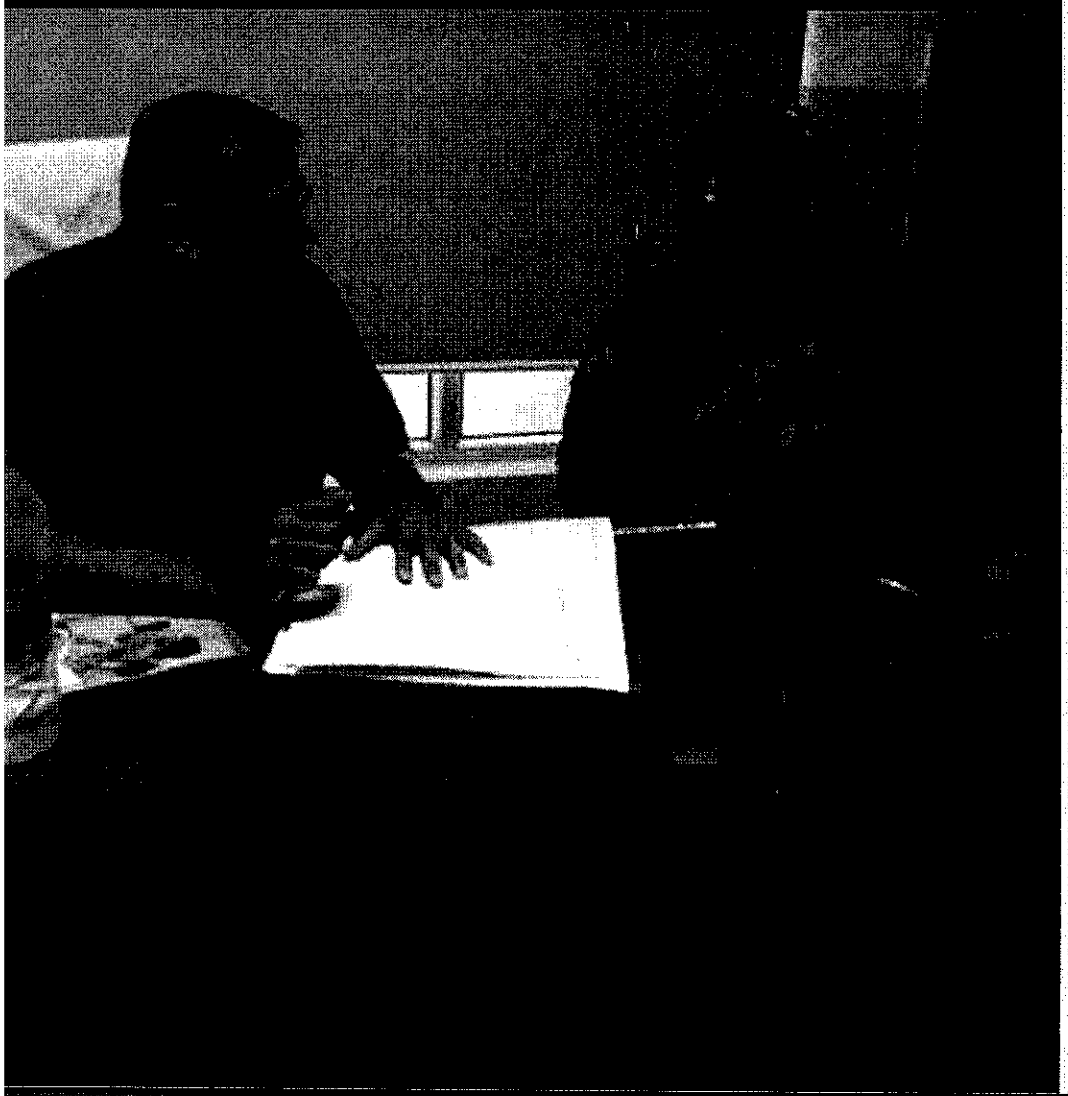
onsidering the above-mentioned scenario, the site selection criteria, need for species of high salinity tolerance and studying their atural occurrence in Kutchh becomes critical in ensuring a substantial survival rate of the mangrove species selected to potentially uccessfully establish a diverse and resilient mangrove community in the Kutchh region.

urthermore, a highly diverse set of mangrove species will ensure resilience in the face of changing climate and could probably provide as thriving gene pool and seed bank in the future for the Kutchh region.

Table 1: NURSERY STATUS AS OF SEPTEMBER 2018

Sr. No.	SPECIES	LOCATION (FROM)	SITE	DATE OF ARRIVAL IN BHUJ	DATE OF SOWING	NO. OF SEED-BAGS ESTABLISHED	NO. OF SEEDS IN EACH BAG	TOTAL NO. OF SEEDS SOWN	APPROX SURVIVAL RATE TILL DATE
1	*Aegiceros corniculatum*	Parangipettai		Sept 21	Sept 25	2000	2	4000	
		Kandla							
2	*Excoecaria agallocha*	Pondicherry		Sept 22	Sept 26	4000	10	40000	
3	*Rhizophora apiculata*	Machilipatnam		Sept 22	Sept 26	4000	1	4000	
4	*Ceriops decandra*	Parangipettai		Sept 21	Sept 25				
		Machilipatnam		Sept 22	Sept 26				
5	*Bruguiera gymnorhiza*								
6	*Xylocarpus moluccensis*	Machilipatnam		Sept 22	Sept 26	1360	1	1360	
7	*Bruguiera cylindrica*	Machilipatnam		Sept 22	Sept 26	1500	1	1500	
8	*Ceriops tagal*	Jamnagar		Sept 15					

Community Health Mundra



Project Details	Beneficiaries (Nos.)	Remarks
Mobile Van	19092	OPD Numbers
Rural Clinic	22256	OPD Numbers
Senior Citizen	10161	Transactions
Medical Camps	4384	Patients
Awareness Sessions	987	Participants
Needy Patients Support	1022	OPD/IPD
Shakti Raksha Project	624	Breast n cervix Cancer
Dialysis	5	Patients (2 times a week
Suposhan	17025	Mundra and Bitta

Total beneficiaries : 75556



Healthy mind remain in healthy body which create healthy community to make healthy Nation.

Adani Foundation relentlessly working for community in health core area through various kind of activities i.e. Mobile Dispensaries, Rural Clinics, Special Innovative Projects - Health Card to Senior Citizens, "SuPoshan"- Fighting to Mal nourishment in Mundra and support to dialysis patients projects. Adani Foundation also organizes special medical camps during disease outbreak.

3·4000

Mobile Dispensaries & Rural Clinics



population of Mundra block is spread over various villages. Due to inadequate sportation facilities, the villagers have to face many hardships even for reaching to the :or in case of common diseases.

medical expenses and zero earning per day add surplus to their hardships.

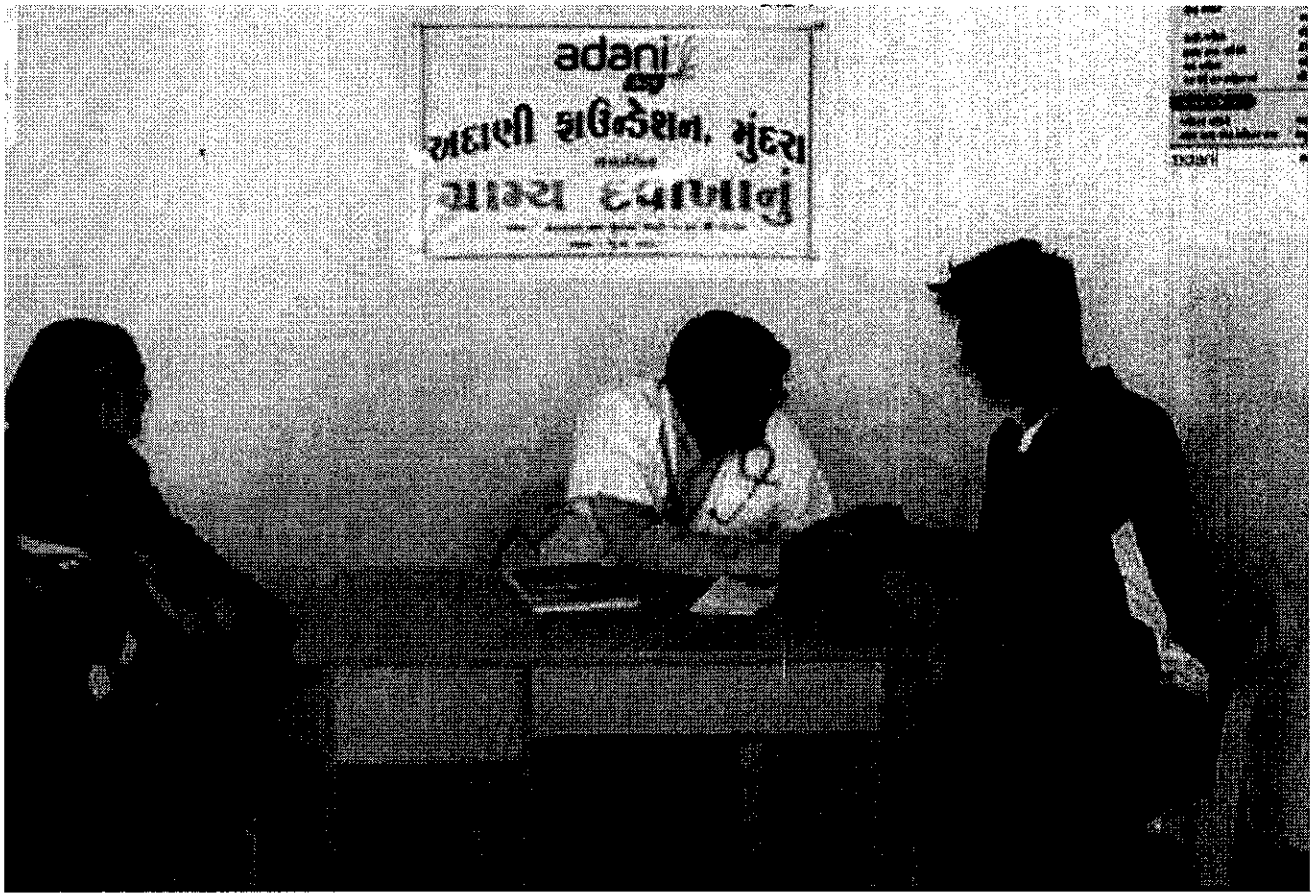
elp them in the above mentioned health related problems, the service of mobile medical has been started by the Adani Foundation in Mundra block. In big villages, rural ensaries have been started considering their population and area.

Adani Foundation runs mobile health care units. Main objective of Mobile Van is to reduce el time, hardships and expenses. Mobile health care units cover 34 villages and 05 ermen settlements. Around 109 types of general and life saving medicines are available in e units. It has turned out to be a boon for women and children as the service is availed at - door - step.

Month	Mobile Van	Rural Clinic
Apr-18	1508	1466
May-18	1397	1491
Jun-18	1236	1533
Jul-18	1523	2166
Aug-18	1512	2103
Sep-18	1796	1726
Oct-18	1832	2068
Nov-18	1386	1628
Dec-18	1897	2187
Jan-19	1684	2013
Feb-19	1743	2037
Mar-19	1578	1821
Total	19092	22256

3704

bile Dispensaries & Rural Clinics



The Adani Foundation operates Rural Dispensaries in 08 villages of Mundra block, 03 villages of Anjar block and 01 village of Mandvi block along with one at Rangoli gate. At these dispensaries, health services are provided free of charge for two hours daily by a doctor and a volunteer.

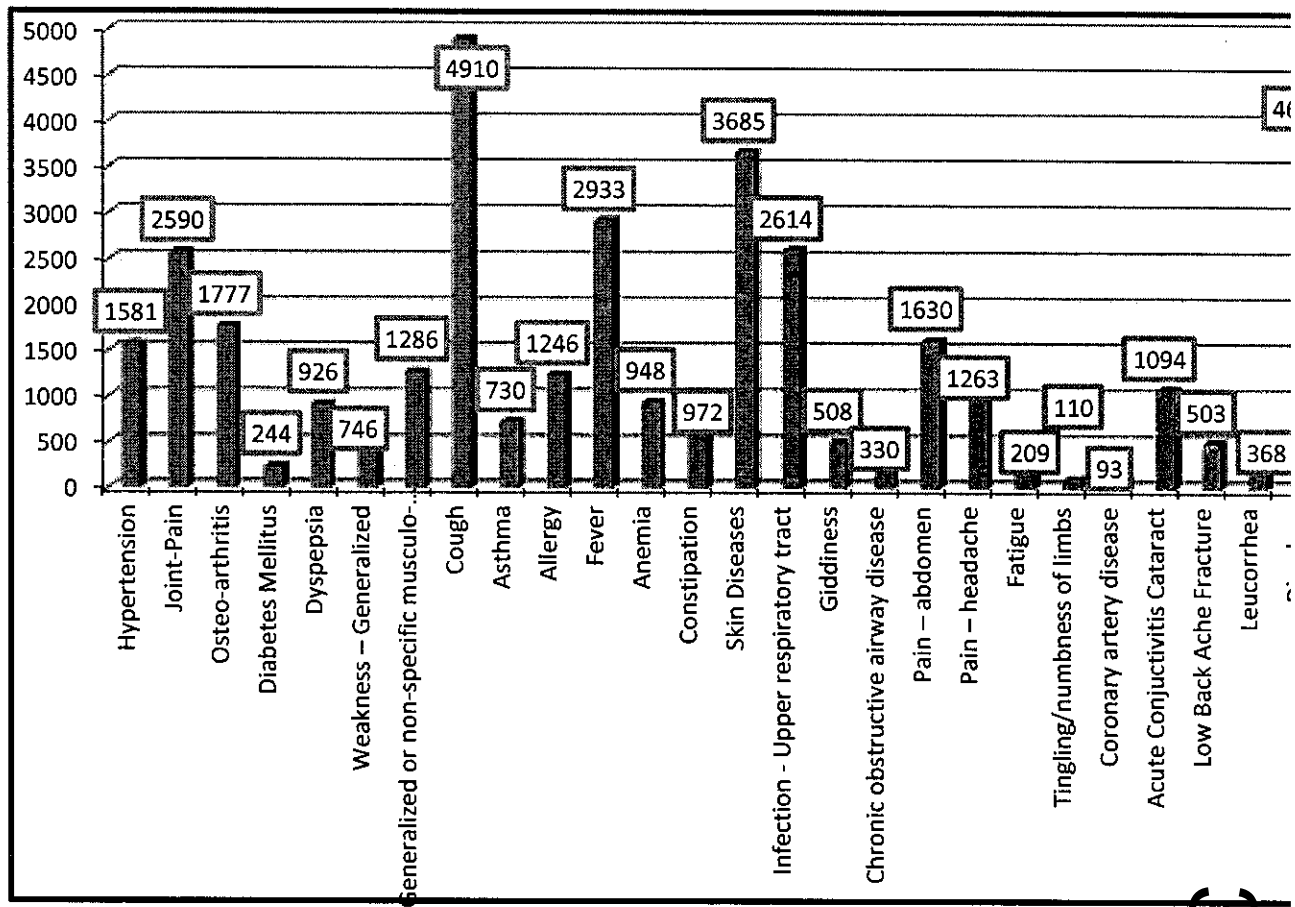
Sr.No	Villages Name	Total
1	Rangoli Gate	510
2	Luni	6,203
3	Wandh	1,272
4	Siracha	3,794
5	Vadala	1,513
6	Bhadreshwar	1,411
7	Tuna	743
8	Vandi	1,443
9	Rampar	519
10	Tunda	831
11	Tragadi	893
12	Navinal	1,732
13	Labour Colony	53
Total		22,256

4002

Diagnosis	MV	RC	Total
tension	664	917	1581
Pain	978	1612	2590
-arthritis	979	798	1777
tes Mellitus	72	172	244
psia	699	227	926
ness – Generalized	164	582	746
alized or non-specific lo-skeletal pain	430	856	1286
	2478	2432	4910
ia	292	438	730
y	266	980	1246
	1404	1529	2933
ia	525	423	948
ipation	406	566	972
iseases	1980	1705	3685
ion - Upper respiratory	899	1715	2614
ness	220	288	508
ic obstructive airway e	36	294	330
abdomen	703	927	1630
headache	589	674	1263
ie	93	116	209
ng/numbness of limbs	25	85	110
ary artery disease	16	77	93
Conjuctivitis Cataract	831	263	1094
ack Ache Fracture	333	170	503
rrhea	298	70	368
ea	2134	2524	4658
Total	**17514**	**20440**	**37954**

Mobile Dispensaries & Rural Clinics

MV & RC Disease specific pattern reported in the mont
April-18 to March-19





Health Cards to Senior Citizens

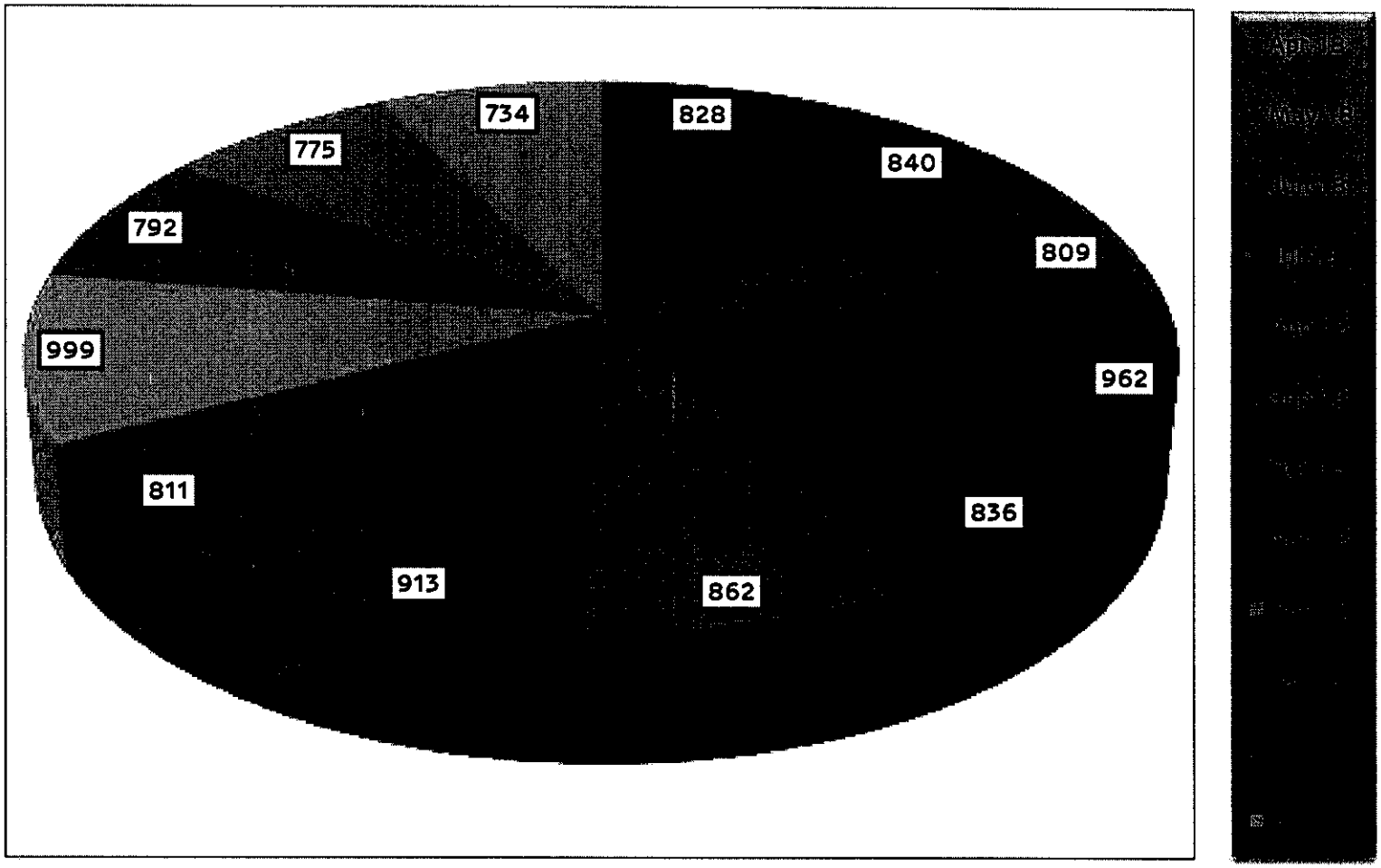
The major junctures of human life are - childhood, adulthood and old age. The first phase is we looked after by the parents and second phase is of self-reliant but the last phase is dependent one. The needs of old people are less looked after. When people become old, the start living a life of aloofness and solitude. Therefore, the Adani Foundation has started th Adani Health Programme for the aged to look after their health. To address the health car issues related to ageing, AF launched a 3 year long pilot project – 'Adani Vadil Swasthya Yojna on 20th February 2011 at Mundra and further extended the same for the next three years i.e up to 2017. Under this Programme, the individuals aged 60 years and above are benefitted Health Cards are issued to them with the purpose of providing adequate and timely treatment The families consisting of aged ones with a yearly income of Rs. 2 lacs or more get a Blue Card The Blue Card holders can avail diagnosis facility and treatment at a subsidized rate in th Adani hospitals, Mundra. The families with a yearly income of less than Rs. 2 lacs are issued Green Card. Green Card holder aged people get treatment for illness in Adani hospitals, Mundr with an aid up to the limit of Rs. 50,000/- within a period of 3 years.

During the year 2018-19, total 10161 transactions were done by 8599 card holders of 6 villages of Mundra Taluka. They received cash less medical services under this project Scheme is continue since eight years The third phase of this scheme was started in last yea The limit for the beneficiary was set to 30000/- within a period of 3 years. the senior citizen get emergency medical care at Adani Hospital, Mundra and they are referred to GAIMS

1004

r.Citizen card utilization status April-18 to March-19

Month	OPD/IPD
Apr-18	828
May-18	840
Jun-18	809
Jul-18	962
Aug-18	836
Sep-18	862
Oct-18	913
Nov-18	811
Dec-18	999
Jan-19	792
Feb-19	775
Mar-19	734
Total	**10161**



Suposhan

uposhan Project endeavors to address the issue of vicious cycle of Malnutrition and Anemia ith a life cycle approach that includes community based management. The project is more ocused on preventive measures.

bjective of the Project is to reduce occurrence of malnutrition and anemia. For successful nplementation of the project, "Sangini – Village Health Volunteer" plays major role in the roject.

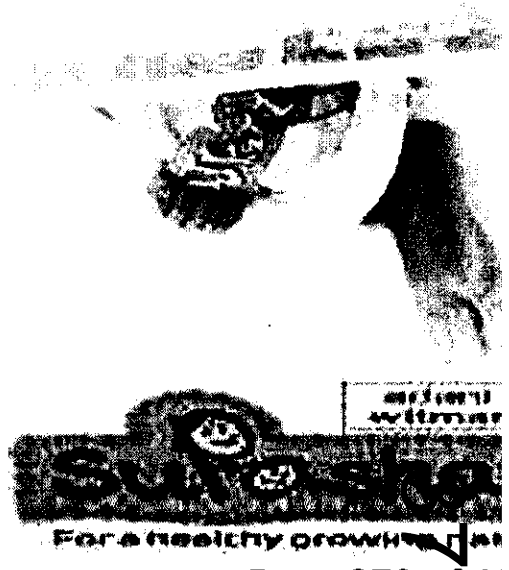
lundra : 61 Villages

itta : 7 Villages

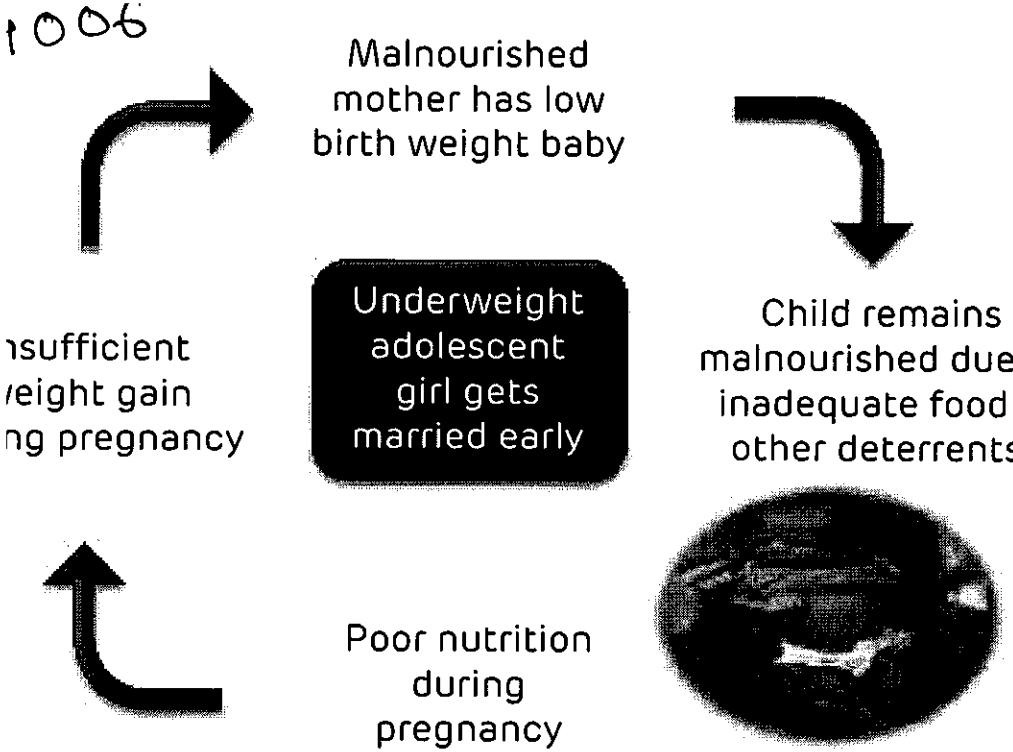
eneficiaries : 17025

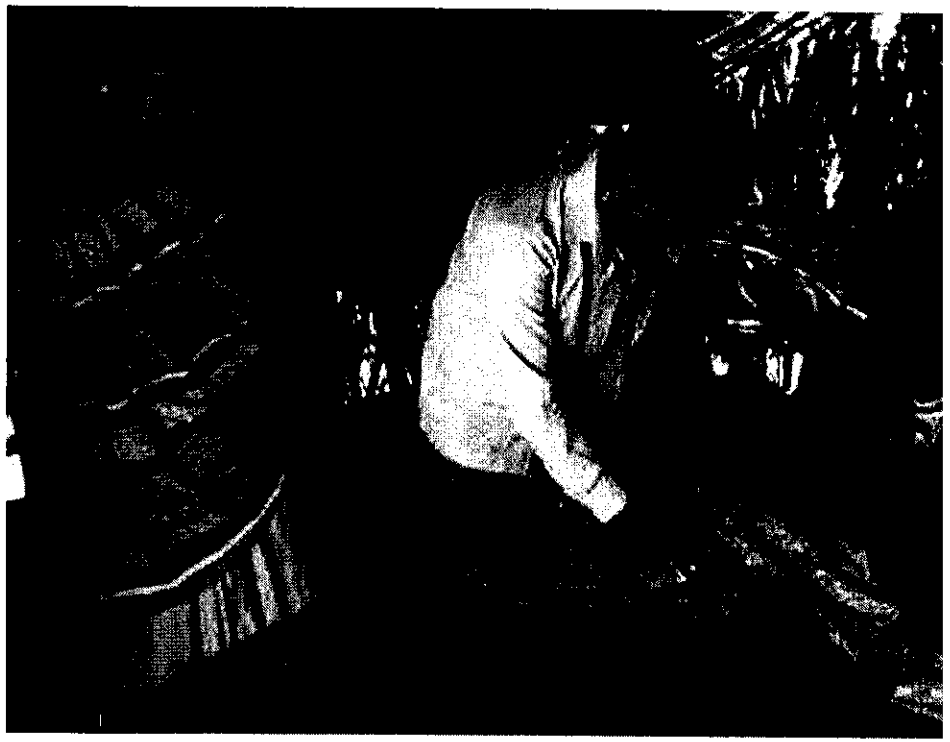


No	Detail	Mundra	Bitta	Total
1	Anthropometric(Children)	5901	647	6548
2	Adolescent – HB Testing	2950	395	3345
3	RPA – HB Testing	5884	1109	6993
4	SAM / MAM to NORMAL	104	35	139
5	FGD	737	228	965



1006





nild's entire life is determined in large measures by the food given to him/her during his/her first five years because childhood is the peri
apid growth and development. Nutrition is one of the most influencing factors in this period. Malnutrition substantially raises the risk
nt and child deaths, and increases the vulnerability to a variety of diseases in later life.

ject Suposhan is initiated with the Motive ....

b malnutrition amongst Children, Adolescent girls and Women in our CSR villages.

To reduce malnutrition and anaemia amongst Children 95 % & adolescent girls and pregnant & lactating women by 70 % in three years

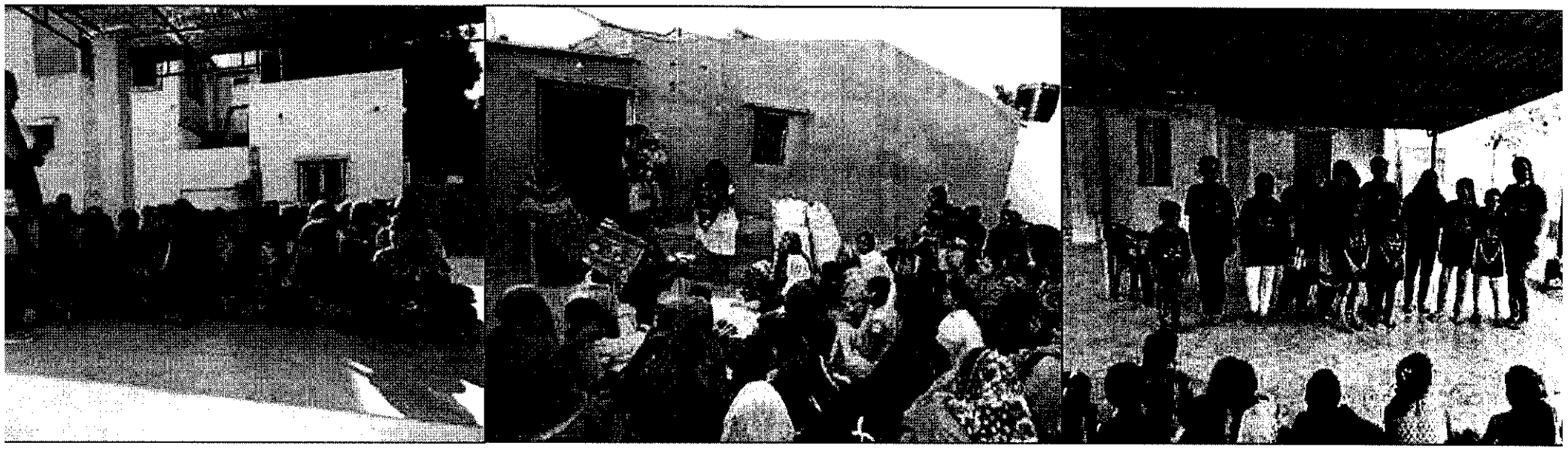
Reduction IMR and MMR

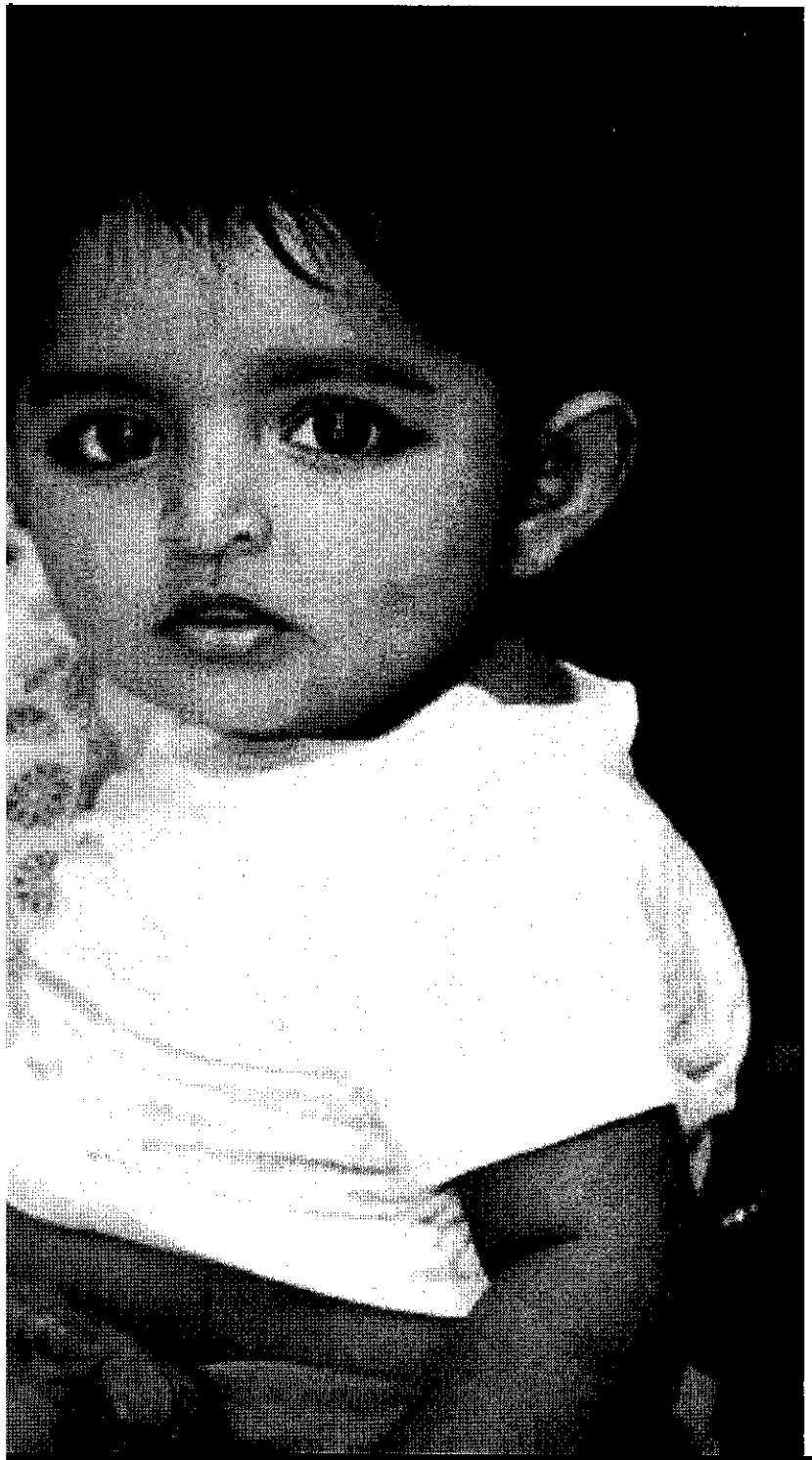
Support Awareness & Cover 100 % Vaccination taken by Child & women.

Interventions with ICDS and Taluka health Office

- CMTC Center started again after our written request to DDO Office
- Distribution of EDF(Energy Dense Food) by THO to 23 Children who are in SAM Category

ɔmmunity Engagement Activity



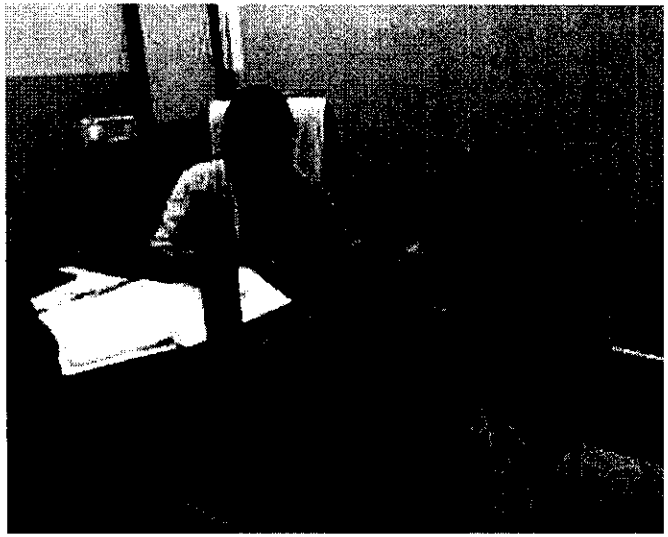


Suposhan Saptah

The birth of a healthy newborn child is determined by the health of the mot Mother's health, in turn, has its basis on her health status during adolescence. health of a society, as a whole, thus depends on the health of the women, in all sta of their lives. Adani Foundation acknowledges this field of health and aims to add women's health, through their entire life cycle. These efforts have culminate Project Suposhan, Adani Foundation Health initiative. Project aims to gene awareness in communities and facilitate the strengthening of the health systems healthcare delivery platforms, with a specific focus on the mother and child. Pro focuses on increasing health literacy in communities for mothers, child and adolesc health services through trained community health workers (Sangini), creating effec referral linkages to higher services. SuPoshan "Food Guidance Week" celebra systematized in all 61 villages in Mundra Taluka from 13th Nov – 20th Nov. Supos Food competition was organized in coordination with ICDS block and Supervis Sarpanch, ASHA workers and women leaders. The reason behind celebrating "Supos Food Guidance Week" is to make people aware about the importance of nourishmen that everyone is able to live healthy life. It involves community by · The importanc Nutrition and Balanced Diet · Importance of locally available food. · Preparing variety nutritious dishes, · Folk songs on nutritious, · Slogans with actions, · Spread awareness on different schemes, · Vaccination · Kitchen garden and · Exclusive B Feeding

)ecialty camp, General Camp & Surgical Health Camp

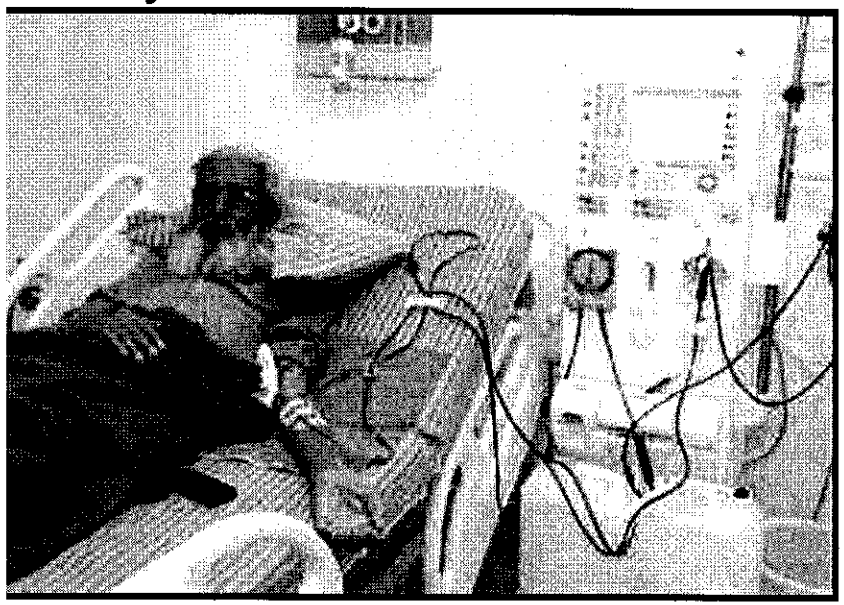
).	Place	Villages Name	Total Patinets
	Jat Malek Muslim & Maheshari Samuha Sadi At Mundra	Mundra	178
	Maleria Camp Sukhpar Mundra	Mundra	36
	Karva E Mustfa Hospital Health Camp	Mundra	50
	Mahesh Nagar Primary School	Mundra	190
	Muslim Jamat Samuh Sadi, Luni	Luni	40
	Rotary Hall, Mundra Surgical Mega Camp	Mundra	185
	Mithani Labour colony Health camp	Dhrub	80
	Shri Swaminarayan Mandir-Baroi Boad	Baroi	191
	Mithani Labour colony Health camp	Dhrub	105
	Jain Derasar, Oshwal Seri	Mundra	56
	Bava Gor Pir Uras Luni	Luni	525
	Mundra Kadva Patidar Samajvadi Health Camp	Mundra	92
	Nana Kapaya Primary school health camp with Rotry club	Nana Kapaya	170
	Luni Maheshwari Samaj Samuh lagan	Luni	517
	Bukhari pir uras	Mundra	106
	Activity Hall Gundala	Gundala	65
	Ashlambhai Labour colony Health camp	Dhrub	315
	sonal Bij Health Facility	Zarpara	2
	Ayushman bharat camp Zarpara Panchyat	Zarpara	19
	Kapilbhai Labour colony Health camp	Dhrub	140
	Surgical Mega Camp- Art-comace college	Mundra	109
	Ayushman bharat camp Art-comace college	Mundra	28
	Juna Bandar Health camp	Mundra	105
	Eye checkup camp with THO & Rotry	Mundra	388
	Vallabha vidyalay Health camp	Dhrab	485
	General health camp	Juna bandar	107
Total...			**4384**





4010

Jrinary stone – Dialysis Treatment



nking water of Mundra contains high Fluoride (amount of t). Hence, the proportion of patients with urinary stone d kidney failure is more . A project for patients who need lysis is thus initiated so that the poor patients can receive e treatment at subsidized rates in the nearby, well-uipped hospitals. The main objective of providing dialysis atment is to help the extremely needy patients to live a althy life.

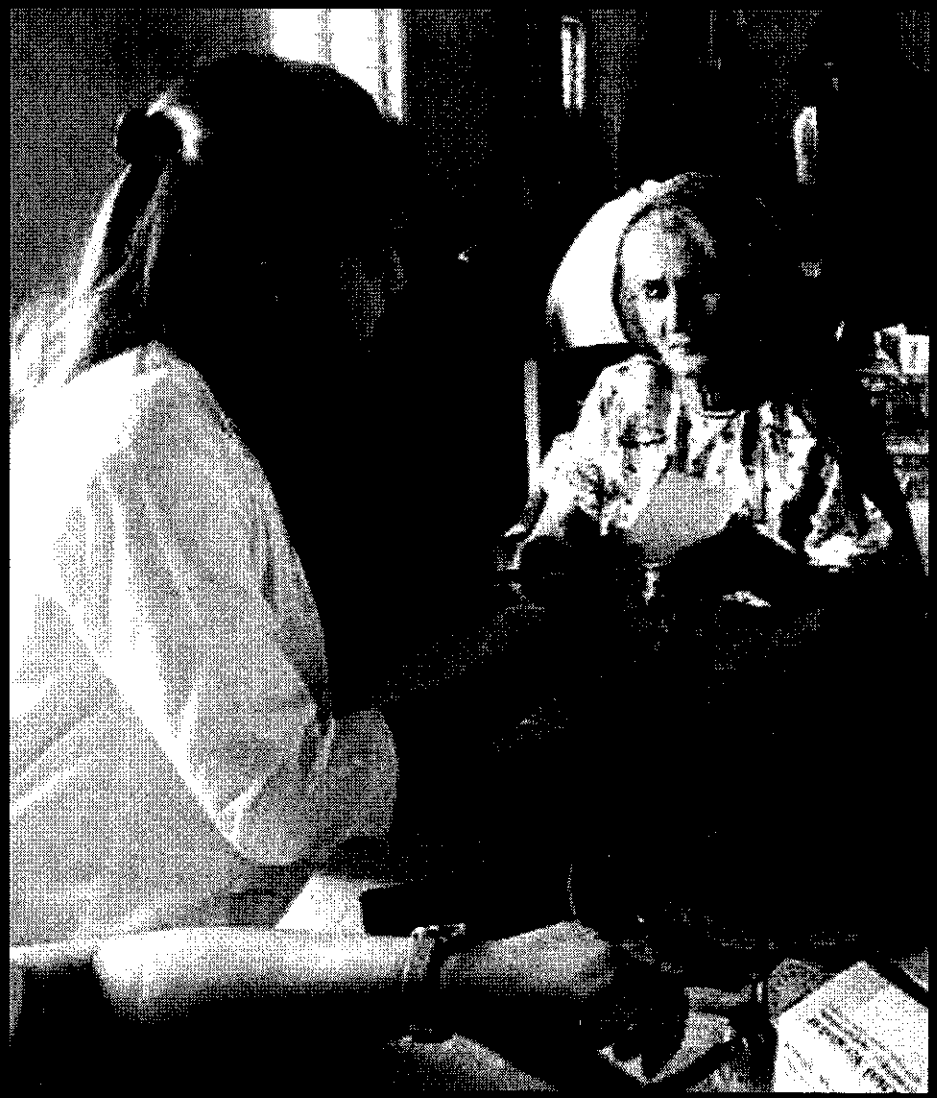
tal 5 Patients were being supported for regular dialysis vice in a week) by participatory approach.

Health Awareness season Programme

Awareness generation program play crucial role to creak and achieve social transformation for same to create awareness about Health and critical disease various kind of session had been organized.

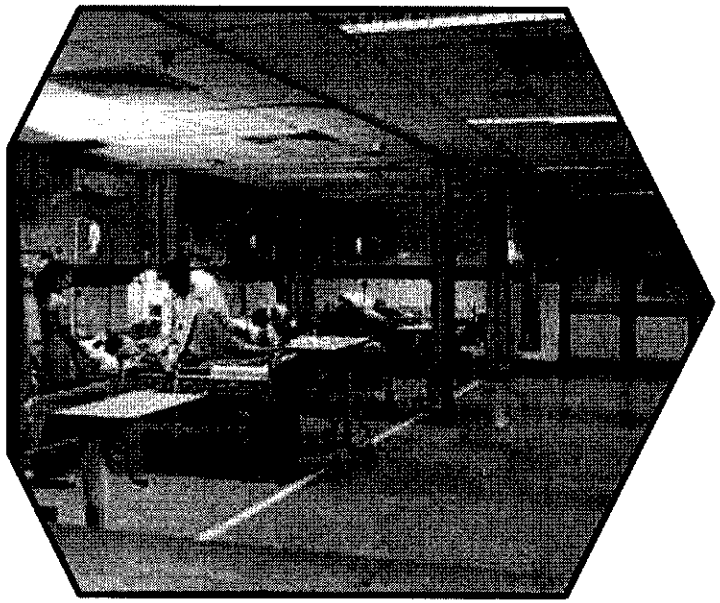
Sr.no.	Session Topic	Villages Name	Total Beneficiar
1	Woman Health	Bocha	35
2	Brest & Cervical Cancer & Woman Health	Lifra	20
3	Brest & Cervical Cancer & Woman Health	Desalpar	25
4	Woman Health	Dhrub	28
5	Woman Health	Mundra	125
6	Health & Hygine awareness session	Mota Kandagara	51
7	Anaemic & Suposhan	Samaghogha	50
8	Beast Censor Awareness	Nani Bhujpur	40
9	Gyneac Awareness	Mundra	28
10	Beast Censor Awareness	Dhrub	30
11	Health & Hygiene awareness session	Pragpar-2	20
12	Health & Hygiene awareness session	Wandh	155
13	Swain flu awareness season	Nana kapaya	390
Total....			987

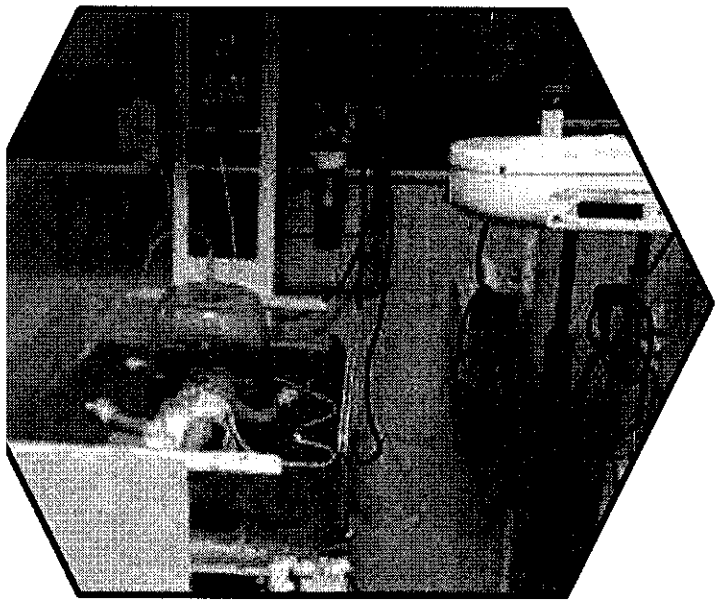
Community Health Bhuj



- **5274** Patient Care and Coordination
- **48** Health Camps 25000 beneficiaries
- **543** Dead body referred by carry van
- **272** Ayushman Gold Card facilitation
- **631** Needy patient support
- **3560** Mahiti Setu
- **1137** Students School health Camps
- **36417** Direct Beneficiaries
- **Covered 293 Villages**

4012





Gujarat Adani Institute of Medical Sciences

Gujarat Adani Institute of Medical Science is the first Medical College Kutch region. It started in partnership with Adani Group and Government Gujrat in the year 2009. This college was affiliated by the Medical coun of India in the year 2014 for the MBBS with 150 seats per year. Gujar Adani Institute of Medical Science is affiliate with the first digital universi "Krantiguru Shyamji Krishna Verma Kutch University". In GAIMS, current 750 students are studying, The GAIMS Medical College is situated in hea of Bhuj city on a large plot of 27 acres.

A teaching hospital (G K General Hospital) with 700 beds is establishe with GAIMS in which patients of Kutch are getting subsidized medic facilities. The Hostel facility is also available for the students in the campu only. The accommodation facility is given to the staff of GAIMS.



- Adani Foundation Team has initiated coordinatior with GKGH hospital since 2014 and established a reception area for the smooth patient coordination and preparation for the socia networking program.
- Adani Foundation organized **48 General Health Camps and Speciality Camps in various interior villages of Kutch in coordination with GKGH which created magical impact and benefitted 25000 patients.** Adani Foundation Bhuj Health team has also organized more than Eleven awareness camps and village level meetings at 293 villages of Kutch regarding services of GKGH.
- Dead body medical van – Dignity to death is one of the noble initiatives taken up by the Adani Foundation. If any death occurs in GKGH, dead bodies are shifted to the native village of the concerned in the Kutch District free of cost. Total 543 dead bodies privileged till now to different locations in Kutch.

014

atent Care and coordination



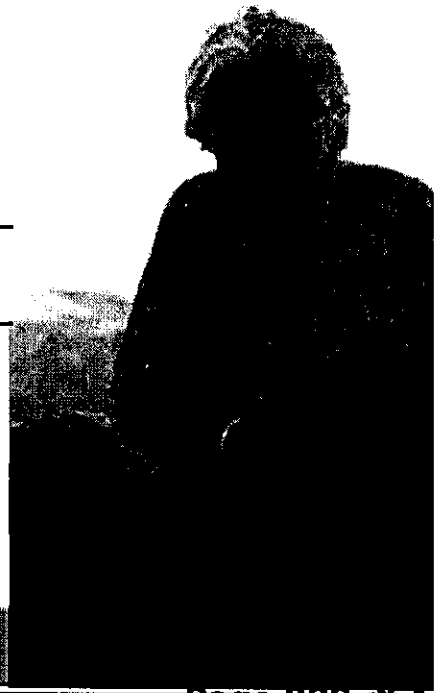
Sr. No.	Month	Total Patient Special Care in OPD and IPD level
1	April to June	1190
2	July to September	1507
3	October to December	1505
4	January to March	1072

In the financial year 18-19 specially care total 5274 patients from our sites Mundra,bitta and tuna,

ayushman Yojana

soon as Government announced for
ushman Yojana, we started process to
oll Golden card to the eligible families by
anizing camps at village level in each
uka

Sr. No.	Month	Total no's ayushman card enrolment
1	December	145
2	January	20
3	February	42
4	March	65
Total		272



Shakti Raksha – Preventive and Curative Breast and Survical Cancer

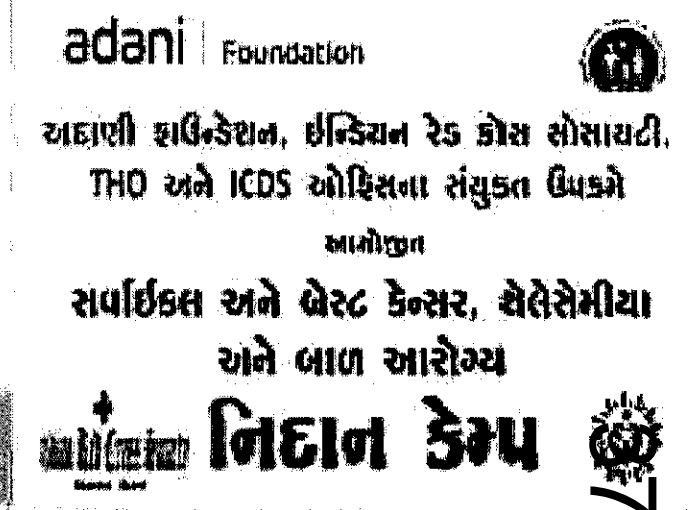


ani hospital Mundra, Taluka health office, Indian Red Cross society and Adani undation has initiated Shakti Raksha Project in which special gynecologist camp - detection of breast n survival camp and thalassemia testing for pregnant women CHC MUNDRA. In first phase we have covered all PHC and susceptible cases has en referred for pep test and mammogram at GKGH, Bhuj.

this project we have covered 103 villages of Mundra and Bhuj this year with rative measures. Most medicine will provided by Taluka health office.

e have covered total 624 patients and 120 cases were referred to GKGH Bhuj. In hich two cases diagnosed with breast lump (not malignant).

No	Place	Gaynec	Thelesmia testing	Total Beneficiary	GAMIS Refar Patients
1	Mundra CHC	62	34	118	25
2	Zarpara PHC	26	6	32	5
3	Moti Bhujpur PHC	54	15	86	18
4	Mota Kandagara PHC	42	11	53	10
5	Nani Tumbadi PHC	55	14	69	12
6	Vanki PHC	48	7	55	8
7	Ratadiya PHC	79	11	90	17
8	Bhadreshwar PHC	52	14	66	11
9	Adani Hospital Mundra	183	0	183	11
10	GEB PHC sub center	23	0	23	3
	Total....	**624**	**112**	**775**	**120**



4016



School Health Camp

``Safe child``

Adani Foundation is regularly organizing health camps in primary government school with support of GKGH. Current year we have carried out check up of 1137 students in Bhuj Taluka.

Month	Nos of camps	Nos of School students
August	1	219
September	2	308
November	2	410
December	1	200
Total	6	1137

3780

ırogya Saptah (8th – 14th August 2018)

lani foundation, Adani Hospital and GAIMS have Jointly Celebrated "Arogya Saptah" 8th to 14th August-2018 in Respect of 72t dependence of our country. Celebration included multi specialty camps, Workshops, truckers health check up, surgical camp o undation day and adolescent fair at different part of district. Collector, DDO, Minister, MLA and other dignitaries from NGOs had remaine esent. Objective of the program was to avail health benefits at GKGH and also at Adani Hospital Mundra and Approximately 4500 peopl ll be direct beneficiaries of the program. (2144 Direct beneficiaries)

ay	Date	Event Name	Detail about Event	Beneficiaries
	8th August 2018	Specialty Mega Camp	Specialist doctors i.e. Gynaecologist, Paediatrician, Nephrologists and general surgeon from GKGH had extended their services.	218
	9th August 2018	Cervical/Brest cancer Screening & Awareness camp	In SOS gada village screening camp organize with preventive awareness session. 17 women critically suggested for further check up at GKGH.	113
	10th August 2018	Haemoglobin Testing camp	Haemoglobin testing and awareness for de warming of 917 adolescent girls at Rapar village.	917
	11th August 2018	1. Surgical Mega Camp, Mundra 2. Roa accident Awareness programme, Nakhtrana	1. Specialist Doctors from Adani hospital Mundra and Medical officers of Adani foundation had extended their services. 2. On occasion of Adani foundation ay session for Road accident awareness and safety including primary health check up camp was organized at Nakhatrana.	223 172
	12th August 2018	Class-4 Staff CPR and first aid training	Class-4 Staff CPR and first aid training was organize in campus of G K general hospital for capacity building of staff and their motivation.	181
	13th August 2018	Adolescent fair, Gadhashisha	Adolescent fair was organized at Gadhashisha high school in which lady gynaecologist had cleared doubts of the adolescent girls and given information.	170
	14th August 2018	Asha Worker workshop	Capacity building workshop was organized for ASHA workers of urban and rural bhuj.	130

4018

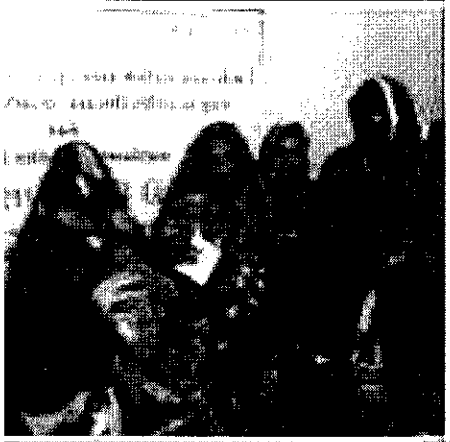
rogya Saptah (19th – 28th January 2019)

ani foundation, Adani Hospital and GAIMS have Jointly Celebrated "Arogya Saptah" 19th – 28th January 2019 in Respect of Republic da
· country. Celebration included multi specialty camps, Workshops, truckers health check up, surgical camp on foundation day an
olescent fair at different part of district. Collector, DDO, Minister, MLA and other dignitaries from NGOs had remained present. Objectiv
the program was to avail health benefits at GKGH and also at Adani Hospital Mundra and Approximately 4500 people will be direc
neficiaries of the program. (Direct beneficiaries – 1342)

y	Date	Event Name	Detail about Event	Beneficiaries
	19th January 2019	Workshop for Counseling for Overcome Exam fear.	Workshop Dr.Prutha Deshai (Psychiatrist) she explained about how to reduce Exam Fear and Stress.	250
	20th January 2019	Cataract Detraction Camp	Cataract Detection Camp organized at khavda village. In this camp 12 patients were referred in GAIMS hospital Bhuj for further treatment.	322
	20th January 2019	Surgical Camp Mundra	Specialist Doctors from Adani Hospital Mundra and Medical officers of Adani foundation had extended their services.	78
	21st January 2019	Medical Checkup Camp Swaminarayan Temple	All Shankhyogini Women from Swaminarayan Temple Bhuj were examined by gynecologist and Total blood check up was organized.	209
	22nd January 2019	Infection Control Awareness Training	Conducted Training on infection control and antibiotic medicine by Dr Gurudas Khilnani and Dr. Kashyap Buch .	170
	23rd January 2019	Anganwadi worker and Asha Training	Training of ASHA and Anganwadi worker conducted by Dr. Hashmukh Chauhan and Dr. Shardul chorasiya.	25
	24th January 2019	Multi Specialty Health Camp	Multi speciality Camp was organized at Rapar in which Gynec, Eye Specialist, physician and orthopaedic Doctors had extended their services	203
	25th January 2019	Medical Checkup camp of journalist and family	This unique initiative covered all journalists of Kutchh for health check up and awareness sessions	86

Glimpse of health week



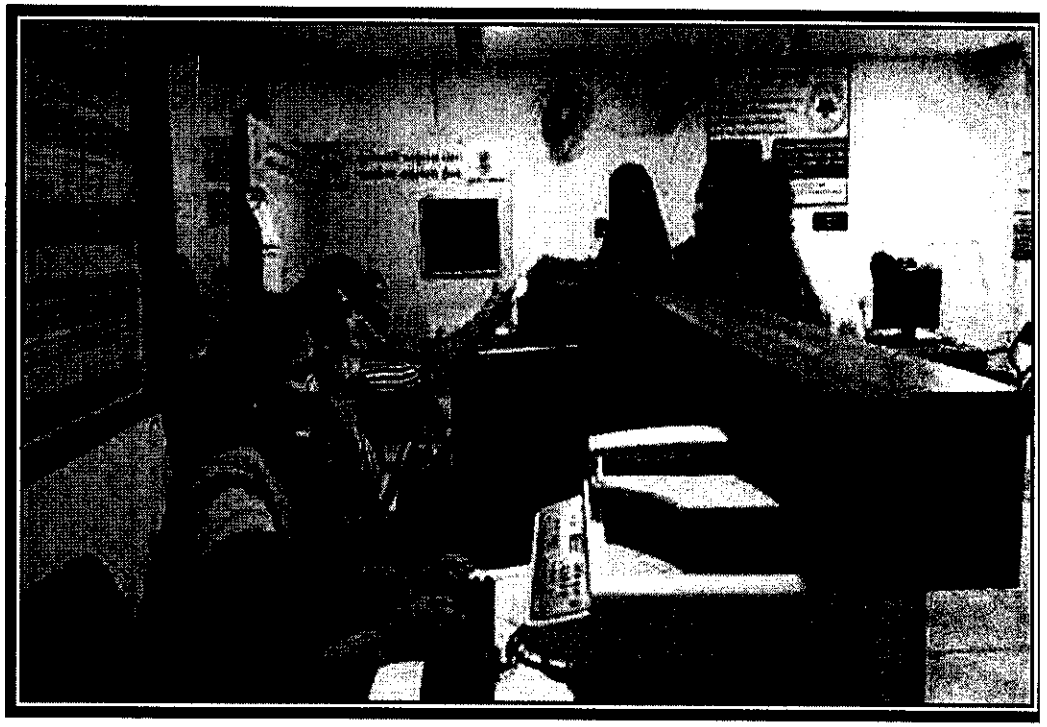






4020

Mahiti Setu





Sr. No.	Month	Total
1	November	814
2	December	814
3	January	764
4	February	889
5	March	279
		3560

"Mahiti Setu"

Objective of Community resource center is to leverage the Government Schemes and making them accessible to community – It's a sustainable community connect!

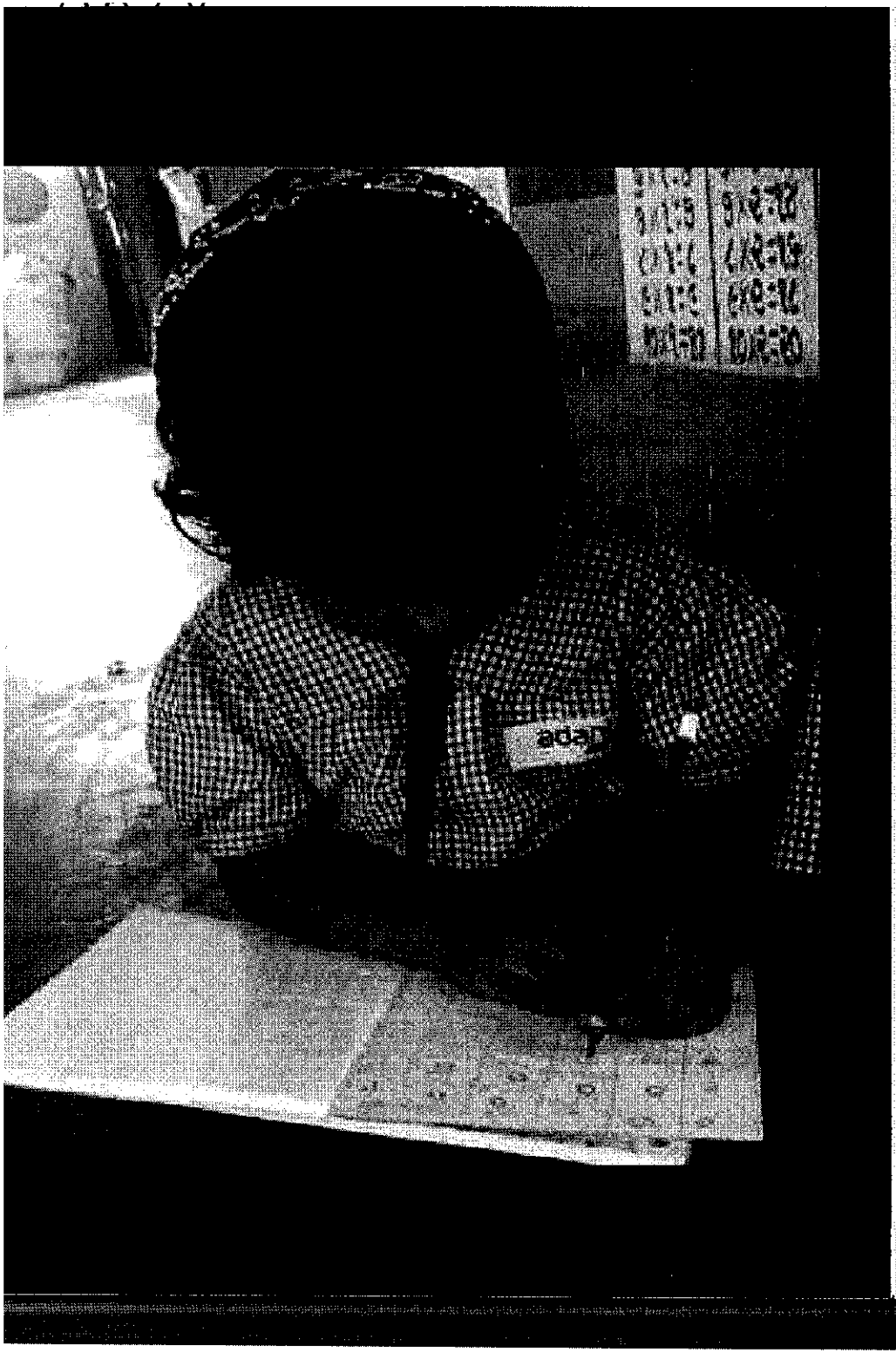
Mahiti Setu has created trust and easy access to various government schemes – outreach will increase with time and awareness.

3724

SUSTAINABLE LIVELIHOOD DEVELOPMENT PROGRAM

Empowering lives and broadening their scope for economic opportunities, Adani Foundation's initiatives introduced under 'Sustainable Livelihood Development Program', have been founded on community based approaches. In the villages at Mundra Taluka, several communities are economically side-lined and weaker that depend on a sole income source or are unemployed. Sustainable livelihood projects have been launched to cater financial independence through building local partnerships, providing diverse livelihood avenues, inculcate the attitude to establish savings, equipping to earn and updating local skills by making use of existing resources to encourage self-reliant lifestyles. Participation is encouraged by launching specific projects for fishermen communities, farmers and cattle owners, youth and women.





Fisherman Amenities work

- 391 Students : Education Support
- 134 Stunners : Adani Vidya Mandir *
- 16 Fisherman : Alternate livelihood
- 78 Fisherwomen : Linkages for schemes
- 1312 Fisherman : Community Engagement
- 1086 Fisherman : Potable water provision
- 6261 Mandays : Mangroves Plantation *
- 231 Fisherman : Capacity Building
- <u>3280 Direct Beneficiaries</u>

166 Fisherman for mangroves planation

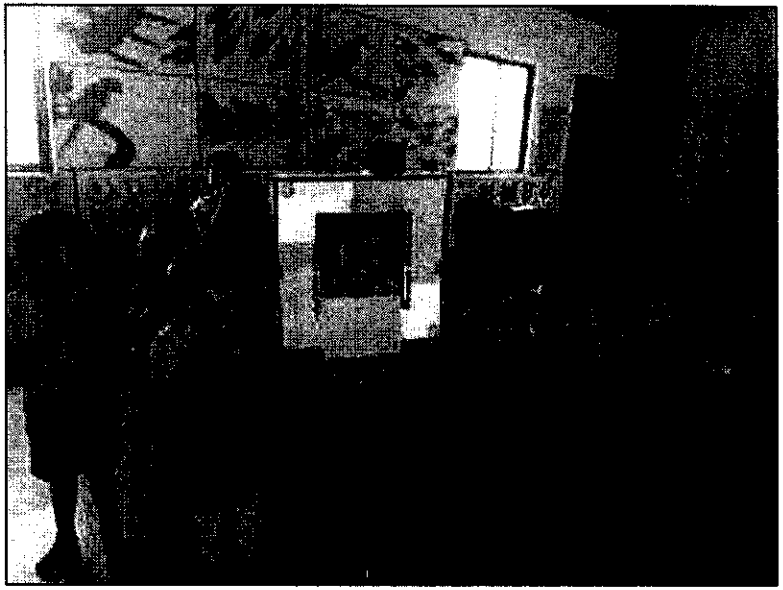
AVMB beneficiaries can count seprately

4028

Education

Education is one of the most important stepping stones to bring about a unified development in any community. The Adani Foundation, through its rigorous surveys and assessments, could understand that it was education which should be taken up to bring about a real change in the status of the fisher folk communities. Following are some of the major education initiatives taken up by the foundation:

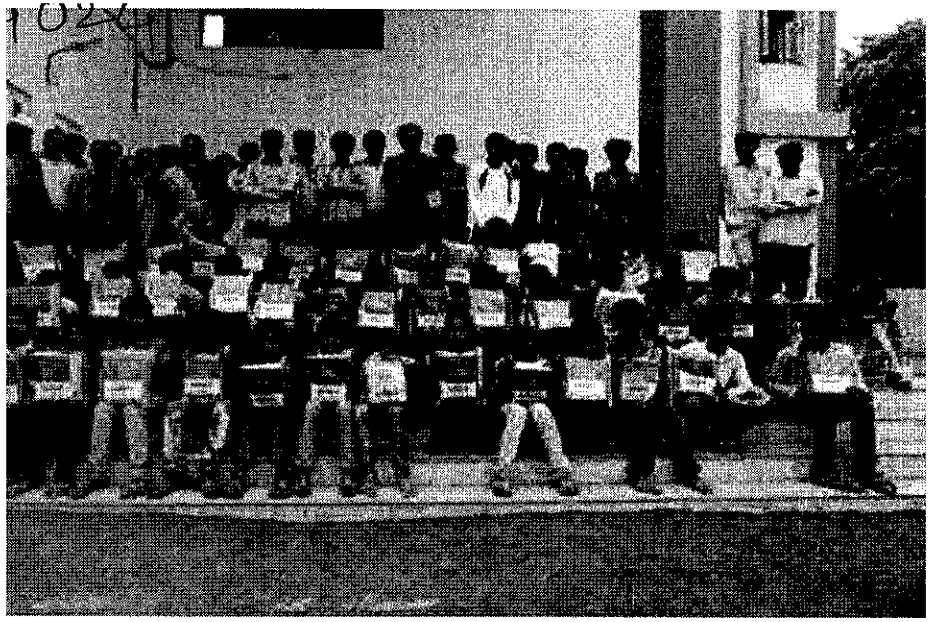
Balvadi		
Sr.	Village & Bandar	Children
1	Juna bandar	55
2	Luni	25
3	Zapara-Chhacha	27
4	Bavadi bandar	30
	Total	137





Vidya Deep Yojana

A great amount of efforts were put in developing school preparedness programmes by empowering 'Balwadis' at Fisher folk settlements. Under the Machhimar Vidya Deep Yojana, Adani Foundation constructed four Balwadis for kids between the age group of 2.5 years to 5 years at different settlements. The programme is inclusive of nutritious food, awareness on health, hygiene, cleanliness, discipline, regularity and development of basic age appropriate concepts.

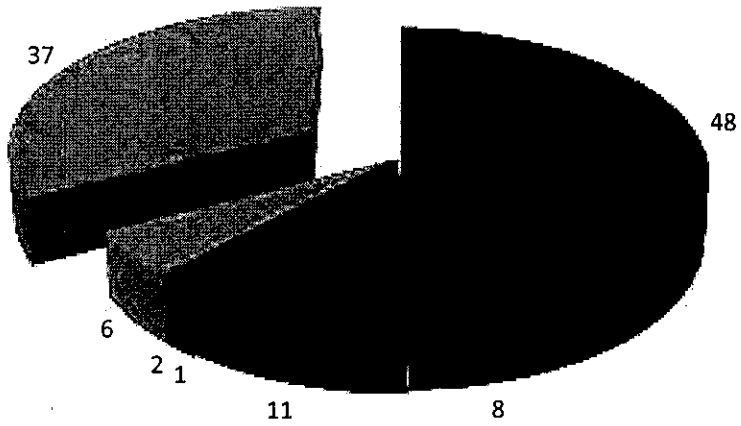


Vidya Sahay Yojana- Scholarship Support

rticipatory scholarship support for fisherman children udying in SMJ high school Luni and to above 12th andards Students . 80 percentage support given by Adani undation and 20 percentage support by parents! They llingly agree for the same.. We also encourage them for chnical education for good job opportunities.. Total 66 udents has been benefitted.

is year 68 students were given book support and 8 udents were given cycle support for higher secondary udy.

Education Analysis



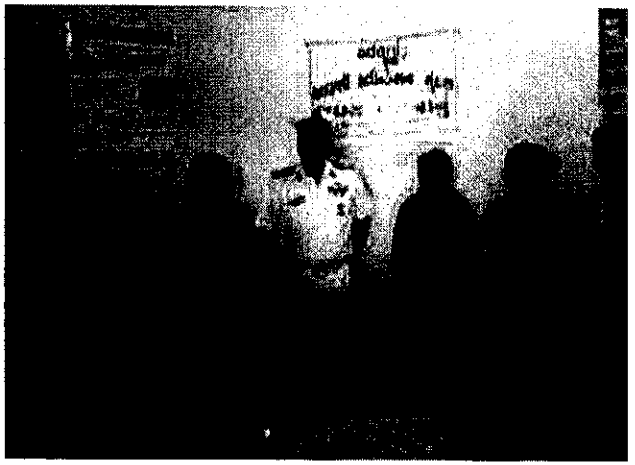
Rather than learn their children, fishermen joined them in their traditional business due to lack of awareness. But Since Adani foundation has started various kind of education initiative like Balwadi , Scholarship support, Cycle support, Book support, free education in AVMB, Transportation support, skill development training ,we bring them in the Ocean of education. By the job placement and motivation we can transform 37 fishermen youth life who have good job and others one continue their further study as below.

achhimar Arogya Yojana

althy person can work well and earn for his family. Hence it is necessary to provide medical ities to cure and prevent them and to provide then the treatment of diseases prevailing ng the people specially women; children and elderly person, especially due the lack of nced nutritious diet.

ile Health Care Unit - the mobile dispensaries have been run by the Adani Foundation since 9. The mobile dispensary is available not only in the Vasahats/Settlements but also near the t where the fishermen, can avail the facilities as and when needed. **Total average 560 ermen were benefitted by Mobile Dispensary during last half year**.

part from this, a number of subsidiary initiatives such as health awareness camps, medical heck-ups, etc. are conducted by the Adani Foundation at frequent intervals, to provide the sher folk community with the much needed and required information and assistance.





Medical Financial Support –Adani Foundation has extended financial assistance to more than **14 financially challenged patients** from the Fisher Folk Community in case of medical rgency during this year.

Health Card for Senior Citizen Project – This is one of the major and prominent and the most innovative project of the Adani Foundation. Under this scheme Health Cards were given to ne to Senior Poverty Stricken Citizens to provide them financial support to combat with neir health related needs. The project for the senior citizens is popularly known as **Vadil wasthya Yojana and till date 350 senior citizens** from fisher folk community are enrolled in ne scheme. Most of them keep these cards in their wallets with other important documents nd cards.

1028

achhimar Shudhh Jal Yojana

; scheme of providing potable water has helped in reducing drudgery of women and contributed largely towards general lbeing.

:er tank platforms have been constructed and tanks have been up in order to provide clean potable drinking water to the ımunity. Daily 1,18,000 Litres of water is supplied at different :lements.

Potable Water		
r.	Vasahat	Total liters/ day
l	Juna Bandar (By APSEZ)	30,000
2	Luni Bandar	15,000
3	Randh Bandar	25,000
4	Bavadi Bandar	15,000
5	Veera Bandar (By AKBTPL)	10,000
6	Ghavarvaro Bandar (By AKBTPL)	8,000
7	Kutdi Bandar (By MSPVL)	15,000
	Total	1,18,000

ıkages with various Departments

:dination with coast guard, Marine Department and Fisher folk ;mooth Port operations Regular Meetings with fisherman for ıus innovate technology for fishing

Machhimar Kaushalya Vardhan Yojana

Apart from providing formal education, special programmes we conducted to enhance youth employability. Based on the need assessment, a number of trades were introduced by the Adani S Development Centre in Mundra, where the fisher folk youth cou join and get vocational training for a number of technical and nc technical skills.

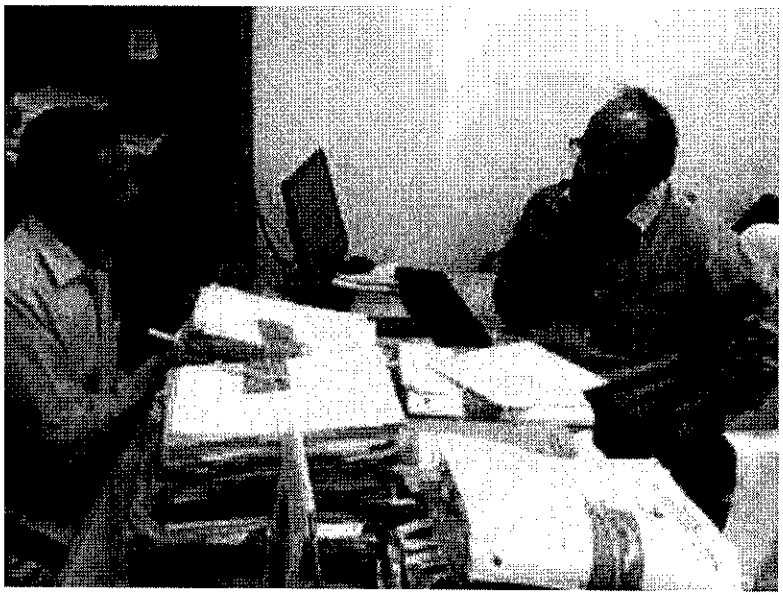
Sr. No	Course Name	No of Students
1	Mud work Zarpara	45
2	Dori work, Navinal	20
3	Checker Cum RTG Crane Operator	03
	Total	**68**



Machhimar Ajivika Uparjan Yojana

e 'Ajivika Uparjan Yojana' was implemented to promote and support ernative livelihoods among the Fisher folk communities during the non-hing months. The Foundation introduced 'Mangrove Nursery Development d Plantation' in the area as an alternate income generating activity for the ople of the region. Both men and women received training on Mangrove ntation, moss cleaning, etc. as per requirements. The Foundation provided em with employment equivalent to 6261 man-days. In addition to this, ployment worth of 35787 man-days has been provided till date. The undation has also supported Pagadiya fishermen as painting laborers by oviding them with employment and job in various field.





Innovative Project : Solar Tent Dryer

CIFT (Central Institute of Fisheries Technology) has been conducting a prototype study on Solar tent dryers with improved technology at their head quarters in Kochi, which is expected to be completed within a span of another three months. They may be able to upscale or replicate the technology once the study is completed. In all probability, they will provide the designs for the solar tent dryer for drying Bombay duck and / or Acetus Indicus with financial estimate by the first quarter of next year. Meanwhile the team from the HQ and Veravel centre can visit Mundra region for initial site visit and feasibility studies. CIFT requested our team to visit CIFT HQ at Kochi during coming months to assess the prototype model and understand more on other CIFT developed hybrid dryers

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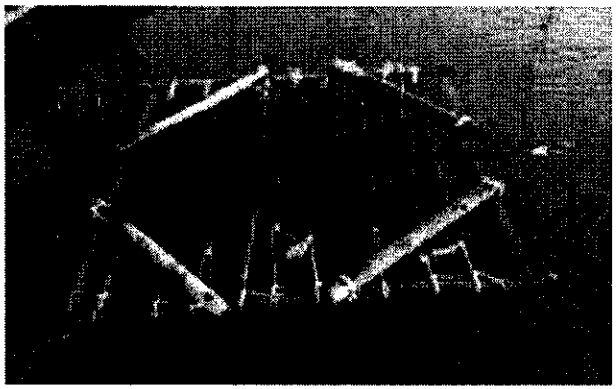
Fisherman Cricket league



Adani foundation, MUNDRA organized Cricket Tournament " Sixth Adani Premiere League among Fishermen community to promote healthy Sportsmanship and harmonically transparent relationship. The Tournament had been played for 13 days at SVC (Shant Vihar Cricket Ground) by 6 matches per Days with full of Audience, Total 65 Teams with 780 Fishermen youth were participated with 550Rs. Contribution per teams from Mundra Anjar and Mandvi Block. The Final Match was played on 9.07.2018 and Pir Saheb (Religious Mentor), Rakshit sir (Executive Director- APSEZ), Dr.A.k Vatsani (Deputy collector ,Bhuj) Mr. Mahesh Dafda (Assistant Director of Fisheries, Bhuj), Mrs. Pankt Shah(Unit CSR Head) ,AF staff and Fishermen Leaders remained present. The Final Match was so interesting and Salaya team becomes winner over Luni Team and more than 1200 Audience from various villages were present. The winner's trophy, Runners-up Trophy, Man of the Series, Man of the Match, Best Baller, and Best Bats-Man Trophy has been given to the Respective Teams and players. The 25000Rs, 15000Rs, 2100Rs, 1100Rs, and 500Rs 500Rs Prize given to the above Respective Teams and Players from the Teams contribution.

ea weed culture

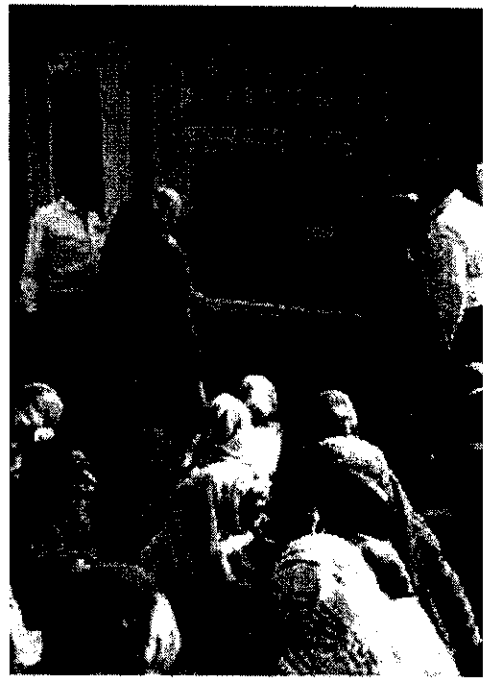
weed culture as alternate livelihood for fishermen
been started as pilot base with Vivekananda
search and Training Institute.
create Fishermen alternate livelihood seaweed raft
e been installed at Juna Bandar. After successful
ults we will support for more raft to fisherman as off
son employment.
ural sea weed which is available at Luni coast and
ng obstacle in fish net is collected and linkages with
TI for selling.





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orting Sieve : Time Saving for Fisher Women



uring bulk fishing catch fisher women remain engage whole day to sort out fishes by hand this is time nsuming and panic for them so, we provide wooden sorting sieve to sort out small fishes, which make em free from finger pain and time saving.

Jani foundation Mundra, Fisheries Department GOG & CMFRI(Central Marine Fisheries Research stitute) had organized sessions for alternate livelihood for fisher women, importance of savings, bank count and also usage of sieve for Fish sorting work along with 78 wooden sorting sieve distribution. . Imelda Joseph, head & principal scientist of CMFRI, Cochin, Dr. Diu incharge of CMFRI, Veraval and eir team had given guidance to all fisher women of Juna Bandar for alternate livelihood possibilities th examples.

isherman Ramatotsav

Development of physical and mental Development of youth Ramotsav week Program was organized at various Vasahat i.e nabandar, Luni, Zarapara, Bavdi Bandar and Navinal for 1st to 10 th standers .



This year Total 485 children were participated and all were facilitated with school bag as well as 1st ,2nd and 3rd prize from each game.

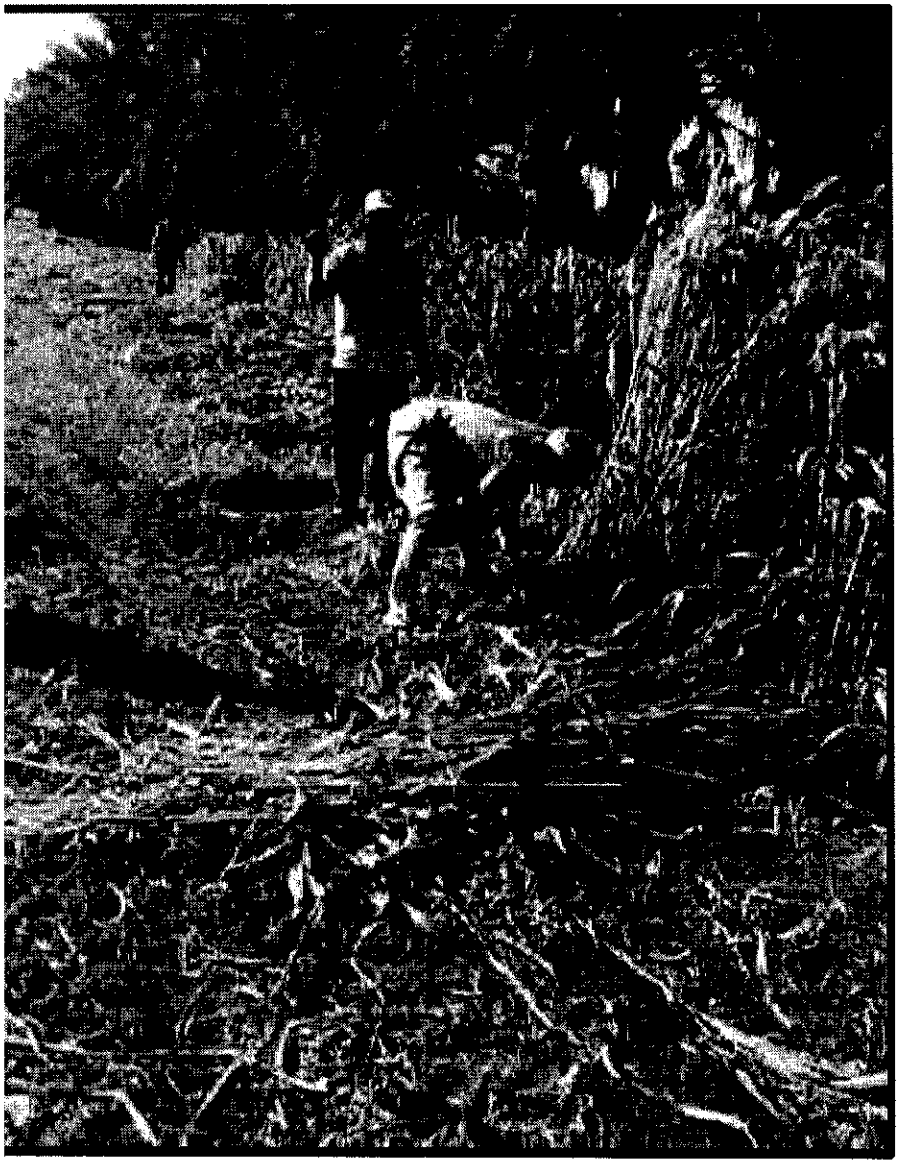
Fisherman Student Ramtotsav Programme-2018-19					
Date- 07-02-2019 to 16-02-2019					
Sr.No	Fishermen vasahat	Date	Students	Attendants	Total
1	Navinal	07-02-2019	47	150	197
2	Zarpara	08-02-2019	94	250	344
3	Zarpara(Chacha)	08-02-2019	81	300	381
4	Bavdibandar	11-02-2019	69	200	269
5	Lunibandar	12-02-2019	60	200	260
6	Junabandar	15-02-2019	134	350	484
Total			485	1450	1935

Agriculture & Animal Husbandry



- 755 Acre – 164 Farmers Drip Irrigation
- 380 Acre – 212 Farmers Maize Cultivation
- 56 Acre - 140 Farmers NB21
- 24 farmers Organic Farming
- 21 Numbers Bio gas Provision
- 387 IG Support and Sadhay Sahay
- 142 Central Govt. Scheme Beneficiaries
- 154 Pension Scheme Linkages
- 132 Women Empowerment Project
- **1364 Direct Beneficiaries**

Drive for Technology to use in agriculture



Adani Foundation puts efforts in Mundra block for consistent betterment in livelihood sector. The organization has carried out remarkable activities in the agricultural and animal husbandry sectors.

- We have initiated Programme for Awareness of Farmers in collaboration with KVK. The outreach is approximate 80 farmers of 5 villages
- The purpose of this project is to initiate village wise integrated agricultural & allied development for sustaining agriculture and socio economic situation of farming community of Mundra block.

Agriculture Programme		
Sr.no	Village Name	Member
1	Zarapara	40
2	Zarapara	42
3	Siracha-	26
4	Navinal	22
5	Dhrub	141
		271

4032

Fodder Cultivation

ıe organization provides fodder during the time of scarcity and the last 3 ɔnths of summer every year. During this period, fodder is regularly sent every village with the help of the local people. This has given stability the families who earn their livelihood through animal husbandry.

order to meet the demand of fodder, the Adani Foundation purchases it ɔm the regional farmers. This gives them fair rates in return.

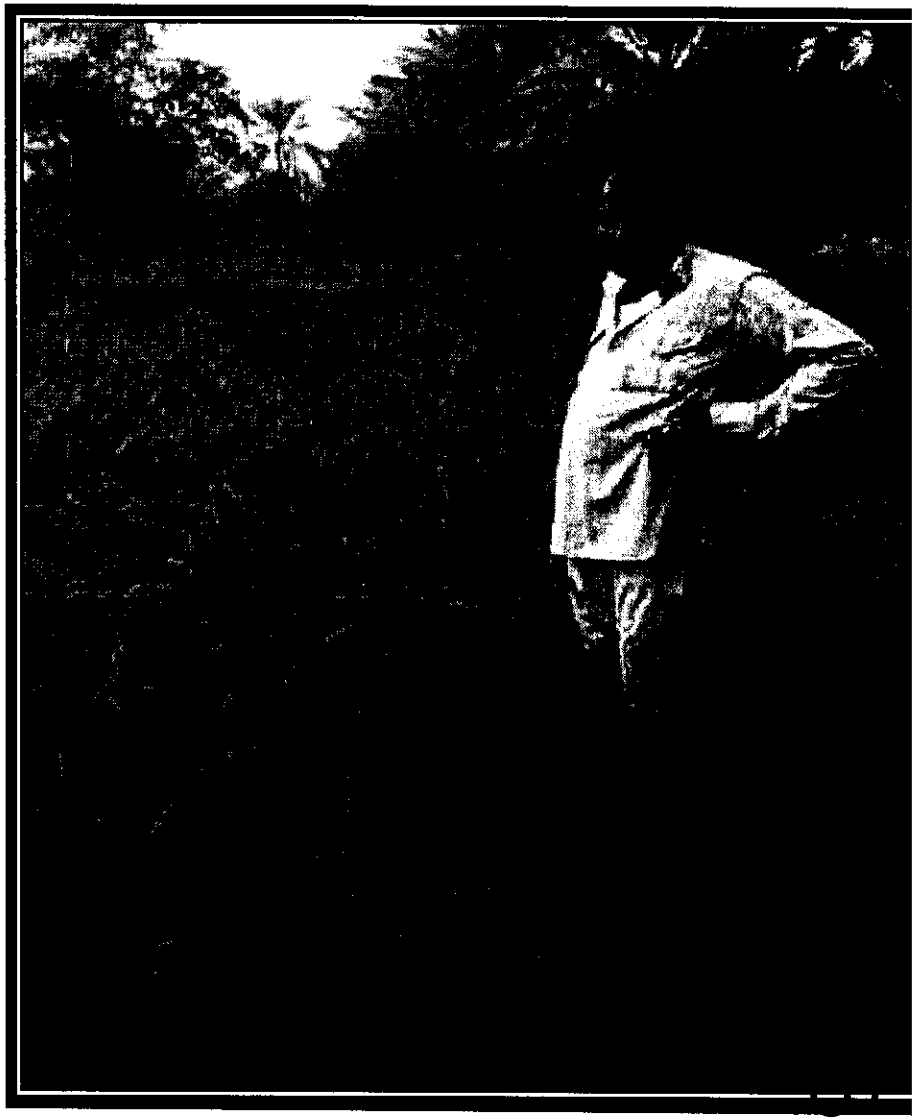
ıis year we have given 1,78,000 man fodder worth Rs. 402.00 Lacs ıproximately at Mundra, Lakhpat, Anjar, Abdasa and Rapar Taluka

ıt, For this Critical Condition some Sustainable Solution is required to ıd out

ıdder is the main issue as rainfall is very less in this region. Adani ıundation is working intensively in direction of fodder sustainability in ree ways

Individual Fodder Cultivation Support – NB21 demonstration – Supported 140 Farmers of Dhrub and Zarpara

Drip Irrigation support Linkages with Fodder – First phase we will support drip irrigation in 22 villages and this linkages will help to convince them for NB21 at least in one acre land



. Village Level Fodder Cultivation : Participatory Approach

(a) Winter crop Cultivation – Support to 180 Individual (Supported for seeds of Makai for 180 acre land)

(b) Winter Crop Cultivation – Support to Group of Farmers (200 acre of land with 32 farmers)

Ve are also planning for grassland development at Village Zarpara and iracha in Gauchar with mutual understanding with Gram Panchayat.

Vin win situation of this project

Cost saving initiative: Financial saving by Rs. 7.23 lac in three months. (15%)

Assured of green fodder and supply

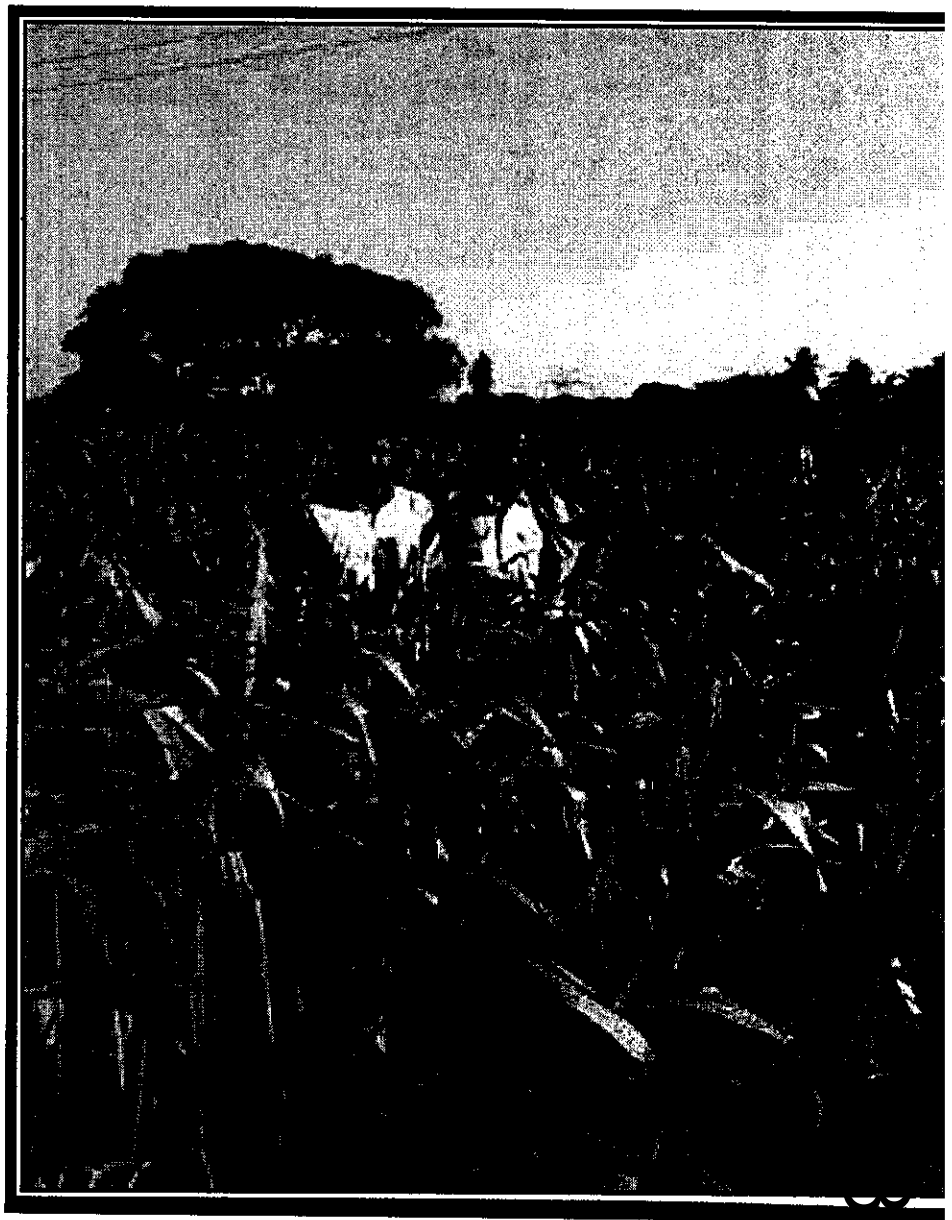
Empowerment of farmers by providing livelihood

Increase of Green fodder cover

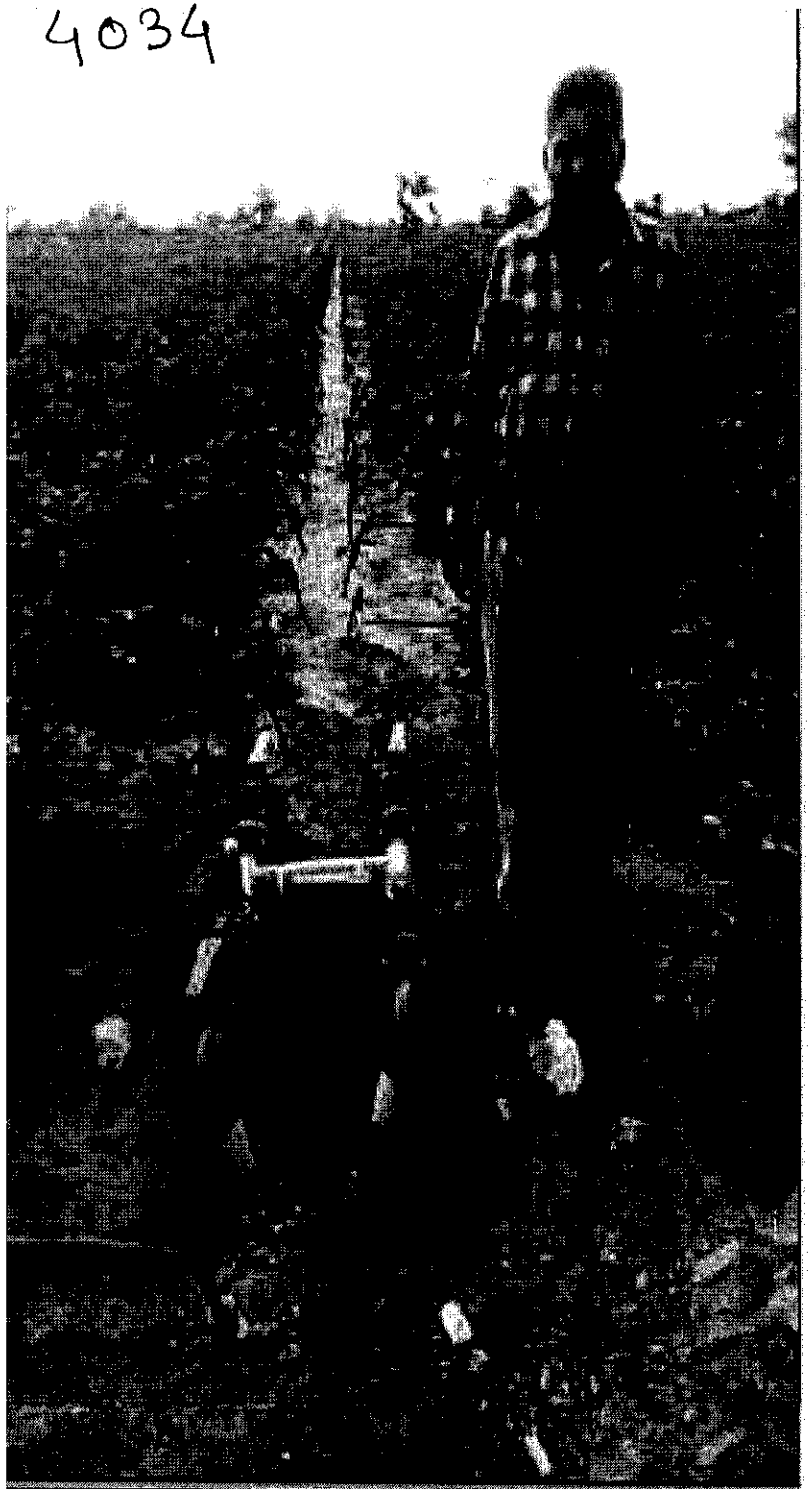
Milk productivity enhancement

Fulfilment of double the farmer income concept of Govt. of India

Crop rotation increases the soil fertility



4034



PROJECT "DRIP IRRIGATION"

- **Basis of Requirements of Drip Irrigation**

The main source of livelihood being agriculture, the cultivators tend to use more more underground water for irrigation. Underground waters have gone very hi saline. The use of such water for irrigation has made the soil also saline and the yields have dwindled.

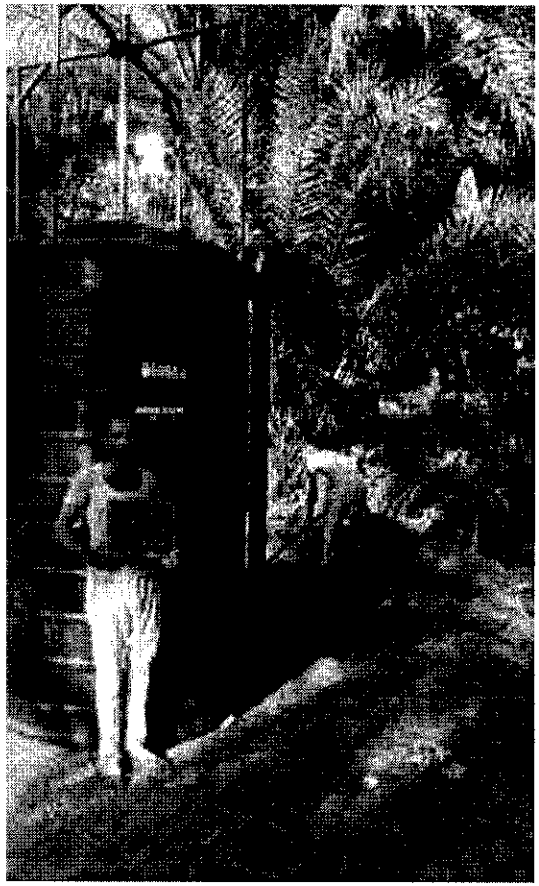
- **Process of Drip Support**

Farmer have to applied in the prescribed form of Adani foundation with photograph.
Inspection and verification will be by AF representative.
Ration card, work order of G.G.R.C, 7/12 certificate and all bills must be attached.
Farmer will be informed by telephonic to have form query.
Primary information about farmer land will be received by telephone.
Farm visit within 10 days of after received of application and verified the installatio system as per map and material as per bill will be checked and get farmer feed back.
Verification report submitted to account office.
Payment within 20 days if all document is complete through net banking.
Farmer economic study after our support.

- **Villages of Drip Support**

Keeping in view the situation and request comes from community, once again **irrigation support is planned in three phase. As a part of first phase, we considering 22 potential villages. We have covered 164 farmers and 755 acre irrigation area.**

3713



Biogas

Biogas is a clean, non-polluting and low cost fuel. It contains about 55 to 75 percent methane, which is inflammable. Bio gas can be produced from cattle dung, human waste and other organic matter by a process called "Anaerobic digestion" which takes place in a biogas plant. The digested effluent, which comes out of the plant, is enriched manure.

The Multiple benefits of the biogas have changed many lives in rural areas. During this year 21 plants have been constructed. We are providing support addition to Government support to the beneficiary. (Under bio-gas scheme of government, the total cost is Rs.33, 500 out of which Rs.15, 000 will be granted by the government and out of the pending amount of Rs.18, 500 sum of Rs.10, 000 will be contributed by the Adani Foundation. The beneficiary will have to pay only Rs. 8, 500). Beneficiary women use the time, saved from cooking and fuelwood collection, to take up an additional economic activities.

epresentation of Adani Foundation was invited as Guest of honor by Krishi Vigyan Kendra ı 'Scientific Advisory Committee Meeting" . Main Objective of meeting was to study about resent agricultural Scenario of Kutchh and new CROP Patter. Representative from ICAR ;OG and Various NGO were present. We made presentation of our activities for sustainable griculture in this forum.





Agriculture Fair

Adani Foundation has Participated in District Level Agriculture Fair for three days in first week of January. We had show case various activities of Adani Foundation in field of Fodder Sustainability, Bio Gas Support, Cattle care, water conservation and Biodiversity.

Adani Foundation was felicitated award for " To Develop Unique Model for Fodder Sustainability in Kutchh".

State Minister Mr. Vasanbhai Ahir has inaugurated this event. By this platform we could able to connect with approximately 12000 farmers of Kutchh District by providing guidance for NB21 and Maize Cultivation. We have also given information about Saheli Mahila Gruh Udyog and could also our products i.e. Eco Friendly bags, Banana Wafers and Washing powder.

Tissue Culture

ate is the Amrut Fal of Kutchh and Mainly best quality available in some villages in Mundra Taluka. o maintain quality uniformity Adani Foundation is planning for cultivate 4000 tissue cultured lants of elite varieties to the farmers of project area. For this, we will select best offshoots of elite lants from farmers fields in coordination with farmers groups. The selected planting materials will e given to identify tissue culture laboratory for developing tissue culture plants in 3 years. Hence, hole program is coordinating farmers participation basis having four party i.e. Tissue culture boratory, Adani Foundation, KVK and farmers committee of project area. Major functions of all arties are as under;

TC Lab: Develop TC plantlets of elite varieties • Adani foundation: Financial support • KVK : echnical support to the program

armers committee : Provide best planting materials for developing TC plants & contribution in istribution & provide nominal cost of plants. Hence, the farmers contribution in the program is 10 akh.

round work for this project is completed during current financial year i.e. Registration of 200 rmers, series of meeting with KVK and Anand University



Project Swavlamban

ect Swavlamban Launched with blessings of differently abled people of NDRA TALUKA.

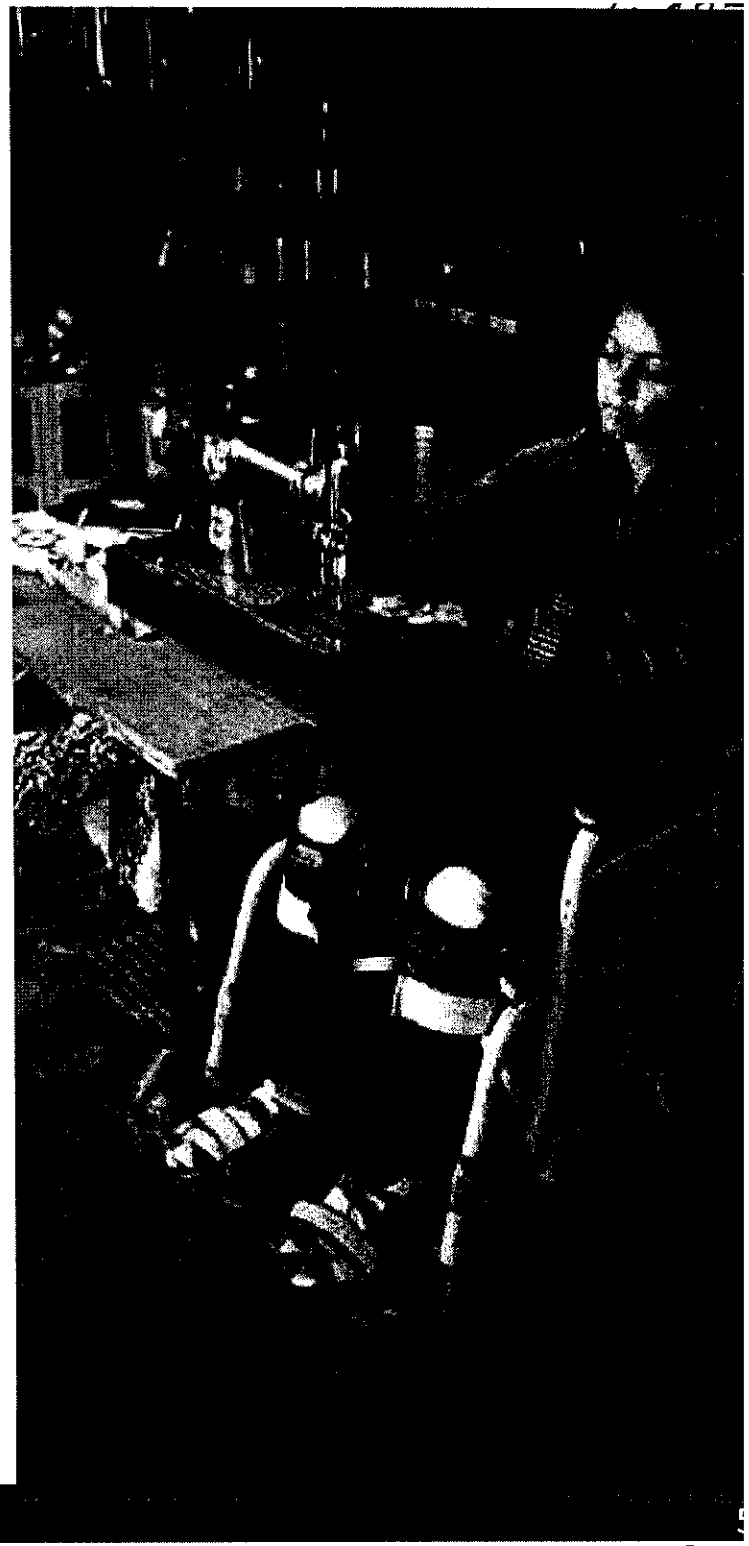
objective is

o increase awareness about Government schemes for Divyang people, widows nd senior citizens and coordinate them with Social Welfare Department, GoG fter getting income generation equipment support - Proper training provision to ake them self-reliant in true sense!!

dani Foundation is playing the role of facilitator in case of tie up with overnment Scheme for Widows, Senior Citizens and Handicapped people. The dentity cards are issued for the handicapped in coordination with Bhuj Samaj uraksha Khata which is beneficial for them to get specific kit for their disability ype. This year 154 beneficiaries linked up with pension scheme.

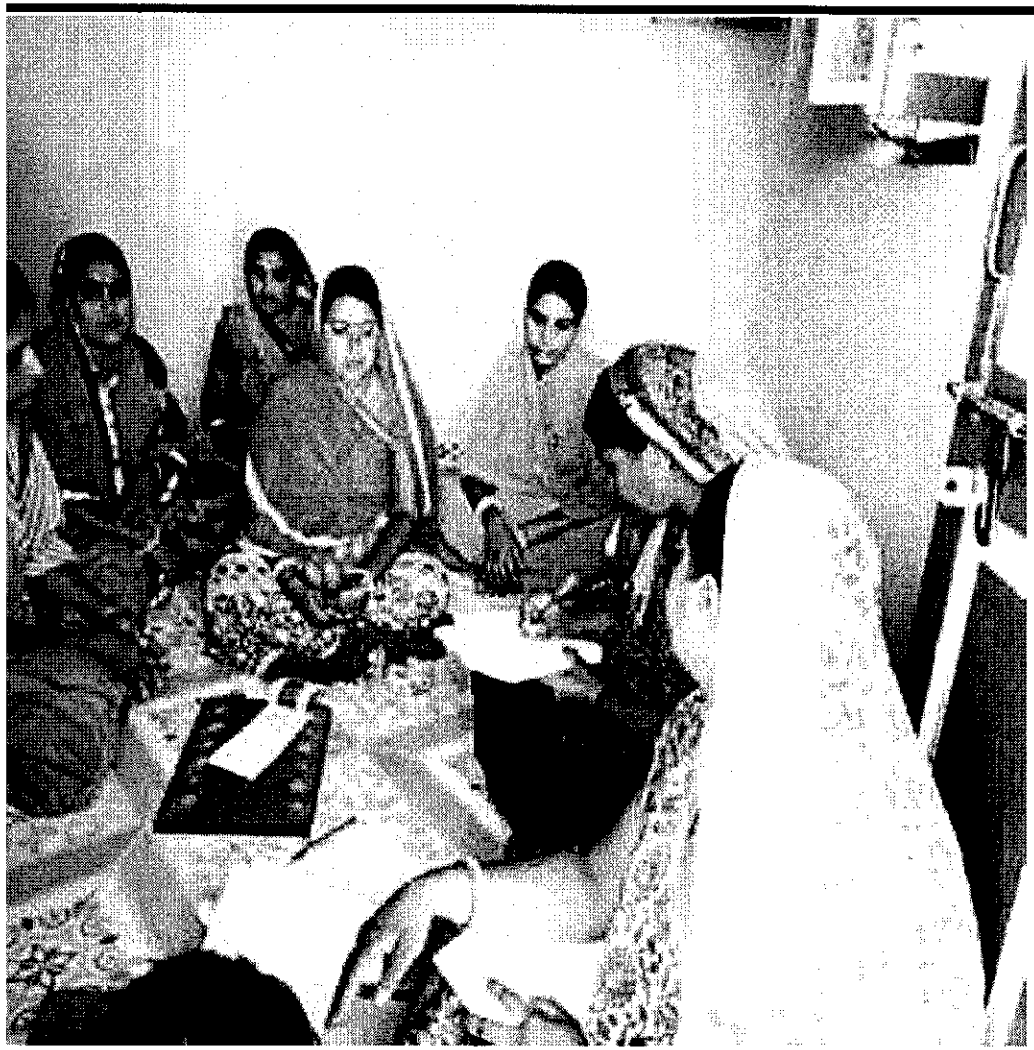
he financial benefit of the senior citizen Yojana is Rs. 500 per month and the idow scheme is of Rs. 1250 per month. Jilla Samaj Suraksha Officer and team emain present every time.

No	Type	Beneficiaries	Financial benefit
1	Disabled	409	10,00,000
2	Widow	92	3,25,000
3	Senior Citizen	32	1,75,000
	Total	533	15,00,000



4038

Women Empowerment Projects



- In Kutch, the situation of women is miserable. Women are totally dependent on male members of family for their needs Consumption of liquor is one of the main culprits in Kutch. Due to this evil prevalent among men many women are suffering.
- Considering this situation, We have started our training program with two major women's group of Villages near Adani Power and Adani Ports. Both the groups of women (**132 women in total**) successfully completed their training for preparing washing powder, phenyl, liquid for cleaning utensils and hand wash etc.
- We have selected 12 women groups having 132 members total as per their ability for different work i.e. accounting, banking leadership, marketing, administration etc.
- As a further step to bring sustainability, we thought to start a shop "Saheli Mahila Gruh Udyog" at Shantivan Colony.
- Main Perishable/ Non perishable items by Saheli are

1. Washing Powder
2. Phynayle
3. Dish wash liquid
4. Pickle of Bijora
5. Suf handicraft
6. Ahir Handicraft

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Women Empowerment Projects
Step towards socio economic development

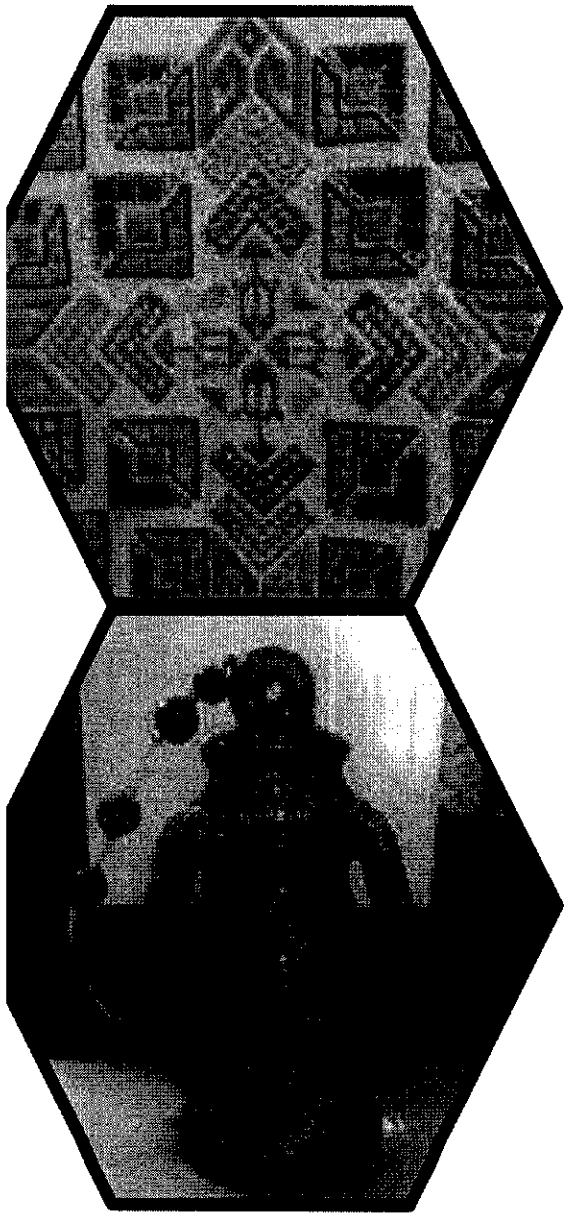
No	Village	Group	Members	Saving Amount	Work
1	Mota Kandagra	Jay Mekran	18	100	Stitching
2	Mota Kandagra	Jay Momai	10	200	Stitching
3	Navinal	Vishwas	14	100	Stitching/Dori
4	Navinal	Chamunda	10	100	Phynayle making
5	Baroi	Adhar	12	100	Perishable items
6	Sadau	Vishwasi	16	100	Dhadki, Frames
7	Shekhadia	Sonal	12	200	Washing Powder
8	Mota Kapaya	Tejasvi	10	100	Eco friendly bags
9	Mundra	Meghdhanushya	18	100	Mud work
10	Mundra	Aaarambh	20		Suf Handicraft
			132	1100	

3713

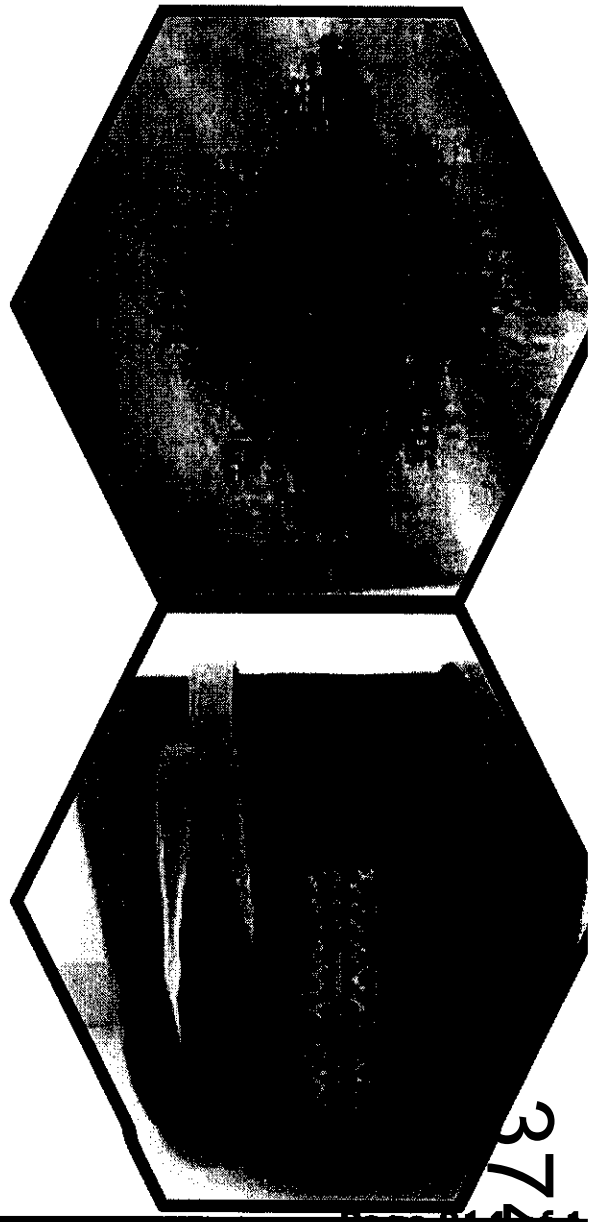
1040

Glimpse of Women Empowerment Projects

SHG Meetings in various Villages regarding record check , Loan , Interest detail also collect information for their hidden Skill.





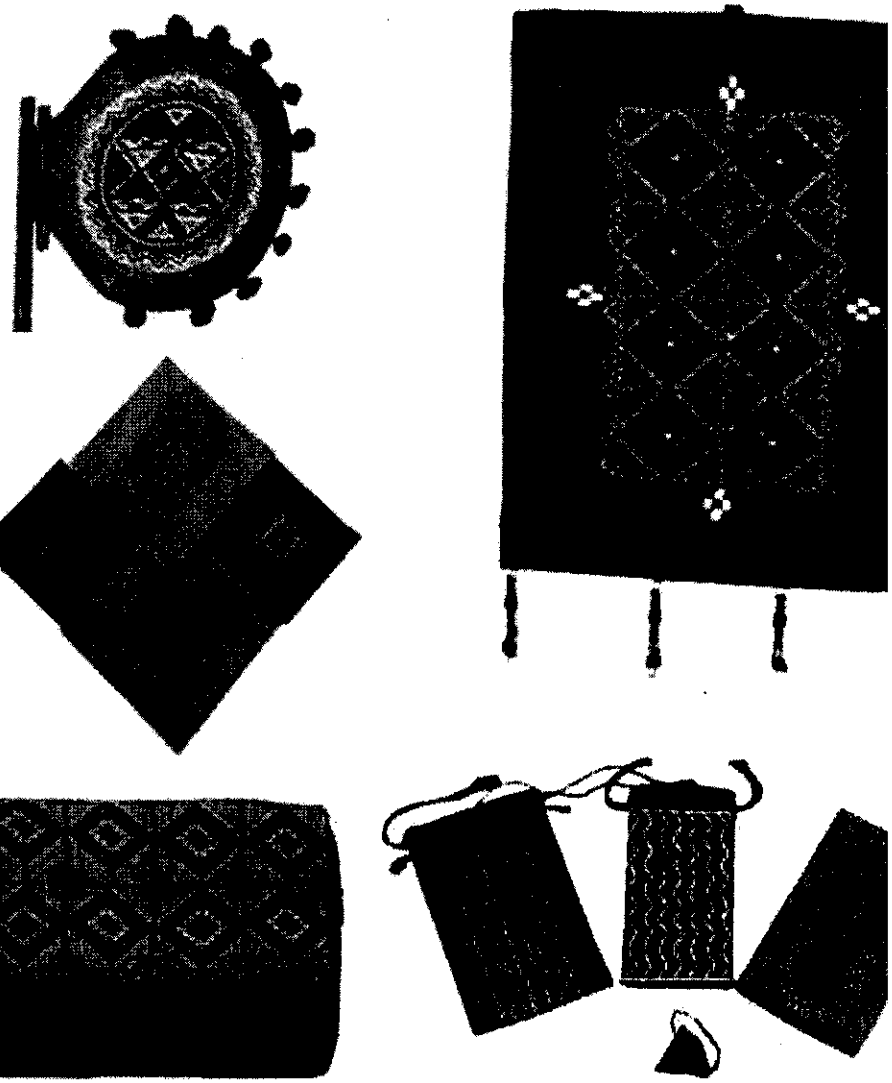


एक शुरुआत

aaarambh

Adani Foundation launched programme AAARAMBH to revive the dying art form of Suf in a ceremony in Mundra, Kutch. Under this project, Adani Foundation will facilitate the training of about 30 women in the handicraft and also help them with market linkages to ensure sustained livelihood for them. On the occasion, Adani Foundation also launched a website made by the women themselves to market their products.

Suf handicraft was practiced in Kutchh District, Gujarat. Due to lack of patrons this handicraft has been dwindling. Suf handicraft is painstaking embroidery based on the shape of a triangle. Suf is counted on the wrap and weft of the cloth in a surface satin stitch worked from the back. Each artisan imagines her design and then counts it out in reverse.



1042

International Women's Day

International Women's Day Celebration Mundra





International Women's Day has been celebrated by the Adani Foundation, Mundra with Integrated Child Development Scheme. Chief Guest of the event was Mr. Komal Singh (Commandant Coast Guard) and Ms. Ami Rakshit Shah (APS School) .Distinguished Guest Mr. Vayda (Taluka Development Officer, Mundra)

On this momentous occasion the supervisors of ICDS were felicitated for their noble work. Adani Foundation also honored Eight women entrepreneurs who were supported by the Adani Foundation, Mundra for income generation.

The Adani Foundation Mundra was also facilitated by the ICDS for their remarkable work in field of women empowerment and Suposhan as well.

Additionally, In coordination with DDO, Kutchh Pradhanmantri Mandhan Yojana form filled up for @ 225 women – who will give benefit of pension of Rs. 3500 per month after age of 60 years. Our Suposhan Sangini remained present and guided about nutrition.

As a Matter of Celebration , Same Day ICDS Mundra got state level Mata Yashoda award at Gandhinagar for best Anganwadi work.

Total 300 women attended the programme with great enthusiasm and Zeal.





International Women's Day Celebration Bhuj

International Women's Day has been celebrated by the Adani Foundation, Bhuj with SOS Gada Village, Bhuj Engineering College as well as Army force Bhuj. Chief Guest of the event was Dr. Kunika Patel (Gynecologist GAIMS) and Dr. Rajendra Harnagar (Gynecologist GAIMS) and Distinguished Guest was Mr. Mishra (Airport Authority, Bhuj)

As a part of Bhuj and Lakhpat CSR celebration International Women's Day in Various place Bhuj Engineering collage, SOS village and Bhuj Airport. Awareness for Breast and cervical cancer, and health - hygiene. Total 230 women are benefitted in this awareness session. Also discussed about various psychological issues during menopause age and its solution.

URAL
FRASTRUCTURE
EVELOPMENT

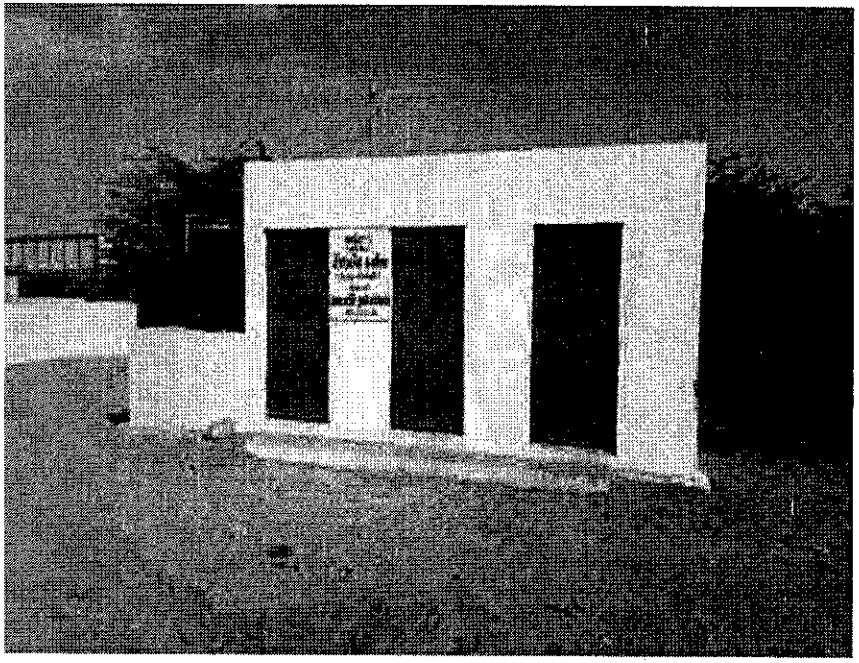


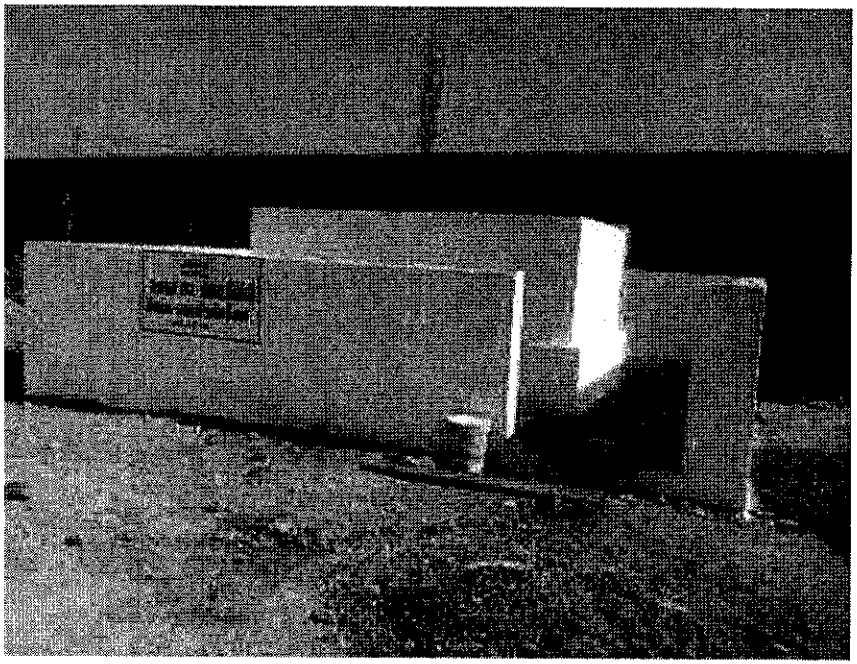
Building a strong community relationship is the key to progress of Adani Foundation. The programs such as Education, Health and Sustainable livelihood development play a very important role in building this strong relationship with the community. These three programs are incomplete without the inclusion of the Rural Infrastructure Development program.

This year on path of sustainability, we have taken some steps as follows...

Under Dignity of Drivers Project, Adani Foundation has constructed Resting Shed for Drivers entering in SEZ Premises. Total 50 beds are constructed, drinking water and sanitation plus recreational – TV Facilities and will be charged minimum. Adani Foundation has handed over the project to ASSET Department – SEZ as a revenue generation model.

In this ceremony Mr. Avinash Rai (CEO- APSEZ), Mr. Rakshit Shah(Executive Director – APSEZ), Mr. Pritpal Sinh (Head – SEZ Operation) and other transporters remained present.





RID – Dignity of Workforce

Present condition of migrated labour community of Adani port, power and Willmar is really matter of concern. They are living in pathetic condition. It is true that we cannot achieve our goal of development until we support to up bring lives of this community. Basic needs of this labour force needs to be address. In labour Vasahats they are not getting facility of pure drinking water, proper living condition, sanitation or proper living atmosphere. To build up trust and transparency in labour community, union labours and Smooth business operations and to create more efficiency by providing better living conditions Adani Foundation has constructed 45 Toilet block and proper bathing place for labours.

4046

ork Completed

Road repairing various vasahat

Open shed at Juna Bandar

Sand Filling plot at JUNA BANDAR

Concrete Step ladder at Juna Bandar

House construction at Shekhadia

Two approach road 5000 meter Zarpara Fishermen and 5000 meter Luni Pagadiya

Drinking water storage tank 5000 ltr capacity bavdi Bandar -2, Juna Bandar -2, Kutdi Bandar -1

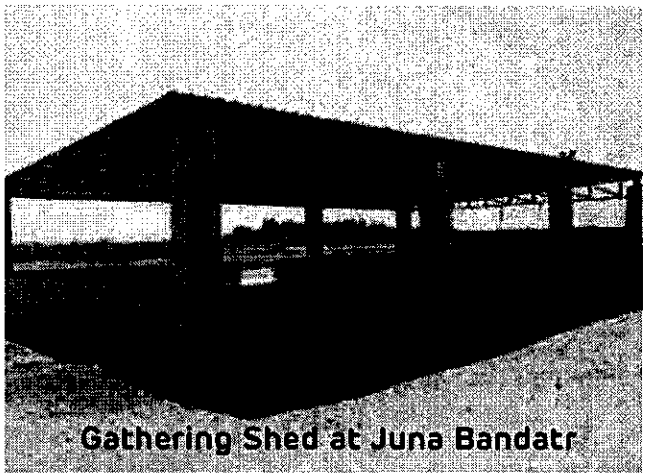
water pipe line installation at Wandi village 2000meter.

Basic amenities at Rampar Village Paver block 6000 LTR Storage tank and Boundary wall at community place.

Additional civil work in community hall

Open shed Gundiyali

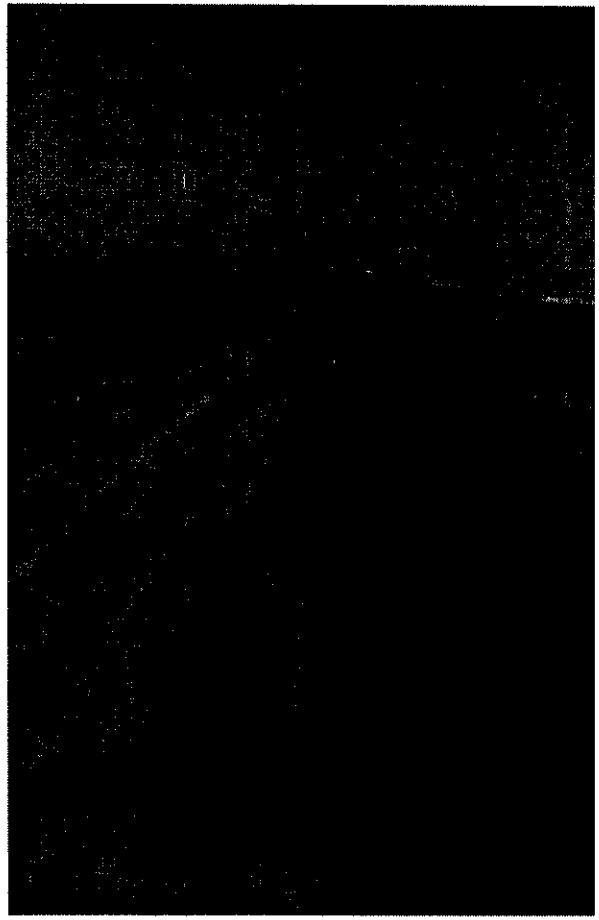
Boundary wall in common place at Tragadi.



Gathering Shed at Juna Bandatr



Veera Bandar



an initiative by

adani

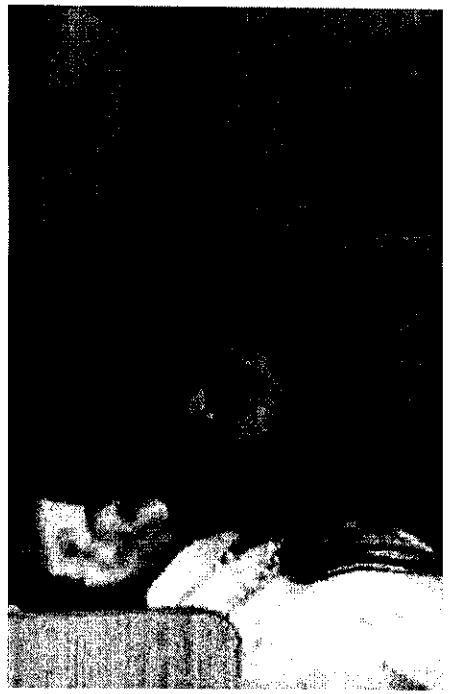
Foundation





1048

Swachhagraha



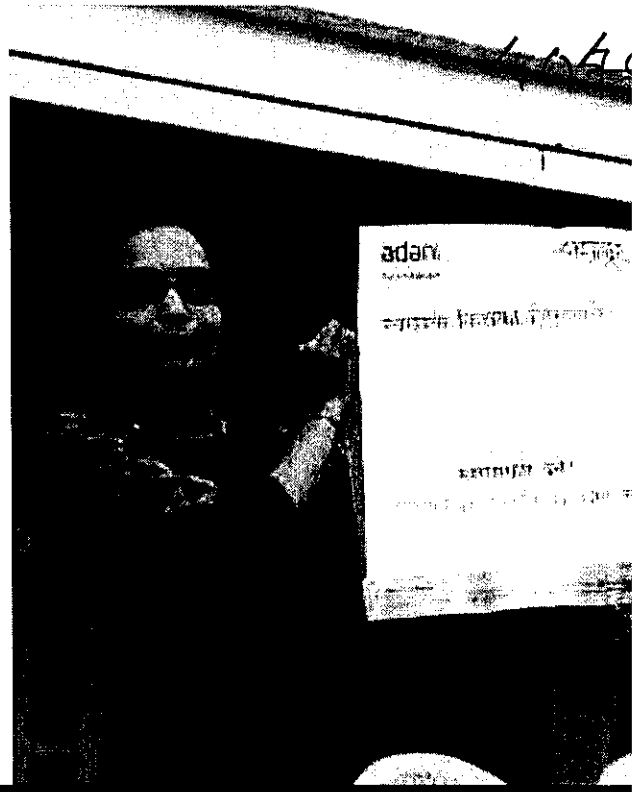
ani Foundation has launched project "Swachhagraha" Swachhata ka Satyagraha in the year 2015, to pport the 'Swachh Bharat Abhiyan'. Falling in line with our Honorable Prime Minister's call for a Clean India, launched this mass movement towards making our Nation litter free.

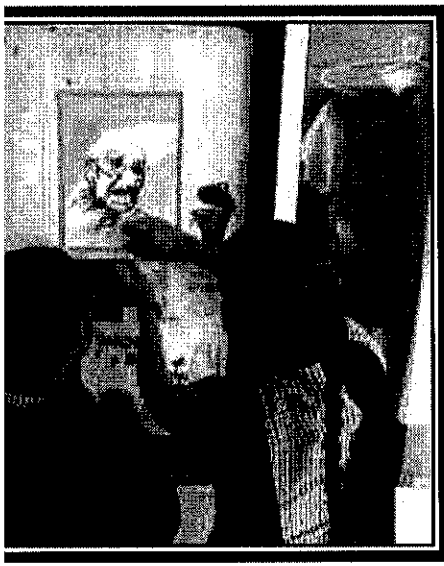
e programme draws inspiration from one of the largest mass movements - Satyagraha, which catalyzed ion by winning over people's hearts through tremendous patience and resolve, instilling dignity and self-pect among our people. Swachhagraha aims to engage people and bring about a behavior change, where ople get involved 'to create a culture of cleanliness'. Swachhagraha is inculcating behavior change ucation in cleanliness, sanitation, personal hygiene and civic consciousness amongst young minds.



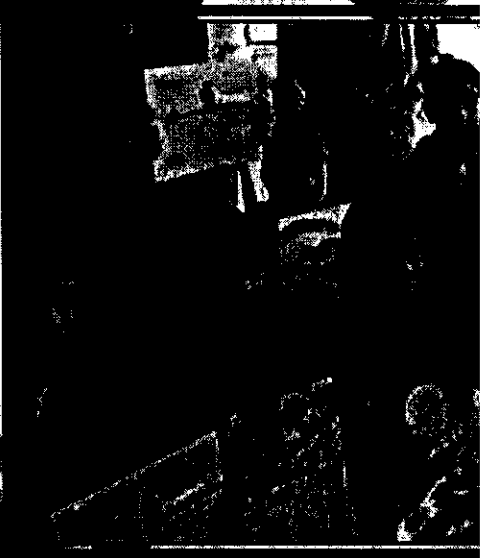
Presently the Swachhagraha project is being implemented in 3000+ schools across 17 States. So far 3500+ teachers have been trained in behavior change education in schools, ranging from elite private schools to government municipal schools. The programme has directly involved over 57000+ students who have further reached out to their peers, parents and community through a variety of planned action projects and campaigns.

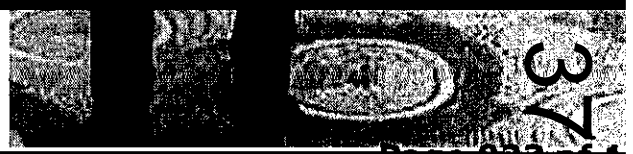
undra site- Adani Foundation launched Swachhagraha in 4 Blocks of Kutch District (Mundra, ıjar, Gandhidham, Bhuj). The Swachhagraha programme was launched in Bhujwith ırticipation of over 450 Schools in Swachhagraha Prerak's Training Workshop with support District Education Department, Kutch District. The programme was launched by Mrs. Shilin Adani, Trustee (Adani Foundation); Mr. Prabhav Joshi(DDO, Kutch), Mr. V.S.Gadhavi, irector, Adani Foundation); Mrs. Sushama Oza, (Director, Adani Foundation); Mrs. Ami ıkshit Shah (Adani Public School); Mr. (Rakesh Vyas – DEO, Kutch); Mr. Sanjay Parmar (DPEO, ıtch) on 1st October 2018.











4050

SWACHHAGRAHA - ACTIVITIES



4 057

wachhagraha Marathon :
ɹn Against Depression

Gujarat Adani Institute of Medical Sciences G K General Hospital and Student Counsel Organized the Bhuj Marathon. Theme of the marathon was Run against Depression and Swachhagraha. Total more than 800 participants took part in this marathon with enthusiasm and zeal.

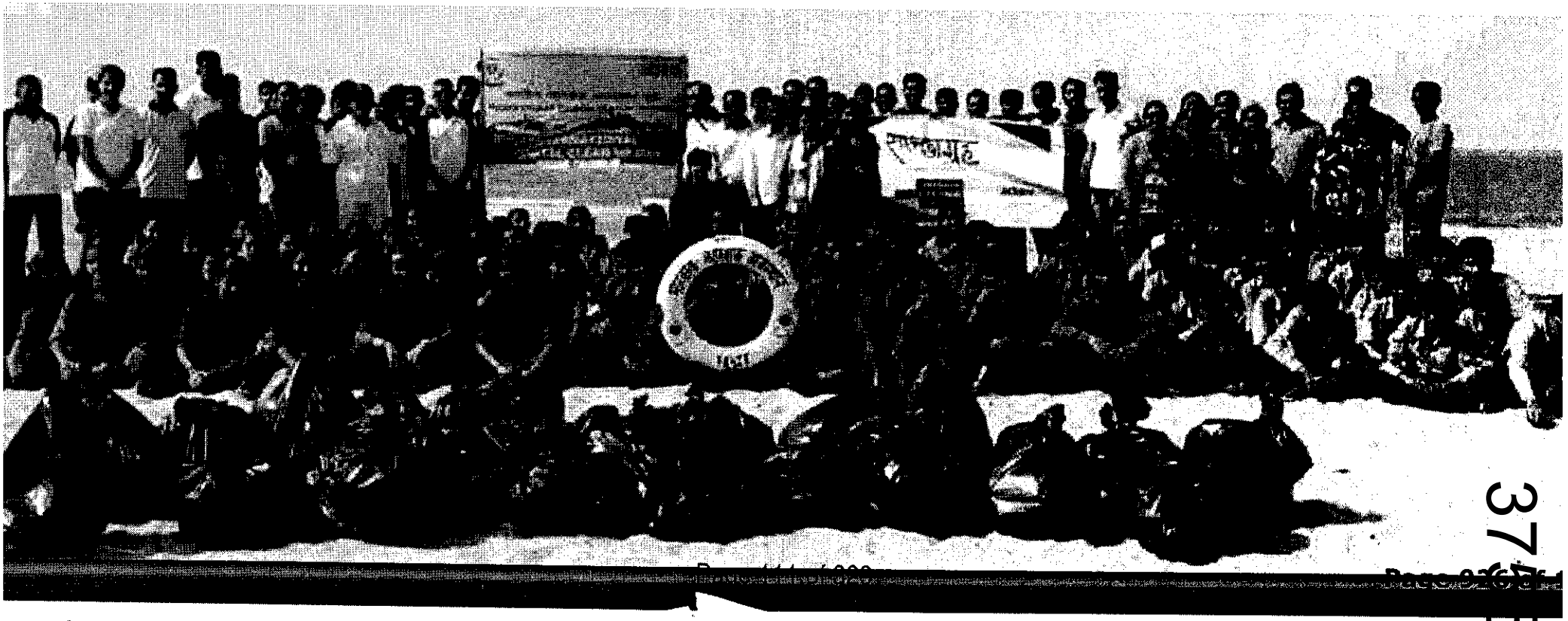


4052

International Coastal Clean up Day



Mundra Adani foundation MUNDRA has celebrated swachhagraha related International Coastal Clean up Day celebrated with Coast Guard" with theme swachhagraha.. School students, Coast Guard staff and Adani foundation staff had cleaned Mandvi beach and give a message of swachhagraha.. At the end information given about swachhagraha project



Adani Skill Development Centre



Adani Skill Development Centre (ASDC) is playing a pivotal role in implementing sustainable development in the state.

Several miscellaneous industries exist in Kutch district. Adani Skill Development Centre has started a center in Mundra block so that the needs of these industries are fulfilled, the local youth is enrolled in various training / skill courses and the distance between the both is minimized.

The objective of this center is to impart different kinds of training to the students of 10th, 12th, college or ITI from surrounding areas. Thus, various employment-oriented trainings are organized to optimize the skills, art and knowledge through proper guidance and direction.

During this year Total 1819 people is given various trainings to enhance socio economic development.

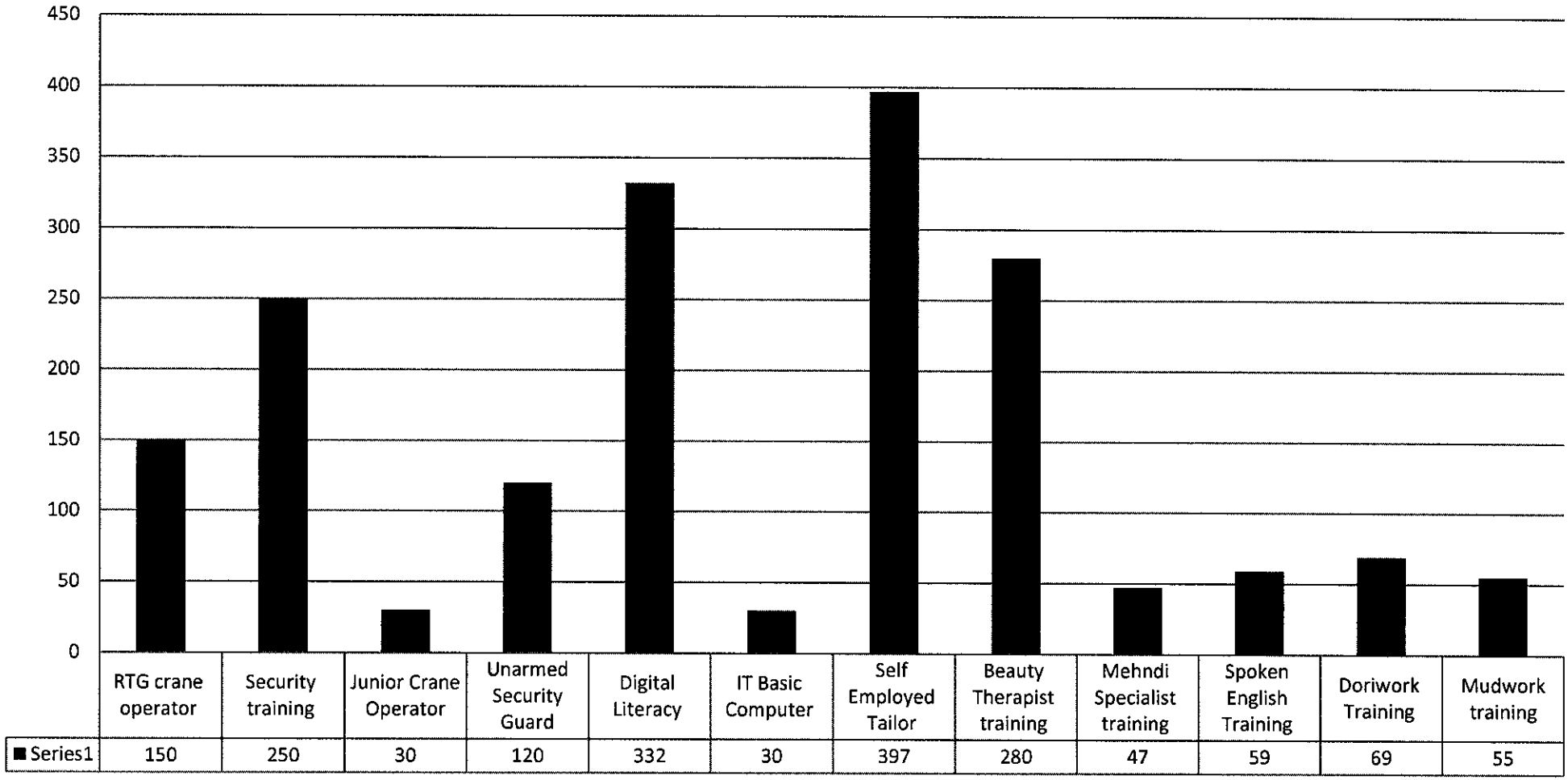
Out of which 1294 People are getting employment or Self Employment and average income up to Rs. 5200 per month. Digital literacy training is very helpful in coordinating with today's Digital world....

4054

In the year 2018-19, ASDC trained 1819 candidates at Mundra.

THE YEAR IN REVIEW : KEY HIGHLIGHTS

Training chart 2018-19

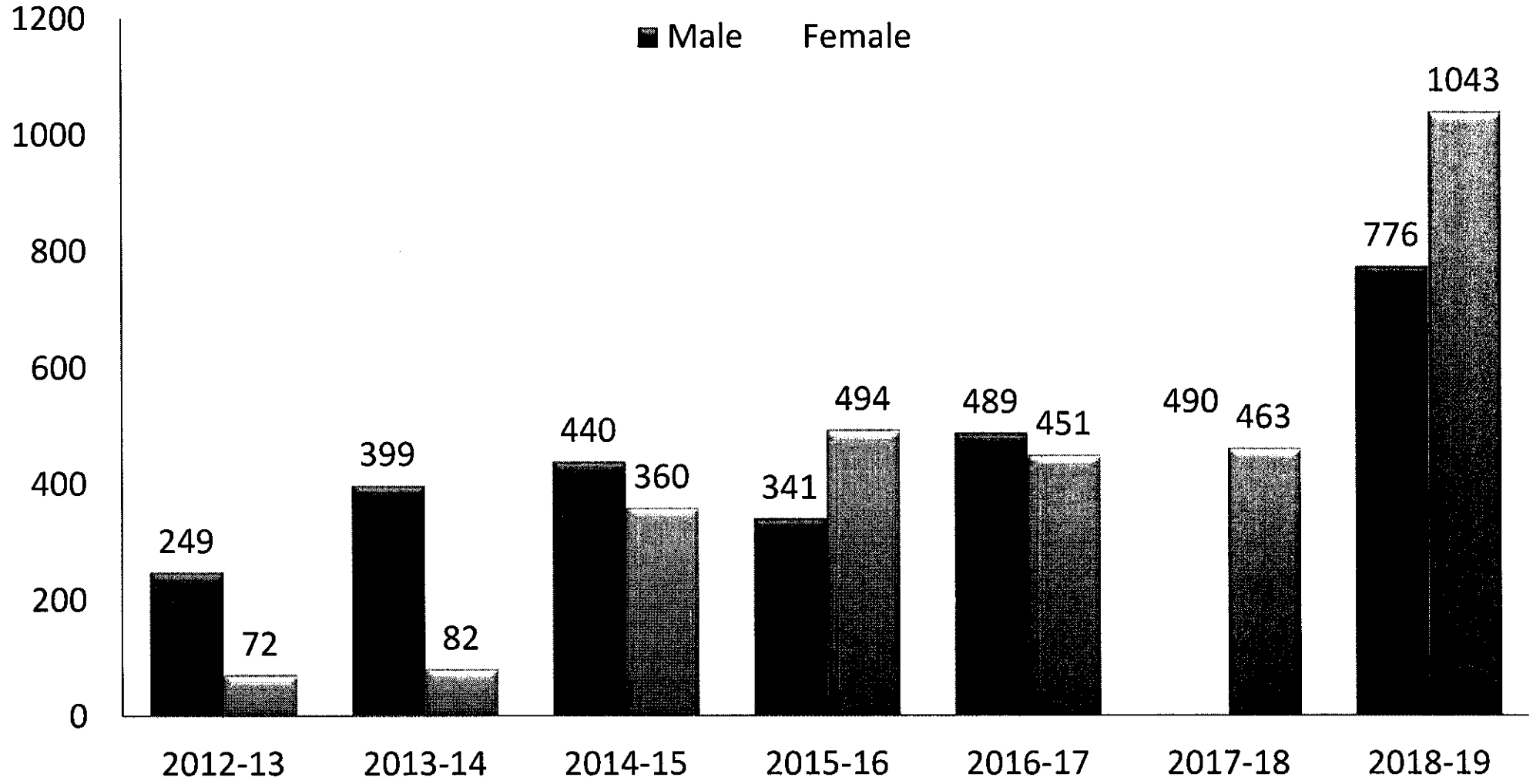


	RTG crane operator	Security training	Junior Crane Operator	Unarmed Security Guard	Digital Literacy	IT Basic Computer	Self Employed Tailor	Beauty Therapist training	Mehndi Specialist training	Spoken English Training	Doriwork Training	Mudwork training
Series1	150	250	30	120	332	30	397	280	47	59	69	55

[redacted]

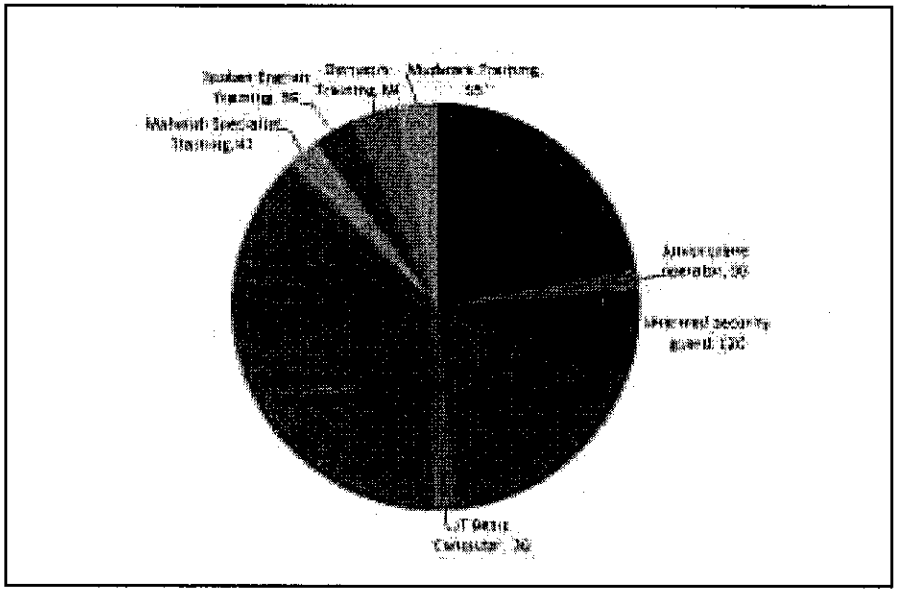
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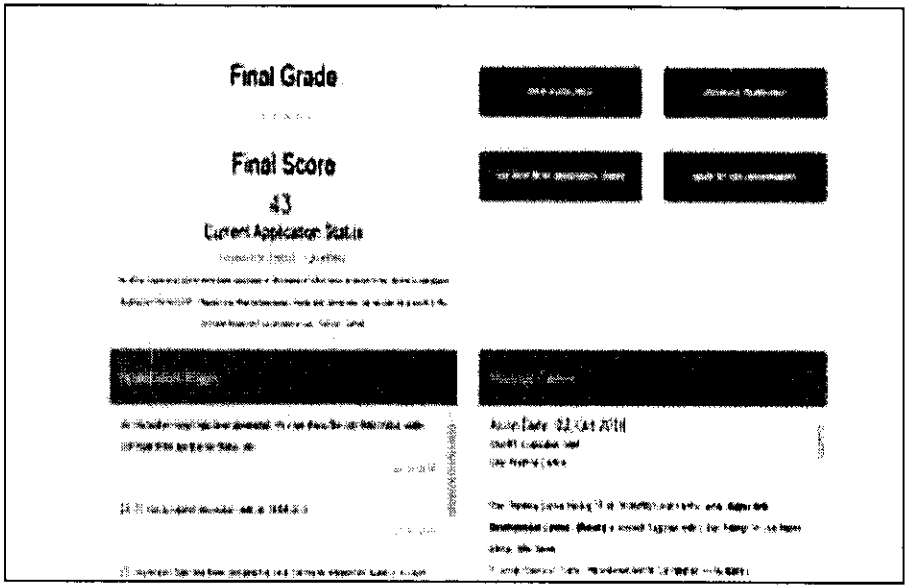
OUR PROGRESS MUNDRA



4055

DETAILS OF VARIOUS TRAINING UNDERTAKEN





Adani skill development centre Mundra Placement figures of ASDC. Total 1294 people are getting employment after training with approximate ROI Rs. 5200 per month.

Adani skill development centre Mundra is qualified in NSDC with 5 star rating for job role junior crane operator and unarmed security guard.

JNCHED "SAKSHAM" CENTER AT BAROI EST HOUSE



DC-Baroi (Mundra):- Adani skill development Center (ASDC) nched 'SAKSHAM' center at Baroi guest house in Mundra on h June 2018 to provide skill development training to youth in Mundra.

initiative of Adani foundation, the center in the Mundra city benefit about more than 500 candidates every year in auty &Wellness course.

e center will provide skill development training to the youths the age group of 14-40years initially in Beauty & Wellness urse. Total enrolled for this training were 90 students.

LAUNCHED "DIGITAL LITERACY" AT UTHHAN VILLAGES



Adani Skill Development center, Mundra has started digital literacy class in local village. 40 girls and boy are participated in first session. All village people are happy for this training in phase. We have also arrange evening batches to cover all people of various village.

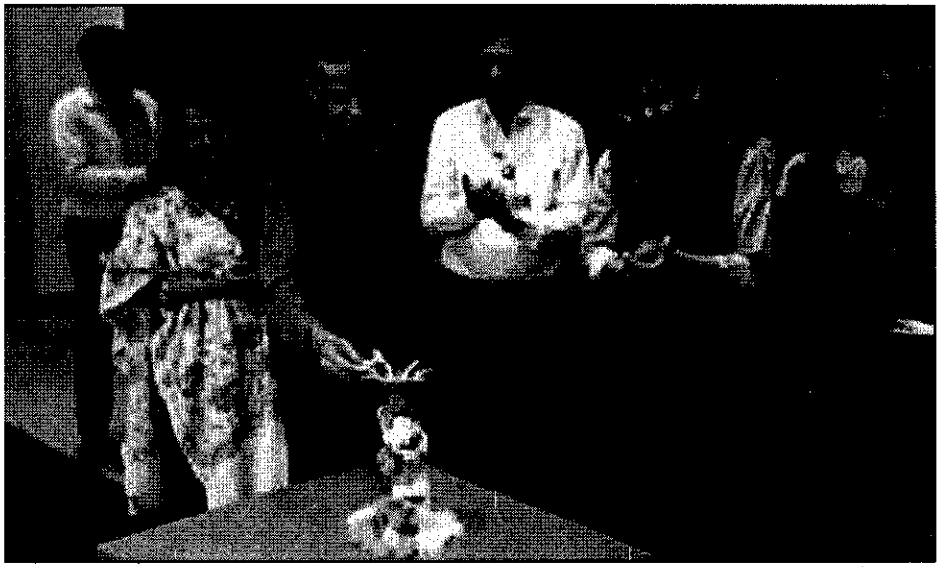
Digital literacy training done through laptops and Tablets:-

1). The course duration is 26 days and number of hours is 52.
2). Per day training delivery hour is 2.
3). This is completely based on demonstrative and practi training methodologies.
4). The delivery is intended to be done through Desktops a Tablets
5). Attaching Also cover for payment banking topics .

4057

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LAUNCHED "JUNIOR CRANE)PERATOR" COURSE UNDER PMKVY



6th December 2018 launching program was organized at ani house for (1) Junior Operator crane (2) Unarmed Security ard

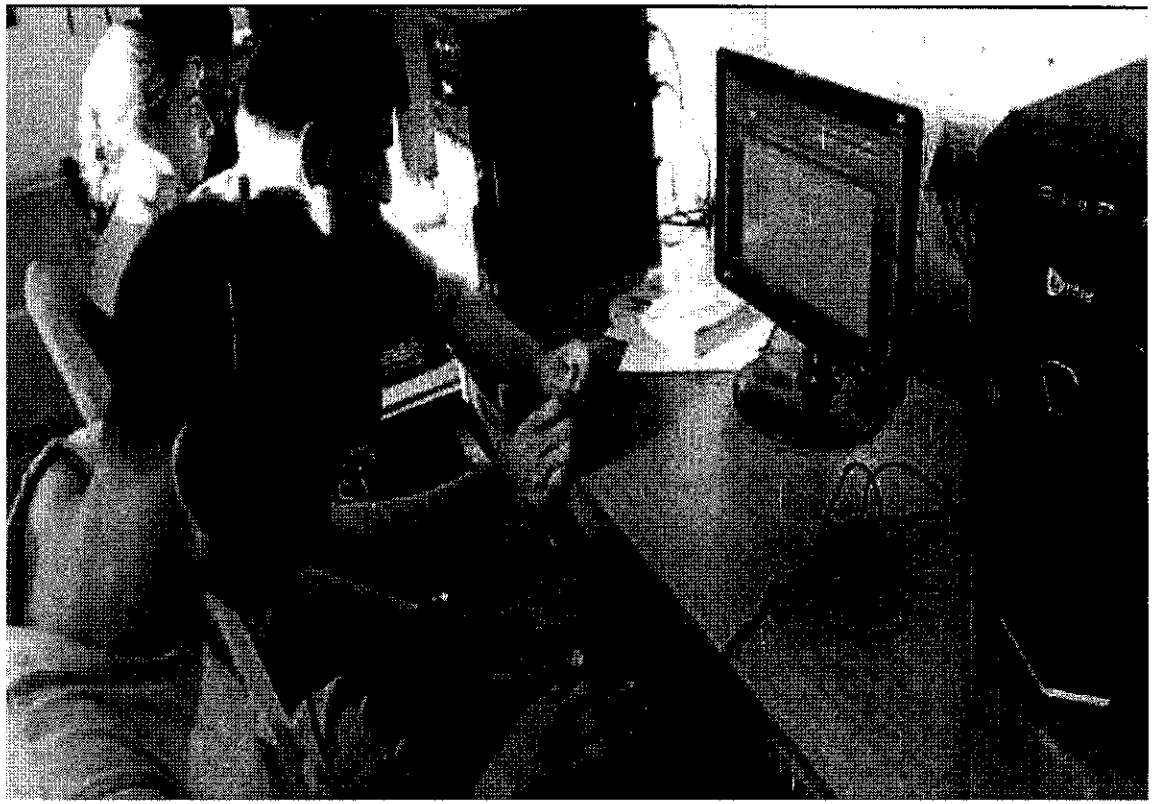
:al 30 beneficiaries identified and registered for Junior erator crane PMKVY portal. Mr. Vasant Gadhavi Sir (Director Adani Foundation), Mr. Avinash Rai (CEO,APSEZ), Mr. kshit sir (ED APSEZ), and all HOD remained present and all)tivated by their speech.

STARTED UNARMED SECURITY GUARD COURSE UNDER PMKVY



Adani Skill Development Centre, Mundra received 120 candidates target of Unarmed Security guard training of PMKVY (NSDC). We have started 2 batch with 60 candidates of Unarmed security guard training at Adani Security training school at Mundra.

Adani Skill Development Centre - Bhuj



One more feather added in Cap of Project Saksham – Adani Skill Development Center started in Bhuj.

PMKVY certification received with Four Star Rating in October 2018.

We have started Adani Skill Development Center at Campus of Gujrat Adani Institute of Medical Sciences with a main stream course of "General Duty Assistant". After that we started digital literacy, beauty and wellness plus stitching courses.

ASDC Bhuj got overwhelming response of district administration for organizing special batch for widows and coordinating for their placements.

We got prodigious rejoinder during training of visually impaired and hearing impaired students at Navchetan Andhjan Mandal Madhapar.

By the unique activities and coordination, ASDC Bhuj received huge amount of appreciation from media.

Total 663 Beneficiaries have taken training out of which 432 people are doing job or self employment.

4059

In the year 2018-19, ASDC trained 663 candidates at Bhuj.

Training Details	Qtr.-1	Qtr.-2	Qtr.-3	Qtr.-4	Total
Digital Literacy	0	27	58	175	260
General Duty Assistant	59	55	83	00	197
Spoken English	0	14	0	0	14
Beauty & Wellness	0	35	18	79	132
Banking Related Training	0	0	0	60	60
Total	**59**	**131**	**159**	**295**	**663**





Event Celebration





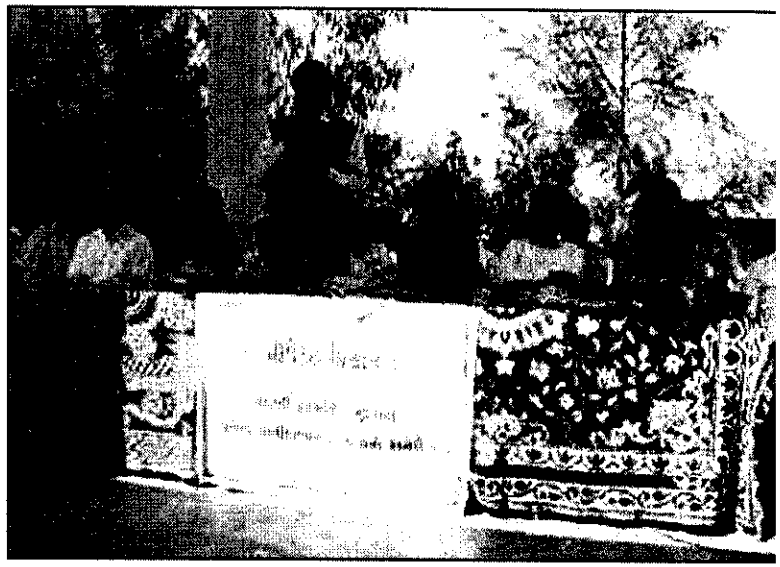
0 61

Teacher's Day Celebration : Guru Vandana



- Teacher's day Celebration - Guruvandana' Progra was organized under esteemed presence of Sh Prabhav Joshi (District Development Officer) ar teachers of 106 government primary schools wit great enthusiasm.
- Objective of the programme was "healthy mir resides in a healthy body which is why a healt checkup is scheduled for all the teachers whic included BMI, BP, RBS, HB and vision test. Healt check was done by Adani hospital Mundra.
- Followed by a motivational speech by Dr. Darshar Dhodakiya who is the Director of Bhasha Bhavan Gujarati Subject, Throwing light on the principle tha teachers cannot be trained in to be coming a teache but they are teachers because they actually are bor teachers.
- Soft skill training by Ms. Riddhi Trivedi who is a high skilled trainer from ASDC and would explain us th importance and need of soft skills. A highly thoug provoking drama by students of 'Shekhadiya' schoc And last but not the least session taken by Mr. Jat Upadhyay.

Utthan :
Review and setting tone





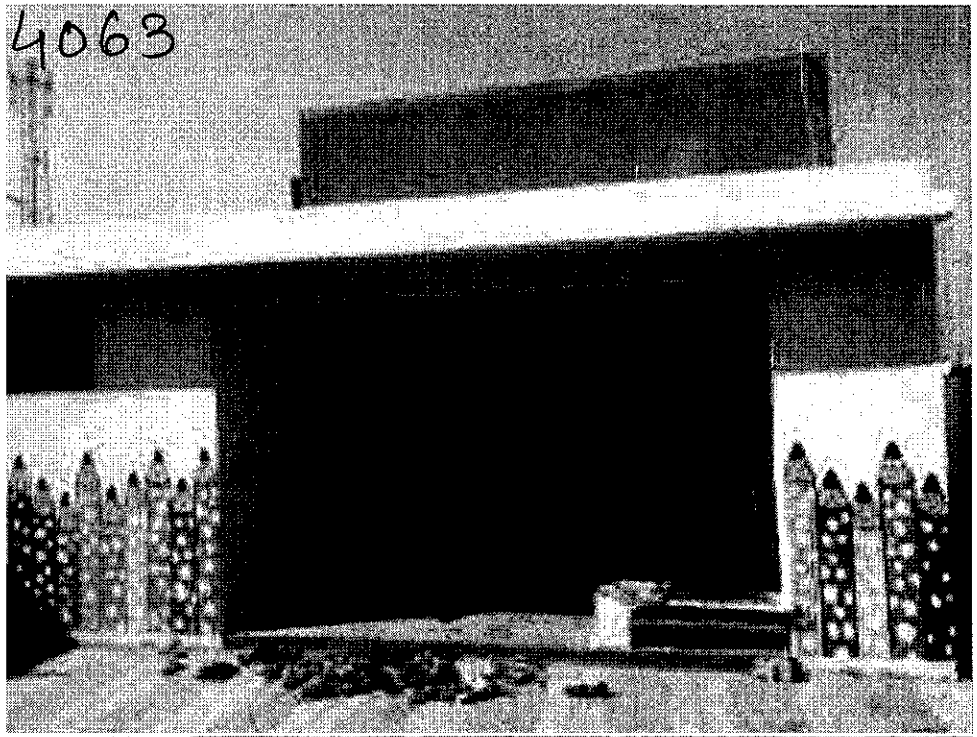
To review and propel the Project Utthan was scheduled on 18th February 2019 at Kamandpur Primary School and Dhrub. Distinguished Guest of the Programme was Mr. Prabhav Joshi – District Development Officer, Kutch , Mr. Rakshit Shah - ED, Mundra , Shri Vasant Gadhavi, Director - Adani Foundation. SMC members of the School and villagers were gathered in Kamandpur Primary School.

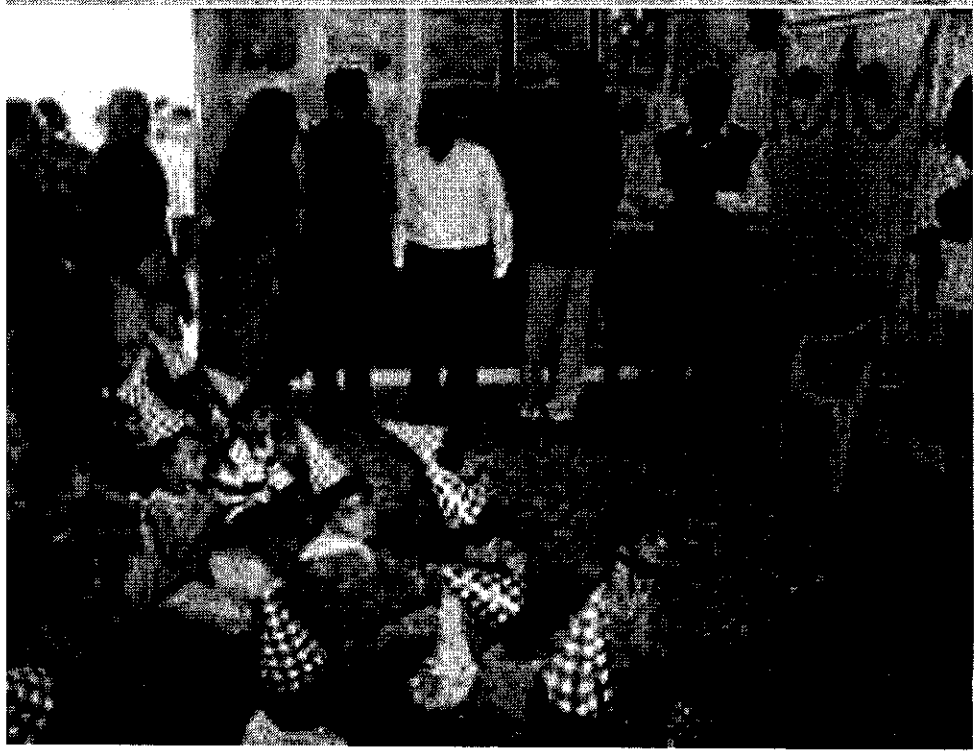
DDO appreciated this unique initiative taken by Adani Foundation to enhance the level of Primary education of Kutch district. He is happy for the concept of Mothers' meet which is the keen area of this project for sending students on regular basis. He requested to all the mothers to send their ward in school daily. He especially recognized the installation of Smart Classroom in all the 17 School.

SMC members were highly appreciated the material support and introduction of English language in classes- 1 to 4 by the teachers which were appointed by Adani foundation. Principal briefed the project and shared his satisfaction towards this project on behalf of 17 School Principal.

Villagers are accepted Project Utthan with open handed and broad minded. Around 130 people were witnessed of this program.

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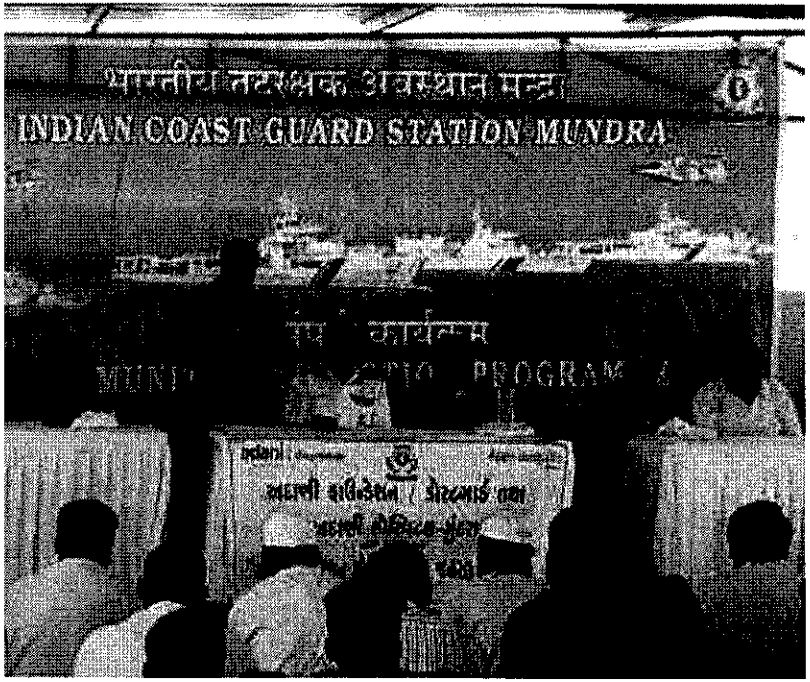


Uthhan : Anganwadi Upgradation

Under Project Utthan and part of early intervention Adani Foundation has upgraded Anganwadi infrastructure. To inauguration of the upgraded Anganwadi was scheduled on 18th February 2019 at Dhrub. Distinguished Guest of the Programme was Mr. Prabhav Joshi – District Development Officer, Kutch , Mr. Rakshit Shah - ED, Mundra , Shri Vasant Gadhavi, Director - Adani Foundation. ICDS members remained present to motivate the Anganwadi supervisors.

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Coastal Week Celebration with Indian Coast Guard

During celebration of coastal week - Safety and Security awareness program for fishermen while fishing as well as health check up camp and fishermen shed inauguration program was organized at Juna Badar with collaboration of Indian coast guard department. In this occasion Mamlatdar of Mundra, Commandant of coast guard and Mr. Ashvin Zinzuvadiya (Media : Kutchh Mitra) were present. Mainly they emphasized on national security as well as Personnel security in their speech.

Health camp was organized with support of Adani Hospital Mundra. Total 107 patients were benefitted by health check up camp and prize distributed to winner of Ramaotsav program.

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Fisher Folk Amenities..

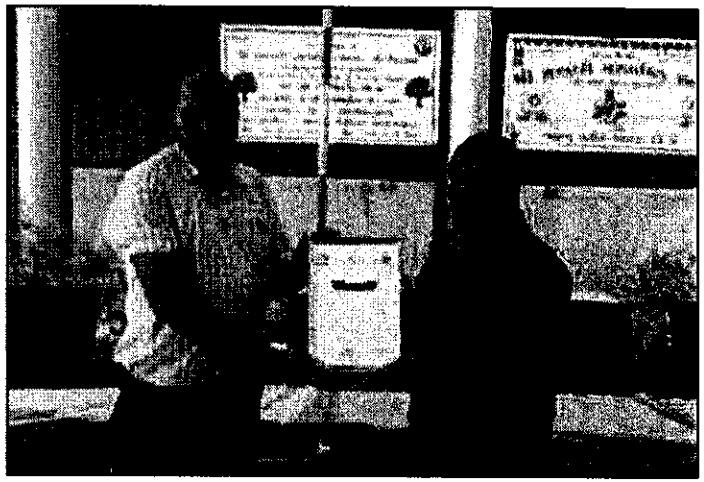
ani foundation, MUNDRA organized Cricket Tournament " Sixth Adani emiere League among Fishermen community to promote healthy ortsmanship and harmonically transparent relationship. The Tournament d been played for 13 days at SVC (Shanti Vihar Cricket Ground) by 6 tches per Days with full of Audience, Total 65 Teams with 780 hermen youth were participated with 550Rs. Contribution per teams m Mundra, Anjar and Mandvi Block. The Final Match was played on 07.2018 and Pir Saheb (Religious Mentor), Rakshit sir (Executive ector- APSEZ), Dr. A.k Vatsani (Deputy collector ,Bhuj) Mr.Mahesh fda (Assistant Director of Fisheries, Bhuj), Mrs. Pankti Shah(Unit CSR ad) ,AF staff and Fishermen Leaders remained present. The Final Match s so interesting and Salaya team becomes winner over Luni Team and re than 1200 Audience from various villages were present. The winner's phy, Runners-up Trophy, Man of the Series, Man of the Match, Best ller, and Best Bats-Man Trophy has been given to the Respective Teams d players. The 25000Rs, 15000Rs, 2100Rs, 1100Rs, and 500Rs, 500Rs ze given to the above Respective Teams and Players from the Teams ntribution.





elebration of World nvironment Day at High chool, Moti Khakhar

antation of 1111 trees in Moti Khakhar high school ground in coordination ith forest department : Moti Khakhar is a Village in Mundra Taluka .It is cated 19 KM from Mundra. School is constructed in year 2008 and it is with rge ground. Principal requested Adani Foundation to support for tree antation in area. As per size of ground we can plant more than 1000 plants. addition, Soil condition is also appropriate. Adani Foundation contacted orest Department for Tree plantation before monsoon and Forest Department ıpported for 4000 plants. After getting support from Forest Department – dani Foundation supported for Drip and Fence for protection of plantation. n 5th June 2018, Adani Foundation Mundra planted 1111 trees at Moti nakhar. Function was scheduled by Gram Panchayat. Mr. Vyas (District ducation Officer),Mr. Anjan (DCF, Mundra), Mr. Saxena (COO, APSEZ),AF Team, udents of the school and Village leaders remained present





4067

Talent Hunt:
nternational Disability Day

dani Foundation is working intensively for differently abled in Mundra Taluka ince 4 years in coordination with District Social Welfare Department. Till date we ould able to support more than 560 Divyang in Mundra Taluka .

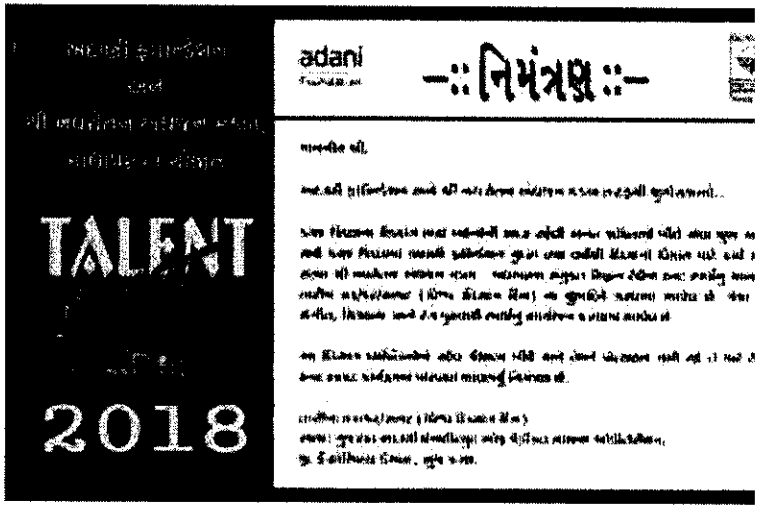
n celebration of International disability day, Adani Foundation organized Music nd Painting competition at Taluka Level and Zone Level.

or Winner s of Zone level – District level competition was organized on 3rd ecember 2018.

Vith the blessings of almighty, divine Start of the program with blessings speech f District social Defense officer and Laljibhai Prajapati of Navchetan Andhjan Mandal.

otal 675 people from different institutes remained present in inaugural session. ll Divyang participants remained present with full preparation.

ome glimpse of the programme Second session of Talent Hunt - International isability Day was prize distribution with musical celebration. District Collector Ms. emya Mohan IAS, Mr. Prabhav Joshi IAS, Rakesh Vyas DEO, Mr Arvind District ocial welfare officer remained present. Mr. Rakshit bhai Shah ED, APSEZ was with s throughout the program. All four categories got 3 prizes. District social defense fficer had given certificate of appreciation to Adani Foundation Mundra..





Talent Hunt : International Disability Day Glimpse















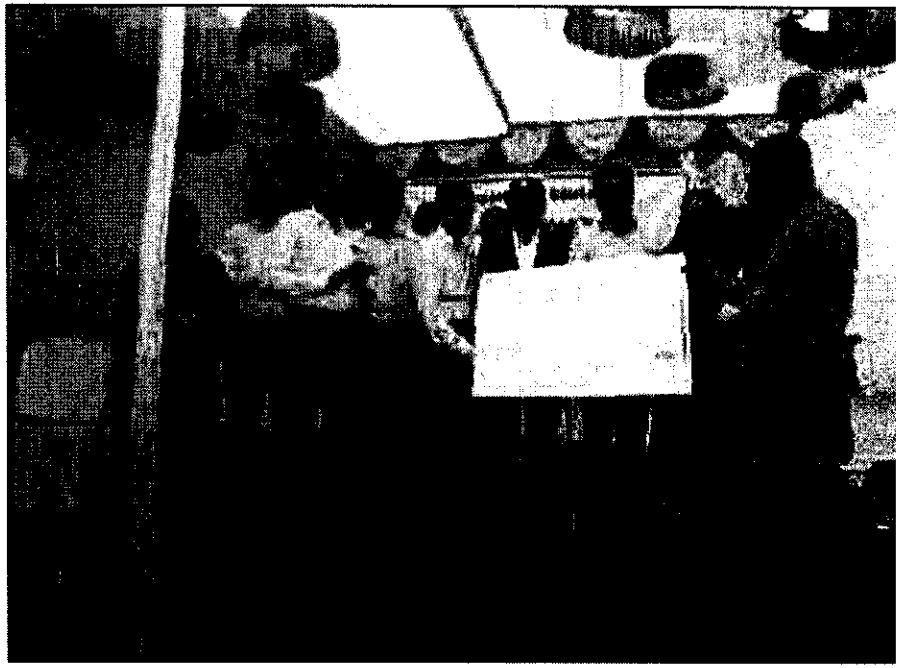
4069

ivine feeling towards Mata no Madh!!

Mata no Madh is a village in Lakhpat Taluka of Kutch district, Gujarat, India. The village lies surrounded by hills on both banks of a small stream and has a temple dedicated to Ashapura Mata, the household deity of former Jadeja rulers of Cutch State. She is also considered patron deity of Kutch. Many people are used to reach this Ashapura temple by feet from different parts of India. G K General hospital has organized health facility through at 10 locations on way of Mata Na Madh during Navaratri 5th to 11th oct.. In addition to medical facility, This health shibir will provide awareness of swachhagraha, swine flu and Beti bachavo as well The concept given by Shri Gadhvi Sir and implementation will be taken care by Dr. Chintan and Adani foundation health team.



Employee Volunteering Programme





ı a move first of its kind employees of the Adani Group have adopted all ıe students of the Vallabh Vidyalaya school in Mundra in their Employee olunteering Programme (EVP). All the 704 children in the school are from ımilies of migrant labourers working in various industries in and around lundra. Children from migrant labourer families in addition to resource onstraints at home also bear the disadvantage of unfamiliarity with local ınguage and culture inhibiting participation in school.

allabh Vidyalaya by passes the language barrier as the medium of ıstruction is in Hindi and mostly the kids are from Hindi speaking ımilies. "Thanks to Adani EVP financial resource constraint will be ubstantially relieved", Dharmendra Bhai who created the school from one hed institution gratefully acknowledged.

nergised by the inspiring leadership of Adani Foundation's Chairperson ır. Priti Adani the Group employees handed over a collective cheque in an mpressive function at the school premises. One student of Std. VII joyfully xpressed, "Your benevolence will have indelible imprints and impact on ur lives. Will remember you ever."

407H

Employee Volunteering Programme



Adani Group is deeply involved in all round social and economic development of the areas in and around Mundra. Adani EVP is context driven and employees have taken part in teaching, improving Aanganwadis, giving impetus to national Swachhata mission and blood donation. The journey continues



Employee Volunteering Programme

Dignity of workforce day was organized jointly of APSEZ (Adani ports n SEZ Limited), AWL(Adani Wilmar Limited), MSPVL (Mundra Solar Pvt Limited) Adani Hospital and Adani foundation at labour colony with medical camp and handing over of sanitation. more than 32 employees have volunteered in this event.

. Total OPD by Medical camp at Labour colony-315

. Blanket Distribution to 800 workers

n this event Mr. Sharad Sharna Head-AWL with staff, Bhaktbandhu DGM HR and Admin staff (APSEZ), Mr. Ganesh Sharma Head HR, President - Kutch Labour Union and Adani foundation team remained.





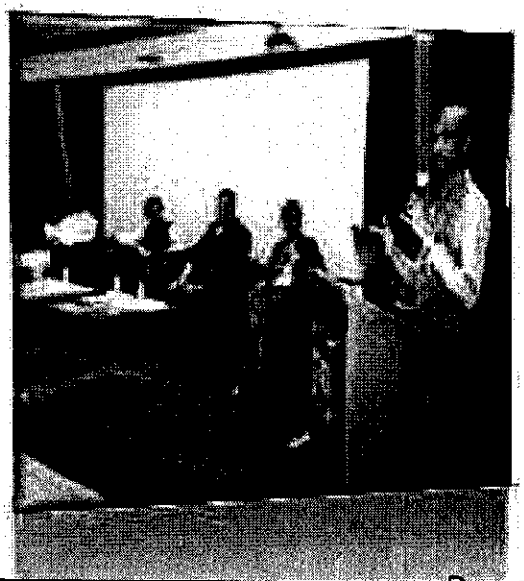


1073

nauguration of Skill Development training program or Schedule cast beneficiaries

nother milestone reached on 28th Dec 2018, ASDC launched its program for schedule caste in the state of Gujarat. This program will ain candidates in various vocational training educational course like Self employed tailor and Beauty & Wellness. Total 60 women/Girls rticipated in this training. This course is sponsored by Department of Social justice and Empowerment . It was inaugurated in the teemed presence of Mr. V. S Gadhavi sir (Executive Director ASDC), Mr. Rakshitbhai Shah (ED of APSEZ, Mundra), Mr. K D Kapdiya irector of Department of social justice and Empowerment), Mr. B P Soyantar (Dep. Director of Social justice and Empowerment, ndhinagar), Mr. Dhangaru (Dep. Director of Social justice and Empowerment, Bhuj), Mr. Jatin Trivedi (HOD of ASDC), Mrs. Pankti Shah nit CSR Head of AF Mundra), Mr. Javaid Akhatar (HR Manager of ASDC).





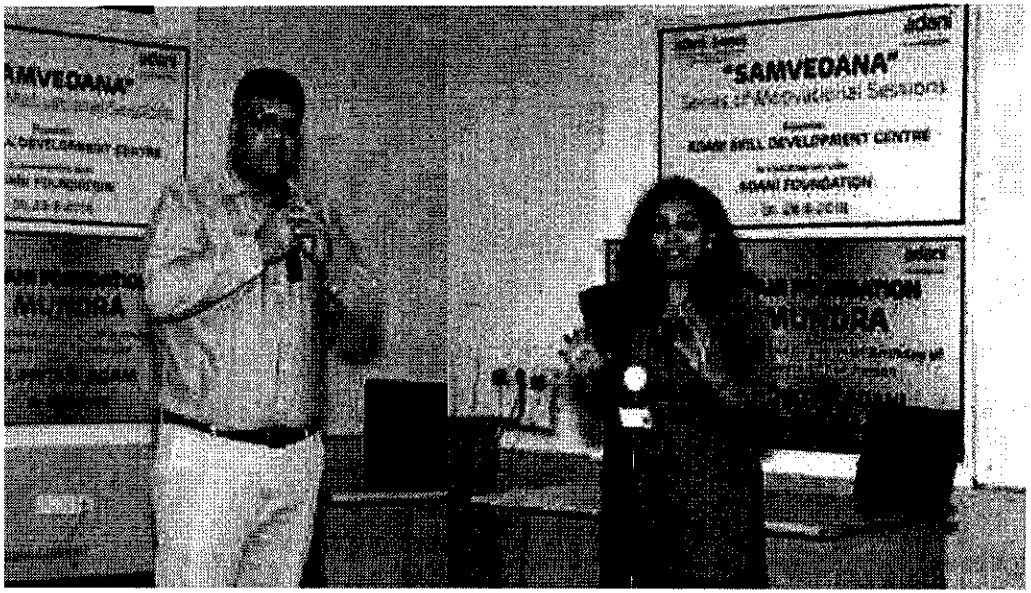




SWACHHAGRAHA :
At Gujrat Adani Institute of Medical Sciences



"Swachhagraha " – Project launched at Adani G K General Hospital to embed values of cleanliness in minds of the staff and community as well. Separate staff member is also appointed by HO team for the same. Mr. Gadhavi had launched swachhagraha by presenting insignia to Dr. Bhadarka' (Head, Adani GKGH).



SAMVEDANA :
Series of Motivational Sessions

To motivate and felicitate paramedical and nursing staff motivational session was organized with help of Ms. Hiral Pandya which is critical requirement of GKGH. She talked about behavior aspect as well as compassionate approach to patients.

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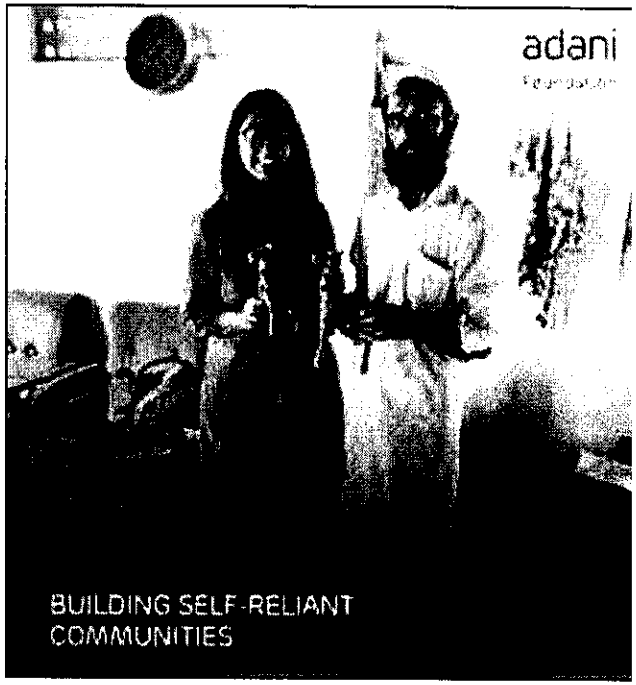
NAMDA ON REVIVAL PATH

ı as a breakthrough is waiting to happen, five trainees were enrolled on Tuesday 5th Dec 17 by ıi Skill Development Centre (ASDC) for the age-old Namda craft, a dying art form of Kutchh ict in Gujarat. First initiative of its kind, the skill development training on Namda is aimed at aring a future generation of artisans for the historic art form.

ıi Foundation, the CSR wing of Adani Group had vowed to save Namda from extinction and ı back its past glory. Originally innovated by an artisan of Mughal Era in the 11th Century India, da craft was primarily practiced by the Pinjara and Mansuri communities and Sama Muslims ve to Kutchh. Sans proper encouragement, marketing avenues and promotion, the art suffered a ır setback with artisans gradually switching over to other professions for livelihood earning.

ecently, when the Adani Foundation, Mundra team members approached Mansuri Karimbhai r bhai, perhaps the sole survivor of the craft in Kutchh, Namda was dying a natural death. As a l corporate citizen, the Adani Group initiated a move to protect the art form, as well to make it ılar and sustainable.

first step towards the enormous goal of reviving Namda, the training programme kicked started lots of positivity and enthusiasm among the trainees, who are committed to put best efforts for ging back the past glory for this craft. And the best part of the initiative is that, the Namda vor himself would train the future-artisans.



AT ACHIEVEMENT IS....

IM MANSOORI ONCE AN ORDINARY NAMDA ARTISAN IS NOW AN ENTERPRENUAR. THE ADANI FOUNDATION FEELS CONTENTIN IVING THE DYING NAMDA ART FORM AND SUPPORTING MANSURI IN STARTING HIS OWN BUSINESS.

JOURNEY IS OFF TO TO A FLYING START AND WE WISH HIM ALL THE BEST.

3730

4076

Beneficiaries Speaks



4077

Utthan : Enhancing Quality of Education !!



vinal is a small village of Mundra Taluka. The village boasts of the works done by the goodwill of the Mahajans.The age is inhabited by approximately 1000 people. Rameshbhai Sathwara , his wife Champaben along with their three s are one of the families residing over here. Rameshbhai is a greengrocer and lives a contended life with his family. eldest son 14 year old Haresh and the middle one 10 year old Lalji study with devotion and bring good result with l's grace and the blessings of the elders of the family. Their final result would bring a new ray of hope for the parents ry year.

the youngest son, Sanjay studying in class 3 could not read or write. Even after a lot of efforts nothing could not ke him read and write. He himself did not even feel like reading or writing. It was meaningless to drag him into ning without his own willingness. The teachers also accepted Sanjay as a dull boy and didn't pay much attention.

one August morning became august for this boy as it brought a bright ray of hope for him.

ew teacher who had come to teach students like Sanjay talked to Sanjay in his Kutchi mother tongue and this tude of this teacher made the little boy go wonderstruck. The new teacher made them sing a lot of poems, showed a of colourful books and told them a lot of stories. Her attitude interested Sanjay and he willingly came ahead. He sat he first raw and told the teacher about a lot of things including the beehive outside his home, his parents and elder thers. What appealed Sanjay the most was the constant attention paid by the new teacher to him. The next day led jay to the special classroom made for the students like him.

s, every morning became a new, exciting morning for him.

l today, the innovative rangoli making in shape of alphabets using the fallen tree leaves interested him so much that got interested in writing letters. This interest led him to write alphabets and later words. Moreover, he got interested o-curricular activities like reciting poems and colouring the pictures.

factor that attracted him the most was the loving teacher and this teacher is Hansbai Gadhvi. A resident of ndra itself Hansbai, studied at Adani Public School. She provides her services to Adani Foundation's Utthan gramme.

Utthan project is the result of the agreement under which Shri Bhupendra bhai Chudasama, the Minister of cation of Gujarat assigned the responsibility of improving the quality of Education to the Adani Foundation. And responsibility has religiously been accepted by Shri V.S.Gadhvi Sir for the 17 government primary school. Shri Gadhvi has taken it as a mission for the foundation to lead the below average students to the upper level. The teachers ing command over Hindi, English and Kutchi have been providing their services in these schools.

Utthan Project initiated in August 2018 has been heartily welcomed and appreciated by the students, parents and chers of this area. Under this project, the children who are weak at reading, writing and basic calculation are taught uch innovative ways that their foundation becomes strong and they can come into mainstream level of their class.

best characteristic of this project is introducing English language from the class 1. Talking about the co-curricular vities, these schools have been facilitated by libraries, smart class rooms and sports equipment.

efforts are made with a hope that these children get the benefit of this teaching mission and move towards a py, bright and prosperous future.

Jtthan : Enhancing Quality of Education !!



Her eyes today had a shine so different, so divine, probably astral... was the shine real or an illusion? Or it /as a simple result reflecting the efforts put in?"

hese are the words of Siddhi Shah who is one of the teachers working as Utthan Sahayak in the Utthan roject. She works in the Zarpara village, a village where the chief occupation is agriculture and this works s the chief reason behind the irregularity of children in attending school.

he area in and around Zarpara is quite vast and looking at this only the Government has approved 6 overnment Primary Schools. But the scenario on the education side is still dismal. There is a long way to o to achieve the desired results. The teachers like Siddhi Shah who work as Utthan Sahayak have their ole here. They play a key role in leading the children to school and bringing their academic level up.

et's talk about what Siddhi Shah has to say about one such girl Prgna who studies in the Khoyadi overnment Primary School.

ragna's father Haribhai is in agriculture field and rearing cattle. This work cannot be carried ahead /ithout the support given by the wife and thus the mother Malsriben too is busy helping the husband in is daily work along with shouldering the responsibilities of performing the household chores of a joint amily and bringing up of her own three children. Hence, she finds it difficult to monitor the schooling of er children.

ragna herself did not have much interest in studies and being the only girl child of the family, Pragna idn't take going to school seriously.

iddhiben Shah would check the attendance registers daily and would go to meet the parents of those hildren who do not come to school regularly.

ragna's irregular attendance was noticed by Siddhiben Shah and she decided to visit her home.

nce she visited her mother Malsriben and persuaded to send Prgna at school. This worked and Prgna tarted coming regularly. To her surprise, Siddhiben found that Pragna who was not at all interested in eading and writing could do Maths sums excellently well. Siddhiben used her interest in Maths and led er to reading and writing. Under Siddhiben's guidance, Pragna started with letters, words and with the assage of time she acquired fluency in reading flawlessly. It was like a test for the teacher and Pragna's eading fluently and with interest was the fruit the teacher's hard work bore.

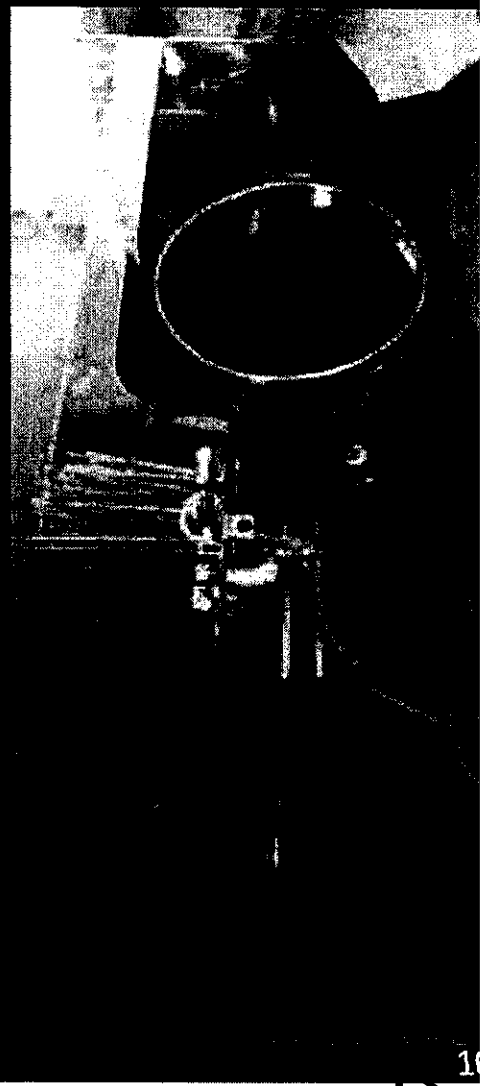
nd today when in the Saturday morning assembly, Siddhiben saw Pragna reading the newspaper fluently, he realized that it was her hard work that had borne fruit.

iddhiben Shah is basically a computer engineer but her love for social work, especially in schools brought er to work in Utthan. The students studying in Adani Foundation and in the schools under the Utthan roject salute her dedication.

4079

Swavlamban :
Pathways to become Self Reliant !!

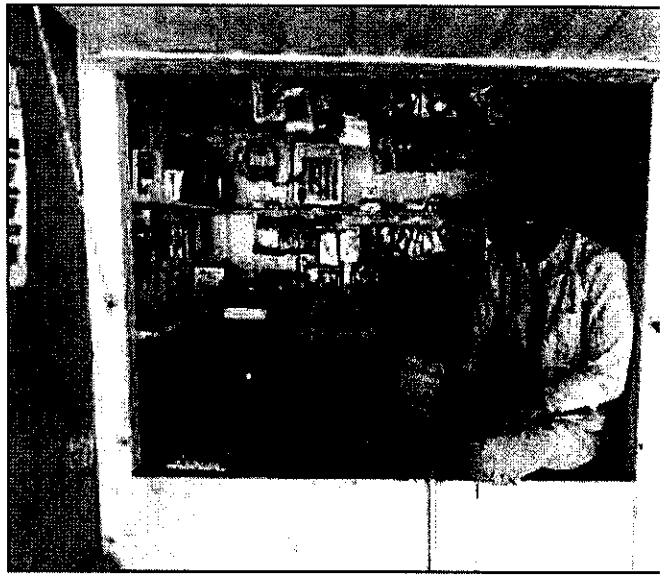




Mina Ben is resident of Baroi village. She is widow and living with his two children who are studying in school. Adani foundation is coordinating with Jilla samaj Surakha department for availing various benefits of Government of Gujarat to widow women, differently abled and senior citizens of Mundra, Mandvi and Anjar Taluka. We did all procedure for Mina Ben for regular pension scheme.

Mina Ben was ready n passionate to start Gruh Udyog with loan support with 40 percent subsidy by Vajpayee Bankable scheme "With our efforts she got loan and now she will start Gruh Udyog of " Aggarbatti " with pre defined marketing linkages with Ashapura temple trust.

Swavlamban : Pathways to become Self Reliant !!



dam Bhai Bayad is living at Moti Khakhar Village He is differently abled and having wife nd two children in his family. He is having one skill of mobile and computer repairing. s per his request we allotted him one cabin for income generation. Now he is started to ale Mobile, Mobile accessories. Additionally he started repairing mobile and computer. By ard work he started earning considerable amount. Adam Bhai says "due to this support ıy children can study well and my quality of life is enhanced



Parvina ben is Divyang but strong lady. She is educated and use to work as a teacher primary school. She was using sticks to reach school. Adani Foundation had given support of tricycle for her comfortable transport.

She says "Adani Foundation is working as a great facilitator for needy people. This is true social work which has created very good imprint in heart of village people. God bless !

4081

wavlamban : Pathways to become Self Reliant !!

the wheels of her sewing machine keep moving, so as the dreams of a better life and powerment enthuse Bhanuben overcome the physical deformities which came in the form an ıry in the spinal cord during childhood. Both her legs were malfunctioned forcing dependence calipers for movements.

ınuben Gangji Patariya of Bhujpur village lost her father when she was just 15 years old, and l very little understanding of the materialistic world and struggle of life. Poverty in the family ıpelled Bhanuben to drop school and do small odd household jobs of fellow villagers and ıetimes accompany her mother as daily labour.

: sudden transition in life, from most adorable darling of her father to an unnoticed and uncared nan being in the society, often disturbed the innocent mind of Bhanuben.

v months back, Bhanuben had enrolled at Adani Skill Development Centre for stitching training, ch she could successfully complete within the deadline due to a strong will power and iration to win over all odds in life. During her training period only she learnt about AF's Project avlamban and expressed the desire to be part of it.

owed by proper counselling and guidance for self-sustainability, AF donated her one wheel ir and a sewing machine which helped Bhanuben change her life and build the self-confidence stitching a bright future for her family. Now she earns an average of Rs. 2500 a month which es care of the basic livelihood needs of her family.

aring a smile of satisfaction on her face and the pride of being self-sufficient, Bhanuben resses her heart-felt gratitude to AF for standing by her during this critical juncture of life. She become a ambassador to spread the message of all good works by AF in her locality. She is yet, ther success story in the saga of sustainable CSR by AF.



4082

wavlamban : Pathways to ecome Self Reliant !!



r name is Sanjuben. Residing in Vadala village with her Divyang sband and 9 years old son. Her husband is working at one shop d trying for two ends meet. During Divyang Mahiti card Vitran Mamlatdar office she came to know about project Swavlamban. e meet Kalyan Gadhvi who is community mobilizer in Adani ndation. Kalyanbhai had given information n support for yang pension scheme.

ce two years couple is getting pension which amount can be d for further study of their son. Additionally, Adani foundation ported her for tricycle in coordination with district social fare department. Sanjuben is daily using tricycle to give tiffin ner husband. Small linkage can bring life transformation !!!

Spruha : Motivating fisher folk for bright future !!



Fakir Mamad Hasan Vagher

24 year old from poor fisherman family was selected by AF provide cricket coaching last year. he has completed success training at Rajkot YB sport academy with excelle performance even in Kutch 23 selection. The YB acade organized honor ceremony and invited AF. On this occasi dignitaries and more than 400 peoples were present and th all appreciated noble support by Adani Foundation.

Fakir Mamad saying that he was playing on behalf of oth team and earn RS 500 to 600 but after cricket coaching he g status and honor in Kutch cricket even in society and earn 1500 to 2500 for each match.

4083

pruha : Motivating fisher folk for bright future !!

mad Sakil Osman Ghani Adani Vidya Mandir – Bhadreshwar 'A High Leap by a Poor Child from the ıer folk Community.....Towards Engineering Studies.....Through Adani Vidya Mandir' 2017-18 Name: mad Sakil Osman Ghani Father's Name: Osman Ghani Mother's Name: Halimaben Family: Brother (1) ;isters (4) & Parents; total 8 members Occupation: Fishing Village: Luni; Taluka: Mundra; District: :chh In modern times along with its importance, education has also made changes in our lifestyle.

ani Vidya Mandir, Bhadreshwar, is like a lighthouse giving a ray of hope in remote areas. It was ablished to provide education to children from socio-economically backward communities. The ıool provides high-quality education, nutritious food as well other kinds of facilities so that children's f-respect increases through the education. Speaking of students, Mamad Sakil was enrolled in the . 7, in 2014-15 in the Adani Vidya Mandir, Bhadreshwar. His father, Osman Ghani, is a fisherman. His ıily of eight members consists of his mother, his father, a brother and four sisters. They live in Luni ıdar.

m the beginning it was seen that he was a quiet, straightforward, humble and cultured boy. He also ıibits behavior with moral values. Everyone helped the family socio-economically. In the Adani ındation with the help of Vijayhai and Ishwarbhai noted details of the family and found that nobody s educated. In such times of rising prices and inflation it is difficult to raise so many children. So the ıool management decided to take over and fulfil his basic necessities. Efforts for this child's ıcational success were made including counselling and guidance.

ing his first year in the school, he participated in the running competition in the Khel Mahakumbh l came first in the district. In this way, he began to progress in not just education but also other as. He started getting promoted to the next standard every year and eventually he reached Std. 10. h the help of the school in various ways and his own hard work, he successfully cleared Std. 10 with ;. He stood second in the school. Now, the journey of his life has really started. He has started to see v and inconceivable dreams for his future career. Now, the Adani Foundation will be holding his hand ulfil his dreams.

er completing studies of the Std. 10, he was gifted an android phone by the school principal, Smt. madam, as he needed new technology to get admission for further studies. In this way all the ;tacles have been removed from his career path. He has now taken admission in mechanical ;ineering in Bhuj Polytechnic, and the Adani Foundation has paid his entire fee. A new innings has rted in his life. With his hard work he is making progress step-by-step. He has set a good example for er students. And we all hope that he will eventually become a strong financial support to his family.



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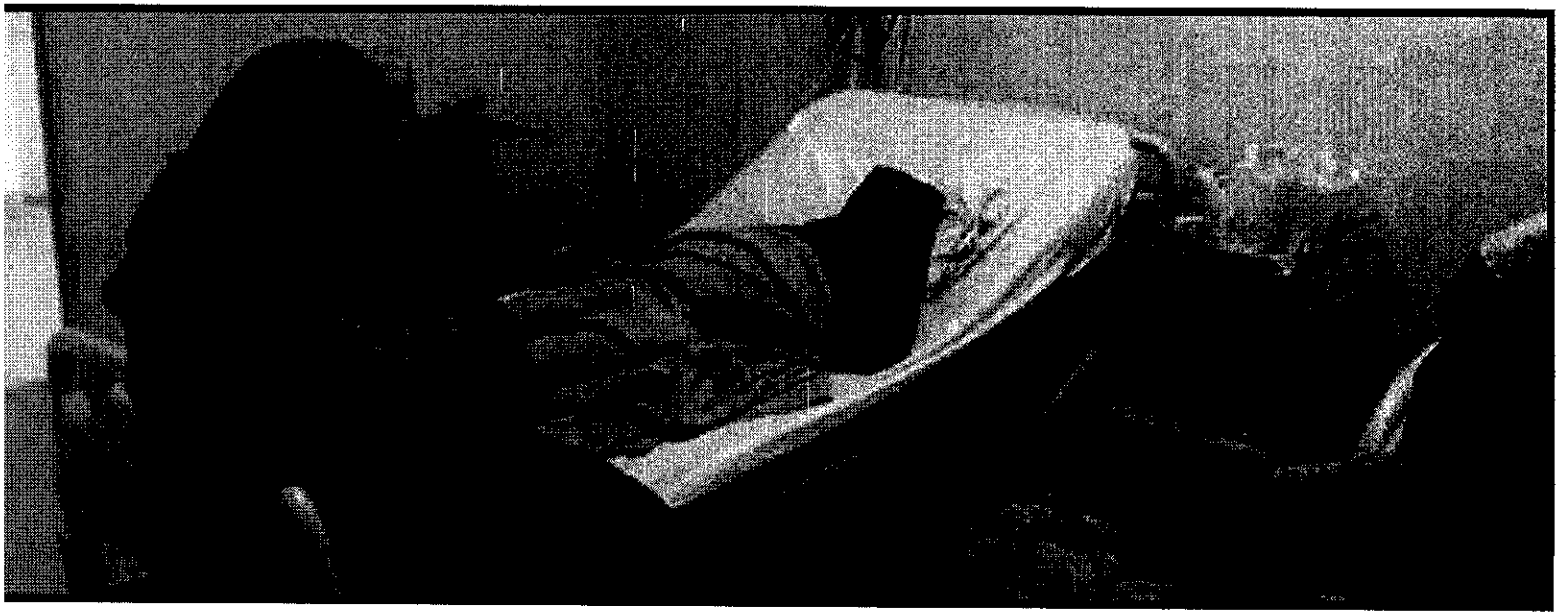
Adani Vadil Swasthaya Yojana: Holding Hands !!

Every human being has specific periods of the life wherein the childhood is for fun and the adulthood is spent for the family; remains old age to take care of health

Adani Foundation is holded hands of the senior citizens of Mundra

Manubha and his wife stay alone. Their son and daughters stay separately. They earn their living by grazing cattle. Manubha is having **respiratory disorder.** The source of income is very meager and that to dependent on rain. He had to borrow money from family friends or at times take on interest for taking basic treatment. His wife Shantaba also has blood sugar and hence she also requires medical assistance at times. The couple took **Adani Foundations' *Senior Citizen Health Card*** in 2015 by which they are able to save good amount, which was their medical expense every month.

"Adani Foundations' Senior Citizen Health Card is like a cure to our emotional, physical and psychological problem; in the times when we are completely lonely and handicap at age."....Says both of them while weeping.





4085

Adani Vadil Swasthaya Yojana: Holding Hands !!



Adani Foundation at Bhuj is aware of its social responsibilities to the surrounding community. Madhapar is a village approximately 28 km away from Bhuj wherein resides Aseembhai who was financially, health-wise and socially unstable until he availed help from AF at G K General Hospital Bhuj. Aseembhai settled in Madhapar 30 years ago. before 8 years, he lost his wife to heart attack.

His parents passed away when he was 3 years of age and the only surviving relative he could call his own was his brother who was also mentally-challenged. His problems did not end there as e suffered from high blood pressure and stress induced thyroid which required he took medication as long as he lived.

Slowly his body stopped reacting to the medicines and these did not work. One He got convulsions as a side effect of over dose of medicine. His neighbors took him to Adani G K G H Hospital. Adani Foundation staff took very good care of Aseembhai. For one month he admitted to hospital and daily staff members ask about his health.

When he got discharged he said

"Adani is Like my Second Son.. I get the services even without asking for it"

Saksham Superhero's : Skill Development



My father is a working as a mechanic in ST workshop and his income was not sufficient for live life better so my mother also was working in different fields. I also was trying to find job for support to my family financially. One of my friends suggested me to visit Adani Skill Development Centre – Bhuj and join General Duty Assistant. When I visited center I got all the GDA related information from the staff, I took admission. During this course I learnt lots of Medical related things from the faculty I also was taught about Personality Development, Computer basics, Basic English, Interview Skills. During my practical for 1(one) month in GAIMS, I got chance to work in 4(four) wards. During my practical I learnt many things. After completing GDA course ASDC SAKSHAM is arrange interview At Adani GAIMS Hospital Bhuj. I attended interview and I was selected for physiotherapy section. I was offered monthly salary Rs.10000/- and join the job. After joining this job, I am glad that now I am a working woman and more then that I can help my family financially. With this job my life has become better than before. I would like to thanks Adani Skill Development Centre to give me this Opportunity and for making me SAKSHAM.



22 years old Dhanabai completed Self Employed t course from ASDC in the m of June 2018. Now she her own tailoring busines home and doing stitch la clothes.
At present she is ear Rs.6000/- Monthly.

4087

sham Superhero's : Skill Development



Bhand Navin Devjibhai is very fond of financial autonomy and self-sufficiency, a principle of life which he has got by virtue of his skill development training at Adani Skill Development Centre (ASDC), Mundra. A Commerce graduate from Mundra village, in the year 2017 Navin had enrolled himself at ASDC for the IT-Basic Computer training. He was unemployed and lacked the minimum confidence of facing any job interview as per his qualification.

)art of the well-designed training curriculum at ASDC, the 21-year old :h learnt skills of public speaking, professional manners, facing rviews etc. along with core subject of IT basic computer. The training ed Navin immensely and fetched him a company job with lucrative Rs. 00/- per month salary. Happy with his financial autonomy, he is now in a fortable position to support his parents and three brothers.



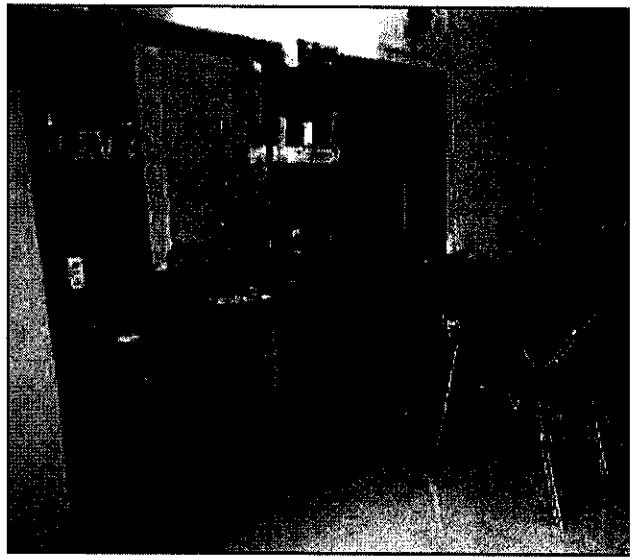
My name is Ashok Maheswari from shedata village, Mundra. My father is no more in this world so I was trying to find job for support to my family financially. One of my friends suggested me to visit Adani Skill Development Centre – Mundra and I have joined Checker cum RTG crane operator training for 3 mont After successfully my training I sent my resume in vari port. One day I received call from aani port at katupall Chennai and I attended interview and I was selected RTG crane Operator. And today my salary 20,000/- month.

So, I can help my family financially. With this job my has become better than before. I would like to tha Adani Skill Development Centre to give me t Opportunity and for making me SAKSHAM.

4088

aksham Superhero's : Skill Development

nisha Patel, from Mundra, has completed Std. 12. Her parents are laborers, earning minimum ges. Manisha had always been a bright student in school, wanting to learn new things. eling restricted in life, she dreamt of doing something different. She wanted to have a cessful career and be recognized by society. Hence, when she was advised by a close friend oin ASDC's Beauty & Wellness course, which is an NSDC certified course, she grabbed the portunity. She came to the course with a fresh mind and ready to absorb all the knowledge. e actively participated in all activities. She was full of curiosity and questions, and this itude enhanced her skills. She was extremely happy when the trainer appreciated her husiasm upon completion of the training.



e was delighted to open her beauty parlor. She had also undergone extra training in specific t skills and business manners in order to handle customers. With these skills, she manages tomers like a pro and runs her salon smoothly. Her family members, including her in-laws, re initially hesitant to let her join the course but soon relented upon seeing her enthusiasm d zeal for learning. They are quite proud of what she has achieved in such a short time.

nisha and Shree Beauty Parlor are synonymous with high-standard beauty and wellness vices in the Mundra locality. Her quality services and reasonable prices have increased her oularity and helped in attracting more customers. Today, she earns Rs. 12,000-15,000 per nth. Her trainer, Ms. Rekha says, "She and many other candidates who completed their ining at ASDC are ambassadors of Saksham. They strive to learn and grow by beating all ds. I am proud to be given this opportunity to groom and create skilled beauticians who can ndle the ever-increasing standards of beauty treatments in a city like Mundra. I wish them very best!"

3713

4089

aksham Superhero's : Skill Development

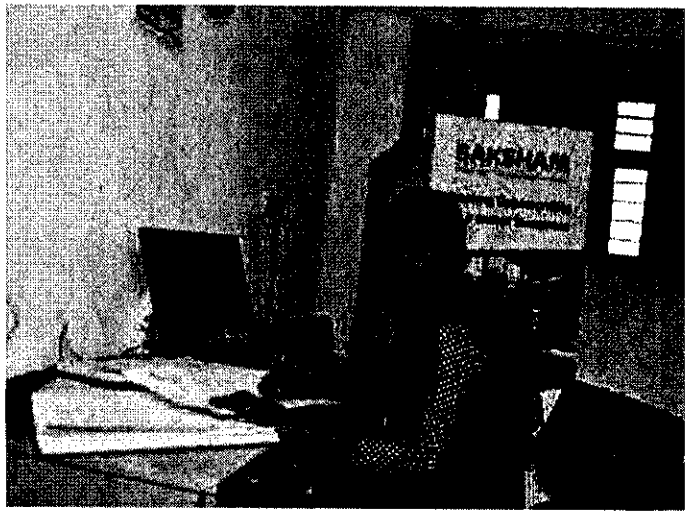
ai koli- A youngest widow of the general duty assistant (GDA) batch from Adani skill velopment center (ASDC) Bhuj is an epitome of courage and confidence. She is 22 rs old with a one and half year old baby, and lives in a Mirjapur village, Bhuj.

e is 12th pass with Arts stream and used to love drawing and painting as her hobby. Her ents work as laborers and her sister cooks at home. She got married in 2016 and lost husband in 2018.The most tragic thing is that she didn't even know the exact reason her husband's sudden death. Happiness is transient, she faced many problems starting h loosing her husband, becoming single parent and loosing financial support from her aws which resulted in returning to her parents home.

en asked about her future plan she says "Talking about remarriage is a taboo in our age and culture. I want to be strong enough to work hard and give my son a healthy l happy Life".

sently, Lilmai is pursuing her ,On the Job Training in G.K General Hospital. A girl who never seen hospital is now learning technicalities of patient care in emergency ward.

young novice is all set to become a successful patient care assistant with a single goal ife i.e 'To become economically stable enough to educate her child'. Lilbai expresses ge gratitude to Adani Foundation and ASDC Bhuj for giving her opportunity to study A course and help her get the job so that she no longer have to depend on anyone's p for herself or her child's future.





3764



Adani Cementation Private Limited (Lakhpat)

4091

Adani Cementation Private Limited (Lakhpat)

dani Cementation Limited (ACL) proposes to setup an ıtegrated cement project as Lakhpat Cement Works which ıcludes Limestone Mine in 251.9 ha area, Cement Plant of ıted production capacity of 10MMTPA Clinker and 3MMTPA of PC/ PPC/ PSC/ COMPOSITE CEMENT in three phases, and a erthing jetty of 15MMTPA traffic capacity in phase wise ıanner in Taluka Lakhpat of District Kutch (Gujarat).

roject Public hearing will be in month of May 2019. For mooth Execution of the Project we have started Participatory ural Appraisal and Village Development Committee formation : three nearest villages (Koriyani, Kapurashi and Mundhvay) of ur upcoming cement plant.



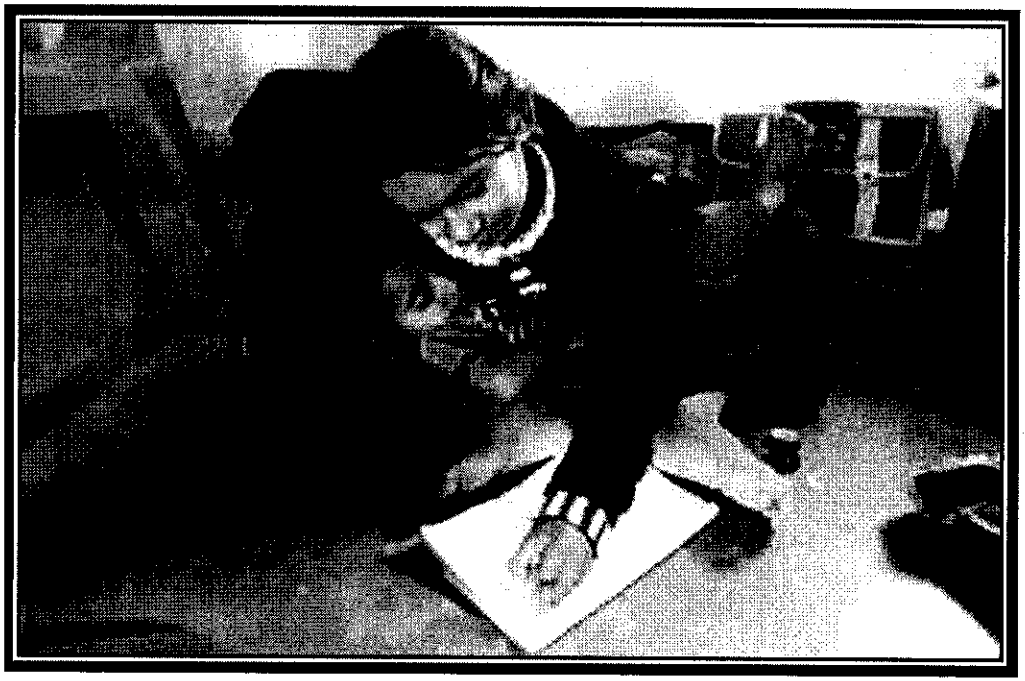


Adani Cementation Private Limited (Lakhpat)

Kutchh is the biggest district in India and Lakhpat is far away from Bhuj which is main city of Kutchh. Health facilities are very poor as District hospital is around 150 Kms Away. Main livelihood is animal husbandry and daily wedge labour. Except GMDC , no big industrial set up is in Taluka.

Critical Issues are as under

1. Poor Health Facilities
2. Quality of Primary Education
3. Infrastructure of School
4. Livelihood options
5. Fodder and water Scarcity
6. Malnourishment





Adani Foundation will make five years plan to mitigate the issues with priories suggested by Village Development Committees. Detailed PRA including Demographic survey is taken up and submitted.

4093



Adani Green Energy (MP)Limited (Nakhtrana)

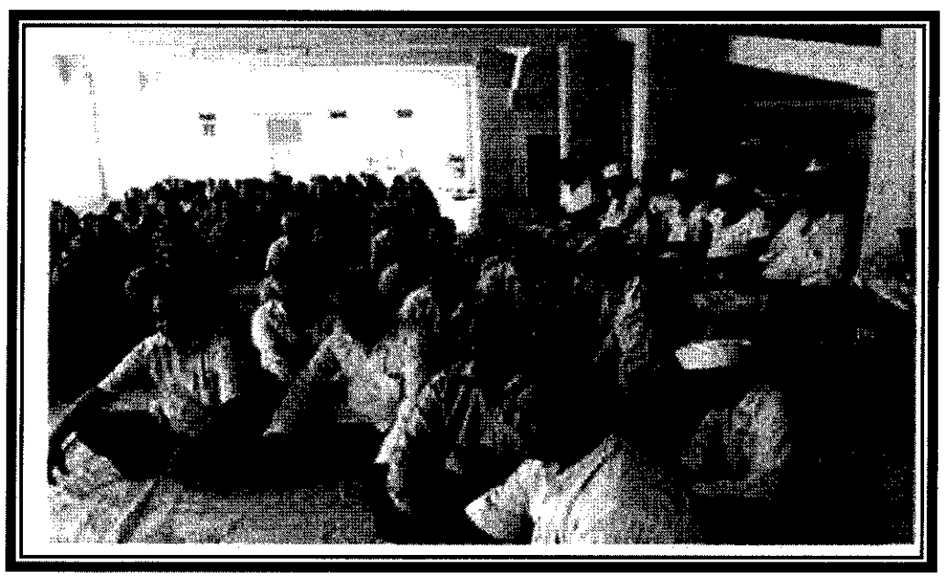
4095

Adani Green Energy (MP)Limited (Nakhtrana)

Kutchh is the biggest district in India and Ratadiya (Nakhtrana) is 70 Km away from Bhuj which is main city of Kutchh. Health facilities are very poor as District hospital is around 70 Km Away. Main livelihood is Agriculture, animal husbandry and daily wedge labour. In Nakhatrana, No big industrial set up is in Taluka.

Critical Issues are as under

1. Poor Health Facilities
2. Quality of Primary Education
3. Infrastructure of School
4. Livelihood options
5. water Scarcity
6. Malnourishment





Adani Foundation will make five years plan to mitigate the issues with priories suggested by Village Development Committees. Detailed PRA including Demographic survey is taken up and submitted.

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Adani Green Energy (MP) Limited (Nakhtrana)



Adani Green Energy(MP) Limited (AGEMPL) proposes to setup an integrated wind energy project as Green Energy Works which includes Limestone 750 Mw, Through approx. 1250 windmill at Dayapar to Nakhtrana in District Kutch (Gujarat).

For Smooth Execution of the Project we have started Participatory Rural Appraisal and Village Development Committee formation at three nearest villages (Ratadiya, Muru and Ambara) of our upcoming Wind Energy Project.

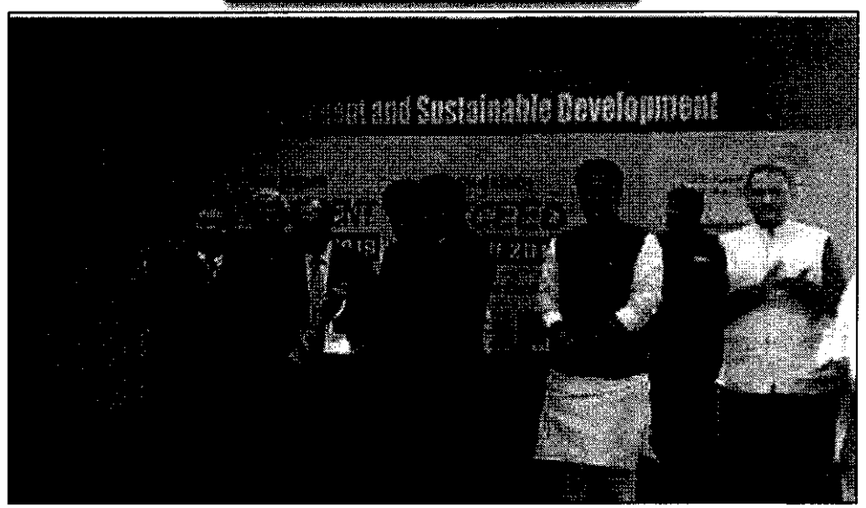


4097

Awards and Accolades

We are glad to announce our latest accolade- the Eminent Award 2018 platinum category presented at the Ek Kaam Desh Ke Naam award ceremony on 25th March , 2019 at New Delhi. The award was bestowed upon Adani Ports and SEZ Ltd, Mundra, for outstanding achievement in Corporate Social Responsibility, specifically " Adani Vadil Swasthaya Yojana - Health card to senior citizen ". The award was presented by Sh. Anil Baijal - Retired IAS & 21st Lieutenant Governor of New Delhi and was received by the Community health team of Adani Foundation, the CSR arm of the Adani Group.





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Pleasure to share that

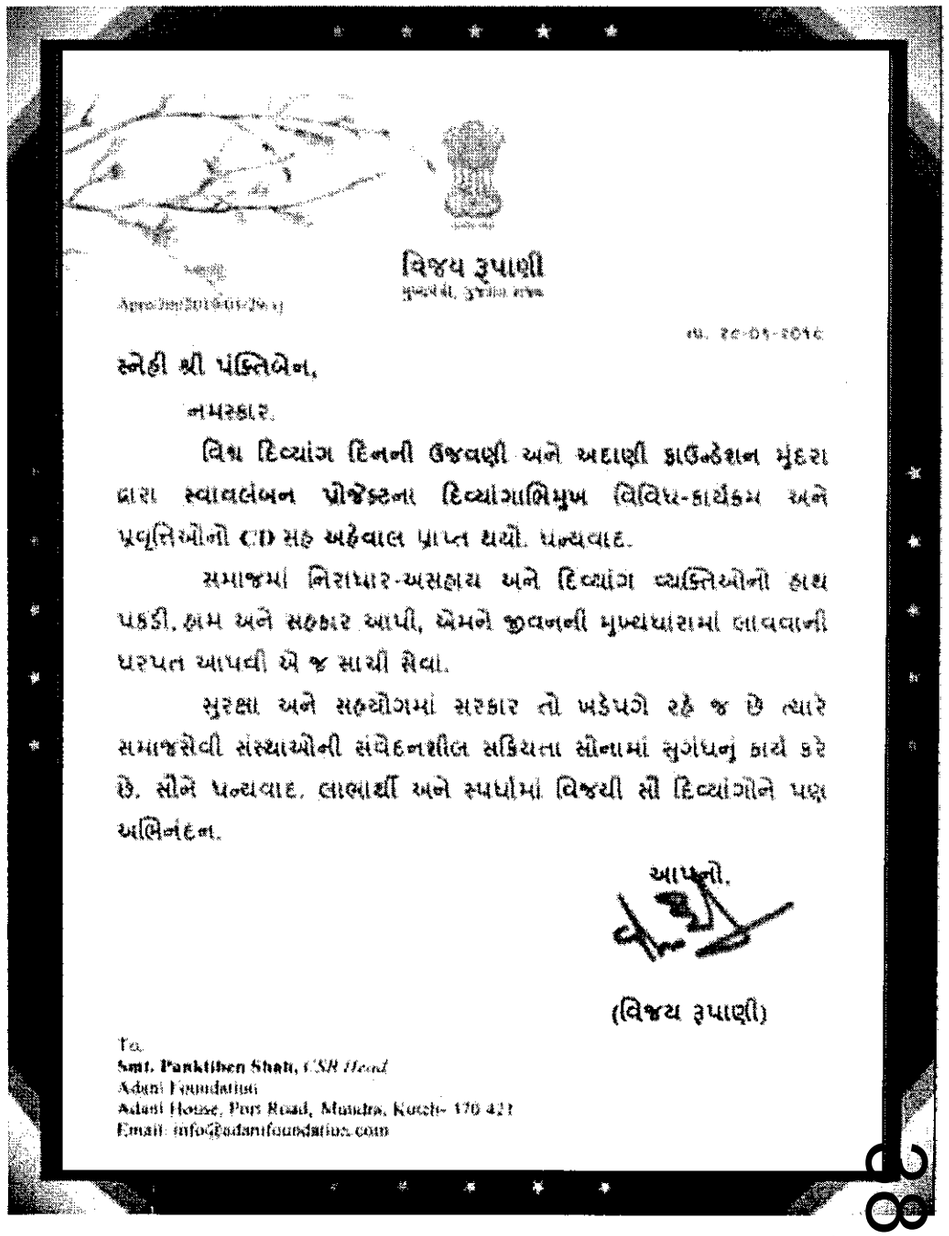
Adani Foundation have received

appreciation letter from

Mr. Vijay Rupani (Chief Minister, Government of Gujrat) for

commendable work for Project

Swavlamban in District Kutchh



વિજય રૂપાણી
મુખ્યમંત્રી, ગુજરાત રાજ્ય

Ref. No: GH/201601/2961

તા. 26-01-2016

સ્નેહી શ્રી પંક્તિબેન,

નમસ્કાર.

વિશ્વ દિવ્યાંગ દિનની ઉજવણી અને અદાણી ફાઉન્ડેશન મુંદરા દ્વારા સ્વાવલંબન પ્રોજેક્ટના દિવ્યાંગાભિમુખ વિવિધ-કાર્યક્રમ અને પ્રવૃત્તિઓનો CD સહ અહેવાલ પ્રાપ્ત થયો. ધન્યવાદ.

સમાજમાં નિરાધાર-અસહાય અને દિવ્યાંગ વ્યક્તિઓનો હાથ પકડી, હામ અને સહકાર આપી, એમને જીવનની મુખ્યધારામાં લાવવાની ધરપત આપવી એ જ સાચી સેવા.

સુરક્ષા અને સહયોગમાં સરકાર તો ખડેપગે રહે જ છે ત્યારે સમાજસેવી સંસ્થાઓની સંવેદનશીલ સક્રિયતા સોનામાં સુગંધનું કાર્ય કરે છે. સૌને ધન્યવાદ. લાભાર્થી અને સ્પર્ધામાં વિજયી સૌ દિવ્યાંગોને પણ અભિનંદન.

આપનો,

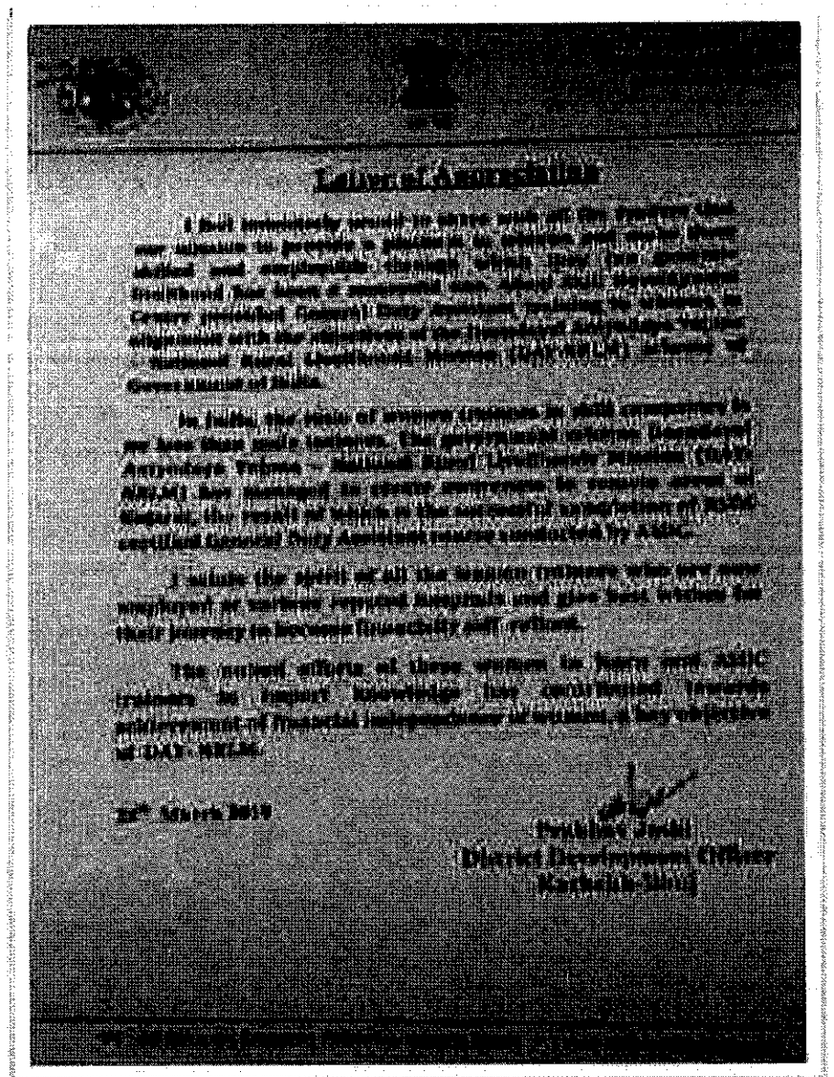
(વિજય રૂપાણી)

To,
Smt. Panktiben Shah, *CSR Head*
Adani Foundation
Adani House, Port Road, Mundra, Kutch- 370 421
Email: info@adanifoundation.com

Awards and Accolades

4099





4100

Awards and Accolades

જિલ્લા સમાજ સુરક્ષા અધિકારીની કચેરી

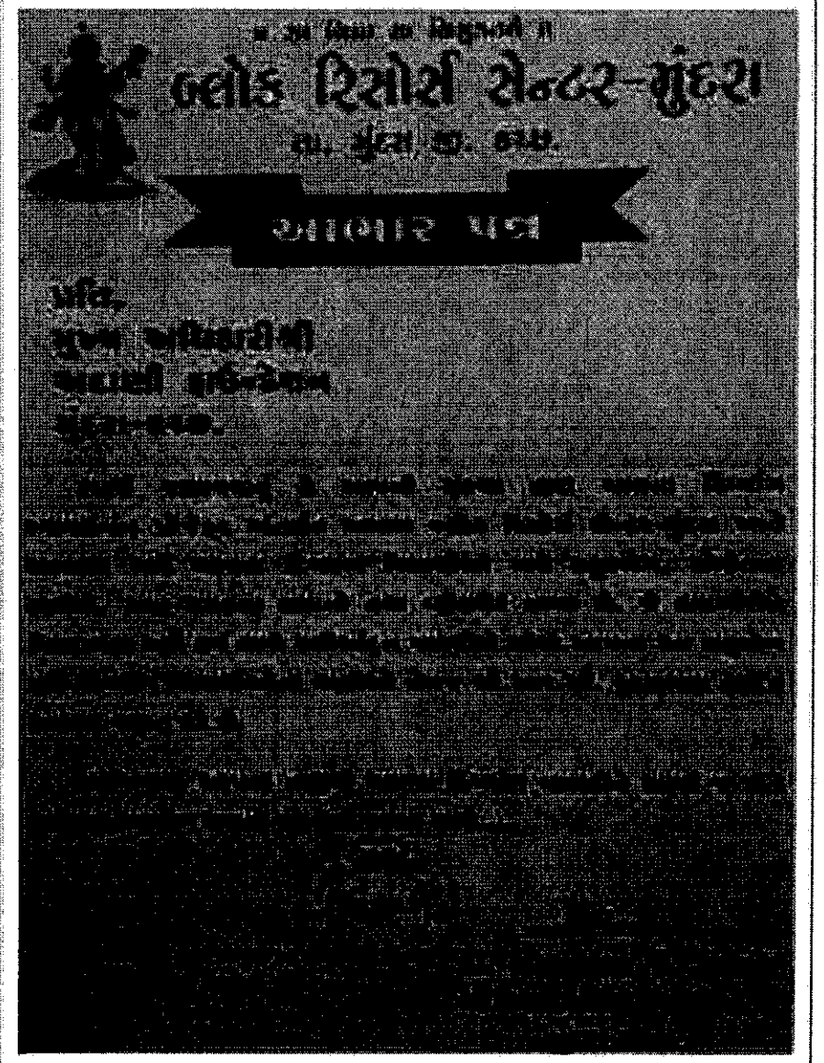
[redacted]

—: પ્રમાણપત્ર :—

[redacted]

[redacted]

[redacted]

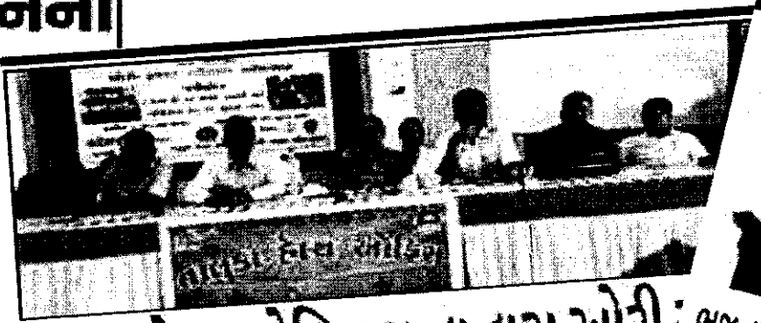


4101

મદ્રેશ્વર ગામે અદાણી ગ્રુપના ચેરમેનના

જન્મદિનની અનોખી ઉજવણ







તાલુકા હેલ્થ ઓફિસ મુન્દ્રા દ્વારા ઓરી અંગે શાળાના આચાર્યઓનો વર્કશ

ભુજના ડો. આંબેડકર કન્યા શાળાલયને આર.ઓ. પ્લાન્ટ મળ્યો

જીકે હોસ્પિ.માં કાલે માહિતી સેતુ કેન્દ્ર ખુલ્લું મુકાશે

સરકારી યોજનાઓ વિશે વિનામૂલ્યે માહિતી અને ફોર્મ આપવામાં આવશે

મુન્દ્રા તાલુકામાં પ્રા. શિક્ષણના ઉર્ધ્વીકરણ અર્થે કરાર કરાયા

મુન્દ્રા તાલુકામાં શિક્ષણના ઉર્ધ્વીકરણ અર્થે અદાણી ફાઉન્ડેશન અને જિલ્લા પ્રાથમિક શિક્ષણ અધિકારી વચ્ચે કરાર કરવામાં આવ્યા છે.

પ્રાથમિક શિક્ષણની ગુણવત્તા વધે, વિદ્યાર્થીઓનાં શિક્ષણ પ્રત્યેનો અભિગમ બદલાય



આયુષ્માન ભારત યોજના તળે ભુજોડીમાં મેડિકલ કેમ્પ યોજાયો

માંડવીમાં ગણિત-વિજ્ઞાન પ્રદર્શનમાં ૬૫ શાળાના છાત્રો દ્વારા એકસો વિવિધ કૃતિ પેશ કરાઇ





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...રો સારવારની સાથે સાવચેતી પણ રાખે

શેખડીયા ગામને ગ્રીન વીલેજ બનાવવાના કાર્યનો પ્રારંભ





...ગરમાં પાંજરાપોળ મલ્ટ તબીબી કેમ્પનું દીપ પ્રગટાવી ...અગ્રણીઓ.

...નગર ખાતે તબીબી તપાસણ...

...ો ૨૦૦ દર્દીએ લાભ લીધો

...૨૬ : અદાણી ...સ્વામી વિવેકાનંદ ...ના સહયોગથી ...ા રબ્બરનગર ...નિઃશુલ્ક આરોગ્ય ...કેમ્પમાં ૨૦૦ ...ોની આરોગ્ય ...ી કરવામાં આવી હતી. ...રના લોકોને નિષ્ણાંત ...ી સેવાઓનો લાભ મળી ...કોઈ મોટી બીમારીઓનો ...ભનો તે પહોંચેથી જ ...તપાસ થઈ શકે અને ...ારવાર કરાવી શકાય ...ત સાથેના કેમ્પમાં ...અદાણી ગ્રાઉન્ડેશન ...દવાઓ નિઃશુલ્ક ...અને વધારે સારવારની જરૂરિયાત ...જણાતા દર્દીઓને અદાણી જી. કે. ...જનરલ હોસ્પિટલમાં ...

નિષ્ણાત), ડૉ. પૂજા નંદાણિયા (જનરલ ફિઝિશિયન), ડૉ. ખ...

વિનામૂલ્યે દવાઓ અપાઈ : જરૂરવાળા ભુજમાં તબ...

...મહેતા (સ્પીચ થેરાપી નિષ્ણાત), ...પૂજા પટેલ (આંખના નિષ્ણા... ડૉ. નિલિન (જનરલ સર્જન) ...દર્દીઓને તપાસવામાં આવ્યા હ...

સ્વામી વિવેકાનંદ પુસ્તક મં... પ્રાનપ્રોના ટ્રસ્ટી પી. સી. ગઢવી ...જિલ્લા પંચાયતના સભ્ય હઠુભા ...સોંદા તથા મહેંદાદાન ગઢવી સા... સ્વામી વિવેકાનંદ પુસ્તક મંડળ ...પ્રાનપ્રોના ...સહયોગ ...ગ્રાઉન્ડેશનના પ્રોજેક્ટ ઓ...



...માં મફત મેડિકલ



...ભુજના ખાવડી મંડિત ગજર ખાતે આયોજન કરવામાં આવેલી ...નિમિત્તે યોજાયેલા આરોગ્યલક્ષી વિવિધલક્ષી ઉપક્રમોમાં ...સમાજના અન્ય ...

...ભુજની અદાણી મેડિકલ કોલેજની સામાજિક જવાબદારી સરાહનીય



...અદાણી ફાઉ. દ્વારા ભુજના સ્લમ વિસ્ત... શાળાઓમાં શૈક્ષણિક કીટનું કરાયું વિત...

ધો. ૧માં પ્રવેશ પામનાર બાળકોને પ્રોત્સાહિત કર...

...ઉચ્ચ અભ્યાસ, ડિગ્રી મેળવવા ઈચ્છુકોને અપાયો સહયોગ

...લુણીમાં માછીમાર સમુદાયના તેજસ્વી તારલાને રૂા.૫.૧૩ લાખની સ્કોલરશીપ

...મુંદરા, તા.૨૪ ...ના બાળકો ઉચ્ચ શિક્ષણ મેળવી શકે તથા ...વિદ્યાર્થીઓને COEK દ્વારા આર્થિક સહાયરૂપ આપવામાં આવે છે. ...ધો.૯થી ૧૨ની વિદ્યાર્થીનીઓને ૧૦૦ ટકા ફી તથા ...આર્થિક મદદ ...

...શાળાના ૧૦૬ શિક્ષકો જોડાયા

...તાલુકાના તમામ શિક્ષકોની આરોગ્ય ચકાસણી કરાઈ



મુન્દ્રા તાલુકામાં ગુરૂવંદના કાર્યક્રમ

રાષ્ટ્રીય શૈક્ષિક મહાસંઘ, કચ્છ જિલ્લા મહિલા પાંખના ઉપક્રમે કાર્યક્રમ યોજાયો

ભુજ : રાષ્ટ્રીય શૈક્ષિક મહાસંઘ મુંદ્રા તાલુકા અને જિલ્લા મહિલા પાંખના જિલ્લા શિક્ષણ સમિતિના ચેરમેન છાયાબેન ત્રિવેદી એ ગુરુ ગૌરવ જાળવવા અને ગુણવત્તાયુક્ત શિક્ષણ આપવા મક્કાણા, પ્રેરણાધ્યક્ષ કાનજી ભાઈ મહેશ્વરી,પ્રચાર પ્રમુખ પ્રકાશભાઈ પરમાર,મહિલા કન્વીનર જેલમબેન જરાદી,

No	Core Area	Beneficiaries	Remarks
1	Education	5602	Uthhan, Labour School, School Enrollment
2	Adani Vidya Mandir	387	School Students
3	UDAAN	33932	116 Institute Visited
4	Adani Skill Dev. Center	2482	Mundra and Bhuj
5	Community health Mundra	58531	MHCU, Medical Camps, Senior Citizen
6	Community health Bhuj	36417	Health Camps, Mahiti Setu, patient care
7	SLD Fisherman	3280	Water, Education, Mangroves etc.
8	SLD Agriculture	1232	Drip Irrigation, Bio gas, tissue
9	SLD Women Empowerment	132	Saheli mahila gruh udyog – 12 SHG
10	Rural Infra. Development	81098	Pond deepening, AKBTPL, Labours work
11	Swachhagraha	3711	Mundra, Bhuj, Anjar and Gandhidham
12	Suposhan Mundra	17025	Adolescent, Children and RPA
13	Suposhan Bitta	6450	Adolescent, Children and RPA
14	Lakhpat	512	Cattle owner for fodder

Total Beneficiaries : 250791

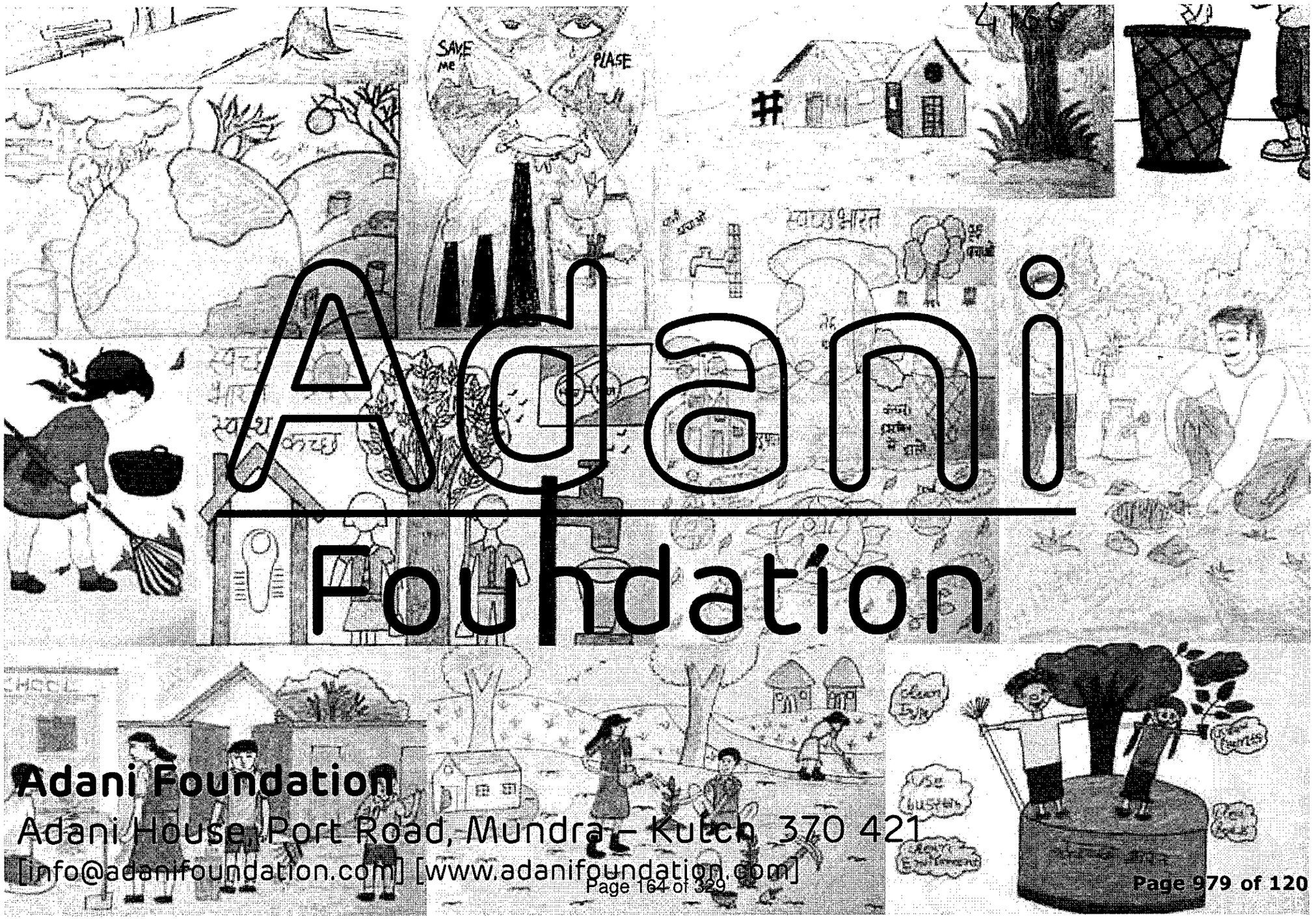
3807

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Financial Overview

Adani Foundation -Mundra				
Executive Summary-Budget Utilization up to March-19				
				(Rs. In Lacs)
Sr. No.	Budget Line Item	Approved Budget 2018-19	Budget Utilizaton 2018-19	% of utilization
A	Admin Expense	67.55	55.44	82.07%
B.	Education	67.85	59.11	87.12%
C.	Community Health	243.21	203.88	83.83%
D.	Sustainable Livelihood Development	505.87	624.68	123.49%
E	Rural Infrastructure Development	326.34	231.81	71.03%
TOTAL AF CSR Budget :		**1210.82**	**1174.93**	**97.04%**
F.	Adani Vidya Mandir - Bhadreshwar	143.15	133.88	93.53%
GRAND TOTAL_MUNDRA CSR WORKS 2018-19		**1353.97**	**1308.81**	**96.66%**
G.	Project Udaan_Mundra	342.82	315.63	92.07%
GRAND TOTAL_MUNDRA CSR+ PROJECT UDAAN		**1696.79**	**1624.44**	**95.74%**

The Utilization will change slightly after receiving data upto first week of April 2019 due to few GRN is pending



Adani Foundation
Adani House, Port Road, Mundra – Kutch 370 421
[info@adanifoundation.com] [www.adanifoundation.com]

ANNEXURE – 4

POLLUCON LABORATORIES PVT. LTD.
Environmental Auditors, Consultants & Analysts,
Cleaner Production / Waste Minimization Facilitator

Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

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"HALF YEARLYENVIRONMENTAL MONITORING REPORT"

FOR

adani™

ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED
TAL: MUNDRA, KUTCH, MUNDRA – 370 421

MONITORING PERIOD:
OCTOBER 2018 TO MARCH 2019

PREPARED BY:

Pollucon

POLLUCON LABORATORIES PVT.LTD.

**PLOT NO.5/6 "POLLUCON HOUSE", OPP. BALAJI INDUSTRIAL SOCIETY,
OLD SHANTINATH SILK MILL LANE, NEAR GAYTRI FARSAN MART,
NAVJIVAN CIRCLE, UDHANA MAGDALLA ROAD, SURAT-395007.
PHONE/FAX – (+91 261) 2455 751, 2601 106, 2601 224.
E-mail: pollucon@gmail.comweb: www.polluconlab.com**

TC - 5945 **ISO 9001:2015** **ISO 14001:2015** **OHSAS 18001:2007**

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POLLUCON LABORATORIES PVT. LTD.
Environmental Auditors, Consultants & Analysts.
Cleaner Production / Waste Minimization Facilitator
Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

MARINE WATER MONITORING SUMMARY REPORT

RESULTS OF MARINE WATER [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018		NOVEMBER 2018		DECEMBER 2018		JANUARY 2019		FEBRUARY 2019		MARCH 2019		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.07	8.01	8.21	8.18	8.12	8.09	8.16	8.1	8.21	8.19	8.13	8.05	IS3025(P11)83Re.02
2	Temperature	oC	30.4	30.2	30.5	30.4	30.1	29.9	30	29.9	30.2	30	30.1	29	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	284	252	264	224	256	270	224	251	191	244	210	234	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	4	3	5	3	4	BDL *	7.2	BDL*	4.8	BDL*	5.2	BDL*	IS 3025 (P44)1993Re.03Editi on2.1
5	Dissolved Oxygen	mg/L	6.4	6.1	6.2	5.9	6.1	5.8	6.2	5.9	6	5.8	6.1	5.9	IS3025(P38)89Re.99
6	Salinity	ppt	34.4	34.1	34.8	34.2	34.9	34.6	34.5	34.7	35.4	35.7	35.6	35.9	APHA (22ndEdi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22ndEdi)5520 D
8	Nitrate as NO_3	µmol/L	5.8	5	8.58	7.79	6.3	4.68	18.51	10.77	10.22	8.53	8.4	6.3	IS3025(P34)88
9	Nitrite as NO_2	µmol/L	1.4	1	1.78	1.25	1.24	1.1	1.55	1.27	0.56	0.42	1.33	1.08	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	µmol/L	2.64	2.15	2.23	2.04	2.96	2.14	3.83	3.35	2.82	2.51	2.64	2.42	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	µmol/L	1.9	1.5	2.67	2.41	2.3	2.2	2.66	2.39	2.27	1.45	2.12	1.8	APHA(22ndEdi) 4500 C
12	Total Nitrogen	µmol/L	9.84	7.15	12.59	11.08	10.50	7.92	18.51	15.38	13.6	11.46	12.37	9.86	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	15	6	14	12	18	14.2	17	12	20	16	13	8	PLPL-TPH
14	Total Dissolved Solids	mg/L	34712	34519	36212	35844	35920	35624	35690	35734	36218	36594	36730	37434	IS3025(P16)84Re.02
15	COD	mg/L	14	10	18	12	15	6	24	7.0	27	19.0	23.6	11.4	APHA(22ndEdi) 5520-D Open Reflux
A	**Flora and Fauna**														
16	Primary productivity	mgC/L /day	1.26	1.12	1.66	1.26	3.6	2.8	4.5	4	8.32	5.62	8.55	5.4	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
17.1	Chlorophyll	mg/m^3	2.06	1.69	2.21	2.11	2.7	2.2	2.67	2.15	3.38	2.79	2.64	2.33	APHA (22ndEdi) 10200-H

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Lab Manager

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Lab Manager (Q)

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17.2	Phaeophytin	mg/m³	1.9	1.3	1.49	1.57	1.96	1.84	2.24	1.92	2.93	2.51	1.86	1.60	APHA (22nd Edi) 10200-H
17.3	Cell Count	No. x 10^3/L	131	111	212	124	270	146	203	122	249	95	207	85	APHA (22nd Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	**Coscino discus** *Nitzschia Rhizosole nia Navicula Biddulphi a* --	**Navicula** *Pleurosig ma Nitzschia* -- --	**Rhizosol enia sp.** *Navicula sp. Biddulphi a sp. Cheatocer ous sp. Ceratium* -- --	**Nitzschi a sp.** *Synedra sp. Cyclotella sp.* -- -- --	Thallasios ira sp. Navicula sp. Biddulphi a sp. --	Nitzschia sp. Rhizosole nia sp. -- --	Rhizosole nia sp. Navicula sp. Thallasios ira sp. Cosmariu m	Coscinodi scus sp. Nitzschia sp. -- --	*Rhizosole nia sp. Cheatocer ous sp. Coscinodi scus sp.* --	*Nitzschia sp. Synedra sp. Fragillaria sp.* --	*Rhizosole nia sp. Navicula sp. Coscinodi scus sp. Thallasion ema sp.*	*Nitzschia sp. Navicula sp.* -- --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
18.1	Abundance (Population)	noX10^3/ 100 m^3	53		66		46		61		55		48		APHA (22nd Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Foraminiferans Polychaetes Gastropods --		Polychaete Bivalves Ostracodes Gastropods		Gastropods Decapods Crustaceans		Copepods Mysids Bivalves --		Foraminiferans amphipods Gastropods		Polychaetes Gastropods Crustaceans		APHA (22nd Edi) 10200-G
18.3	Total Biomass	ml/100 m^3	6.6		7.25		6.2		4.8		3.9		5.6		APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
19.1	Total Bacterial Count	CFU/ml	1300		1840		1880		1840		1760		1820		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22nd Edi)9221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi.2.4 (2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

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RESULTS OF SEDIMENT ANALYSIS [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018	NOVEMBER 2018	DECEMBER 2018	JANUARY 2019	FEBRUARY 2019	MARCH 2019	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.48	0.64	0.42	0.56	0.69	0.71	FCO:2007
2	Phosphorus as P	µg/g	246	212	256	278	311	264	APHA(22nd Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.35	5.18	4.9	5.2	4.98	5.24	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/g	190	210	164	170	235	270	AAS 3111B
5.3	Manganese as Mn	µg/g	1780	1698	1430	1286	1384	1258	AAS APHA 3111 B
5.4	Iron as Fe	%	5.1	4.82	5.2	4.9	5.32	4.89	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/g	53	20.4	34	27	47	24.8	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/g	49	37	49	33	30	31.6	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/g	318	348	230	310	291	270	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/g	3.8	1.9	2.6	3	2.8	1.98	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Polychaetes Decapods --	Mysids Crustaceans Decapods Polychaetes	Crustaceans Polychaetes --	Gastropods mollusca Decapods	Polychaetes Crustaceans --	Polychaetes Crustaceans --	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Nematodes Bryozoans --	Hydrozoan Gastrotriches ---	Bryozoans -- --	-- -- --	Foraminiferans Nematodes --	Foraminiferans Hydrozoans --	APHA (22nd Edi) 10500-C
6.3	Population	no/m2	382	645	616	821	794	853	APHA (22nd Edi) 10500-C

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RESULTS OF MARINE WATER [M2 MOUTH OF BOCHA & NAVINAL CREEK - N 22°44'239" E 069°43'757"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018		NOVEMBER 2018		DECEMBER 2018		JANUARY 2019		FEBRUARY 2019		MARCH 2019		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.15	8.09	8.19	8.12	8.2	8.16	8.19	8.15	8.17	8.14	8.15	8.1	IS3025(P11)83 Re.02
2	Temperature	oC	30.3	30	30.6	30.4	30.4	30.2	30	29.8	30.2	30	30.3	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	254	240	328	290	272	218	216	228	186	246	230	263	IS3025(P17)84 Re.02
4	BOD (3 Days @ 27 °C)	mg/L	3	BDL*	4	BDL*	3	BDL*	5.0	BDL*	3.9	BDL*	5.3	BDL*	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	6.4	6.2	6.2	5.9	6.6	6.1	6.1	5.9	6.2	5.8	6	5.7	IS3025(P38)89 Re.99
6	Salinity	ppt	34.1	33.8	34.4	34.1	34.7	34.5	34.3	34.5	35.6	35.8	35.4	35.7	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5 520D
8	Nitrate as NO_3	µmol/L	8.5	7.2	7.55	6.34	5.8	6.4	8.16	5.87	7.2	6.29	7.96	5.84	IS3025(P34)88
9	Nitrite as NO_2	µmol/L	1	0.6	1.23	1.16	1.5	0.8	0.98	0.69	0.58	0.81	0.84	0.99	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	µmol/L	2.4	1.8	9.28	8.98	11.4	8.2	3.89	3.6	2.6	2.4	2.7	2.5	IS3025(P34)88 Cla.2.3
11	Phosphates as PO_4	µmol/L	2.45	1.6	2.78	2.14	2.56	2.4	2.39	2.07	2.4	1.74	2.3	1.86	APHA(22nd Edi) 4500 C
12	Total Nitrogen	µmol/L	11.9	9.6	18.06	16.49	18.70	15.40	13.03	10.16	10.37	9.5	11.5	9.33	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	6	2	12	4	15	BDL*	18	BDL*	23	BDL*	16	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	34608	34416	35731	35296	36012	35940	35842	35964	36728	36943	36432	36936	IS3025(P16)84 Re.02
15	COD	mg/L	12	BDL*	14	BDL*	12	BDL*	20.0	BDL*	17.0	6.8	24.8	8.0	APHA(22nd Edi) 5520-D Open Reflux
A	**Flora and Fauna**														
16	Primary productivity	mgC/ L/day	1.57	1.3	2.07	1.68	2.6	1.8	5.4	4	7.98	5.26	7.65	4.72	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
17.1	Chlorophyll	mg/ m^3	1.6	0.968	2.25	1.33	1.94	1.2	2.42	1.98	3.4	2.8	3.12	2.31	APHA (22nd Edi) 10200-H
17.2	Phaeophytin	mg/ m^3	2.35	1.01	1.76	1.54	1.68	0.99	1.8	1.54	3.0	2.13	1.4	0.8	APHA (22nd Edi) 10200-H
17.3	Cell Count	No. x 10^3/L	150	106	198	134	172	80	203	99	231	87	219	74	APHA (22nd Edi) 10200-H

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17.4	Name of Group Number and name of group species of each group	--	**Cheatoc erous** *Nitzschia Biddulphi a Thallasion ema Coscinodi scus Cyclotella*	**Melosira** *Navicula Fragillaria* -- -- --	**Biddulph ia sp.** *Nitzschia sp. Cheatocer ous sp. Coscinodi scus sp. Fragillaria sp.* -- --	**Nitzschi a sp.** *Navicula sp. Rhizosole nia sp.* -- -- -- --	**Nitzschi a sp.** Thallasios ira sp. Cheatocer ous sp. Biddulphi a sp.	Nitzschia sp. Thallasiosi ra sp. -- --	*Navicula sp. Bacteriast ram Cosmariu m Biddulphi a sp.*	*Nitzschia sp. Synedra sp.* -- --	*Thallasion ema sp. Fragillaria sp. Closteriu m sp. Synedra sp.*	*Nitzschia sp. Biddulphia sp. Synedra sp.* --	*Rhizosole nia sp. Biddulphi a sp. Navicula sp. Thallasion ema sp.*	*Thallasio nema sp. Nitzschia sp. Synedra sp.* --	APHA (22nd Edl) 10200-H
C	**Zooplanktons**													
18.1	Abundance (Population)	noX10 ^{3}/ 100 m^3	48		57		65		71		58		51	APHA (22nd Edl) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Crustaceans Gastropods Polychaetes --		Hydrozoa Bivalves Foraminiferans Crustaceans		Gastropods Crustaceans Chaetognathes		Copepods Gastropods Cyclops --		Chaetognathes Polychaetes Foraminiferans		Polychaetes Gastropods Bivalves	APHA (22nd Edl) 10200-G
18.3	Total Biomass	ml/10 0 m^3	4.94		5.57		5.8		5.1		4.78		4.29	APHA (22nd Edl) 10200-G
D	**Microbiological Parameters**													
19.1	Total Bacterial Count	CFU/ml	1450		1620		1680		1640		1560		1620	IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent	APHA(22ndEdl)9 221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS:1622:1981Ed l.2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 5887 (P-5)

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Lab Manager

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RESULTS OF SEDIMENT ANALYSIS [M2 MOUTH OF BOCHA & NAVINAL CREEK – N 22°44'239" E 069°43'757"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018	NOVEMBER 2018	DECEMBER 2018	JANUARY 2019	FEBRUARY 2019	MARCH 2019	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.56	0.84	0.51	0.62	0.72	0.68	FCO:2007
2	Phosphorus as P	µg/g	214	232	220	278	319	246	APHA(22nd Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.18	5.18	4.9	5.2	5.19	4.84	AAS APHA 3111 B
5.2	Total Chromium as Cr+3	µg/g	164	152	184	190	213	201	AAS 3111B
5.3	Manganese as Mn	µg/g	1698	1366	1230	1350	1320	1298	AAS APHA 3111 B
5.4	Iron as Fe	%	5.06	5.1	4.92	5.1	4.83	4.94	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/g	38	27	32	40	20	27.3	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/g	46	33	46	28	37	34.6	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/g	260	218	240	298	278	204	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/g	2.9	3.1	2.1	3.4	1.9	2.32	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Polychaetes Chaetognaths Mysids	Echinoderms Bivalves Polychaete worms	Echinoderms Gastropods --	Gastropods Crustaceans --	Polychaetes Bivalves --	Crustaceans Gastropods --	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Copepods Ostracodes --	Nematodes --- ---	Copepods -- --	Ostracodes -- --	Foraminiferans -- --	Nematodes Foraminiferans --	APHA (22nd Edi) 10500-C
6.3	Population	no/m²	250	499	528	645	733	850	APHA (22nd Edi) 10500-C

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RESULTS OF MARINE WATER [M3 EAST OF BOCHAISLAND - N 22°46'530" E 069°41'690"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018		NOVEMBER 2018		DECEMBER 2018		JANUARY 2019		FEBRUARY 2019		MARCH 2019		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.11	8.07	8.25	8.12	8.18	8.11	8.14	8.12	8.19	8.16	8.13	8.06	IS3025(P11)83Re.02
2	Temperature	oC	30.2	30	30.3	30.2	30.5	30.4	30.2	30.1	30.3	30.1	30.2	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	318	364	348	306	298	252	256	271	196	219	203	226	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	BDL*	BDL*	6	BDL*	4	BDL*	5.0	BDL*	5.9	BDL*	4.2	BDL*	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	6.2	5.8	6.1	5.7	6.4	6.2	6.1	6.0	6	5.8	6.1	5.9	IS3025(P38)89Re.99
6	Salinity	ppt	33.9	33.7	34.6	34.3	35.2	35	34.9	35.1	35.4	35.7	35.6	35.9	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	µmol/L	6.6	4.9	9.09	8.64	4.8	5.1	6.41	5.69	9.1	4.5	7.2	6.0	IS3025(P34)88
9	Nitrite as NO_2	µmol/L	1.2	0.8	1.33	1.12	1.7	1.9	0.86	0.63	0.73	0.86	0.84	0.92	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	µmol/L	2.8	1.7	2.25	1.95	3.4	3.6	3.16	2.91	2.7	2.4	2.4	2.1	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	µmol/L	2.59	1.8	3.21	2.78	2.8	2.6	2.7	2.4	1.76	1.36	1.62	1.21	APHA(22nd Edi) 4500 C
12	Total Nitrogen	µmol/L	10.6	7.4	12.68	11.72	9.90	10.60	10.42	9.23	12.53	7.74	10.46	9	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	24	10	17.4	12	19	BDL*	16	11.0	18.4	BDL*	15.3	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	34418	34356	35218	35078	36118	35678	35670	35834	36679	36830	36516	37293	IS3025(P16)84Re.02
15	COD	mg/L	BDL*	BDL*	14	BDL*	16	10	19.0	8.0	21	BDL*	22	BDL*	APHA(22nd Edi) 5520-D Open Reflux
A	**Flora and Fauna**														
16	Primary productivity	mgC/L /day	1.23	1.08	1.98	1.64	2.84	2.76	4.2	3.8	8.3	6.4	7.2	5.17	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
17.1	Chlorophyll	mg/m³	1.97	1.13	2.93	1.01	2.46	2.3	3.76	2.26	3.1	2.46	2.92	2.21	APHA (22nd Edi) 10200-H
17.2	Phaeophytin	mg/m³	1.59	0.865	1.22	0.43	1.8	1.2	2.2	1.3	2.35	1.5	2.18	0.5	APHA (22nd Edi) 10200-H

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17.3	Cell Count	No. x 10^3/L	141	66	204	72	190	84	161	73	224	96	197	59	APHA (22nd Edi) 1020O-H
17.4	Name of Group Number and name of group species of each group	--	**Biddulphia** *Melosira* *synedra* *Navicula* *Nitzschia* **Cheatoc erous**	**Navicula** *Nitzschia* *Biddulphi a* *Melosira* -- --	**Biddulph ia sp.** *Pleurosig ma sp.* *Nitzschia sp.* *Cheatocer ous sp.* *Cyclotella sp.* *Diplones* --	**Synedra sp.** *Coscinodi scus sp.* *Navicula sp.* -- -- -- --	Nitzschia sp. Cheatocer ous sp. Rhizosole nia sp. Amphipro ra sp.	Navicula sp. Thallasios ira sp. Guinardia --	*Coscinodi scus sp.* Rhizosole nia sp. Nitzschia sp. *Thallasios ira sp.*	*Navicula sp. Thallasios ira sp.* -- --	*Thallasion ema sp.* *Nitzschia sp.* *Rhizosole nia sp.* *Coscinodi scus sp.*	*Synedra sp.* *Biddulphi a sp.* *Navicula sp.* --	*Biddulphi a sp.* *Navicula sp.* *Thallasios ira sp.* *Coscinodi scus sp.*	*Nitzschia sp.* *Synedra sp.* *Biddulphi a sp.* --	APHA (22nd Edi) 1020O-H
C	**Zooplanktons**														
18.1	Abundance (Population)	noX10^3/ 100 m^3	58		63		50		64		79		59		APHA (22nd Edi) 1020O-G
18.2	Name of Group Number and name of group species of each group	--	Copepods Polychaetes Crustaceans --		Cephalopods Ostracodes Bivalves Crustaceans		Foraminiferans Ctenophores Ostracods		Polychaete Gastropods Crustaceans --		Polychaetes Crustaceans Bivalves		Polychaetes Bivalves --		APHA (22nd Edi) 1020O-G
18.3	Total Biomass	ml/100 m^3	8.1		8.7		6.2		5.6		6.1		5.85		APHA (22nd Edi) 1020O-G
D	**Microbiological Parameters**														
19.1	Total Bacterial Count	CFU/ml	1700		1980		1880		1820		1860		1780		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22nd Edi)9221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi.2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

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RESULTS OF SEDIMENT ANALYSIS [M3 RIGHT SIDE OF BOCHA CREEK - N 22°46'530" E 069°41'690"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018	NOVEMBER 2018	DECEMBER 2018	JANUARY 2019	FEBRUARY 2019	MARCH 2019	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.52	0.46	0.54	0.48	0.69	0.72	FCO:2007
2	Phosphorus as P	µg/g	208	218	240	290	312	230	APHA(22nd Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.1	4.9	4.86	5.2	4.97	5.12	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/g	174	198	130	168	218	150	AAS 3111B
5.3	Manganese as Mn	µg/g	1540	1614	1346	1240	1475	1136	AAS APHA 3111 B
5.4	Iron as Fe	%	4.9	4.2	4.82	5.1	4.96	5.14	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/g	46.8	30.2	36	42	53	32	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/g	51.6	29	46	35	27	39	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/g	296	250	234	310	219	250	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/g	3.3	2.6	2.9	2.2	1.7	2.16	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Amphipods Isopods Polychaetes	Polychaete worms Bivalves Chaetognathes	Polychaete Chaetognathes Bivalves	Crustaceans Polychaete --	Crustaceans Gastropods --	Gastropods Polychaetes --	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Copepods Foraminiferans --	Nematodes Hydrozoan ---	Copepods -- --	Nematodes -- --	Nematodes hydrozoans --	Gastropods Polychaetes --	APHA (22nd Edi) 10500-C
6.3	Population	no/m^2	279	557	587	704	853	824	APHA (22nd Edi) 10500-C

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RESULTS OF MARINE WATER [M4 JUNA BANDAR N 22°47'577" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018		NOVEMBER 2018		DECEMBER 2018		JANUARY 2019		FEBRUARY 2019		MARCH 2019		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.18	8.05	8.17	8.06	8.07	8.03	8.1	8.08	8.14	8.13	8.13	8.1	IS3025(P11)83Re.02
2	Temperature	oC	30	29.9	30.7	30.5	30.8	30.4	30.2	30.1	30.1	29.9	30.2	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	296	272	338	299	264	226	248	272	208	234	217	243	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	4	BDL*	3	BDL*	4	BDL*	5.2	BDL*	6.4	BDL*	5.8	BDL*	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	6.5	6	6.2	5.9	6.6	6.8	6.2	5.8	6.1	5.7	6.2	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	34.3	34.1	34.2	33.9	34.8	34.4	35	35.2	35.7	35.9	35.6	36	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	µmol/L	7.8	6.2	11.45	9.91	10.2	9.4	13.37	11.67	10.77	9.56	8.52	5.46	IS3025(P34)88
9	Nitrite as NO_2	µmol/L	3.4	2	1.47	1.23	1.60	1.5	0.96	0.78	0.78	1.12	0.83	0.94	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	µmol/L	2.75	2.1	2.46	2.27	2.40	2.8	3.43	3.2	2.9	2.6	2.6	2.4	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	µmol/L	1.95	1.6	2.14	1.82	2.31	2.2	1.96	1.59	1.19	1.18	1.32	1.27	APHA(22nd Edi) 4500 C
12	Total Nitrogen	µmol/L	13.95	10.3	15.38	13.41	14.20	13.70	17.75	15.65	14.49	13.31	11.94	8.76	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	16	4	18	5	10	BDL*	14	BDL*	20	BDL*	17	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	34692	34460	35384	35130	35816	35718	35946	36218	36734	36984	36581	37134	IS3025(P16)84Re.02
15	COD	mg/L	14	BDL*	12	BDL*	14	BDL*	18.0	6.0	23.0	10.0	19.0	8.3	APHA(22nd Edi) 5520-D Open Reflux
A	Flora and Fauna														
16	Primary productivity	mgC/L/day	2.25	1.35	2.36	1.71	3.64	2.9	4.5	3.3	8.43	5.58	7.42	4.38	APHA (22nd Edi) 10200-J
B	Phytoplankton														
17.1	Chlorophyll	mg/m³	1.55	1.02	1.86	1.14	2.8	2.62	3.2	2.6	3.25	2.8	2.79	2.2	APHA (22nd Edi) 10200-H
17.2	Phaeophytin	mg/m³	0.94	0.64	1.44	0.88	1.68	1.52	2.4	1.1	2.1	2.2	1.33	0.96	APHA (22nd Edi) 10200-H

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17.3	Cell Count	No. x 10^3/L	146	87	178	84	204	106	146	73	193	67	179	64	APHA (22nd Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	**Nitzschia** *Navicula Coscinodiscus Rhizosolenia Thallasiosira* --	**Nitzschia** *Pleurosigma Navicula* -- -- --	**Navicula sp.** *Biddulphia sp. Synedra sp. Rhizosolenia sp. Cyclotella sp.* -- --	**Thallasiosira sp.** *Nitzschia sp. Pleurosigma sp.* -- -- --	Gyrosigma sp. Cheatoceros sp. Fragillaria sp. Pleurosigma sp.	Nitzschia sp. Rhizosolenia sp. Thallasiosira sp. --	*Navicula sp.* Biddulphia sp. Coscinodiscus sp. Rhizosolenia sp.	*Nitzschia sp. Thallasiosira sp.* Synedra sp. --	*Rhizosolenia sp. Cheatoceros sp. Pleurosigma sp. Biddulphia sp.*	*Synedra sp. Biddulphia sp. Navicula sp.* --	*Thallasiosira sp. Nitzschia sp. Coscinodiscus sp. Pleurosigma sp.*	*Synedra sp. Navicula sp. Cheatoceros sp.* --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
18.1	Abundance (Population)	noX10^3/ 100 m^3	67		59		72		64		81		73		APHA (22nd Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Polychaetes Gastropods Decapods --		Gastropods Bivalves Crustaceans Oligocheata		Foraminiferans Ctenophores Polychaetes		Gastropods Crustaceans Polychaete --		Foraminiferans Ostracods Polychaetes		Gastropods Polychaetes Decapods		APHA (22nd Edi) 10200-G
18.3	Total Biomass	ml/100 m^3	5.87		6.05		6.9		5.5		6.2		4.94		APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
19.1	Total Bacterial Count	CFU/ml	1600		1870		1820		1840		1840		1860		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22ndEdi)9221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi.2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

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RESULTS OF SEDIMENT ANALYSIS [M4 JUNA BANDAR N 22°47'577" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018	NOVEMBER 2018	DECEMBER 2018	JANUARY 2019	FEBRUARY 2019	MARCH 2019	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.48	0.64	0.52	0.68	0.56	0.67	FCO:2007
2	Phosphorus as P	µg/g	224	178	240	310	259	218	APHA(22nd Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.24	5.3	5.12	4.9	5.2	5.1	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/g	154	167	180	192	174	140	AAS 3111B
5.3	Manganese as Mn	µg/g	1590	1630	1346	1484	1376	1198	AAS APHA 3111 B
5.4	Iron as Fe	%	5.14	5.2	4.98	4.78	5.1	4.6	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/g	58	74	42	60	31	39	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/g	44	44	52	39	45	33	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/g	256	310	230	296	330	274	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/g	4.2	1.8	2.1	3.2	2.4	1.96	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Polychaetes Isopods Mysids	Bivalves Decapods Polychaete worms	Decapods Gastropods --	Gastropods Mysids --	Polychaetes Gastropods --	Crustaceans Polychaetes --	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Nematodes Bryozoans --	Foraminiferans Nematodes ---	Foraminiferans Bryozoans --	Nematodes Bryozoans --	Foraminiferans -- --	Nematodes Bryozoans --	APHA (22nd Edi) 10500-C
6.3	Population	no/m^2	294	528	556	673	824	882	APHA (22nd Edi) 10500-C

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RESULTS OF MARINE WATER [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018		NOVEMBER 2018		DECEMBER 2018		JANUARY 2019		FEBRUARY 2019		MARCH 2019		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.19	8.08	8.15	8.1	8.24	8.17	8.12	8.09	8.16	8.13	8.1	8.06	IS3025(P11)83Re.02
2	Temperature	oC	30.5	30.3	30.4	30.2	30.6	30.3	31.1	30	30.2	30	3.01	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	369	332	356	304	312	294	228	251	182	218	250	276	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	5	BDL*	4	BDL*	5	BDL*	6.2	BDL*	8.3	BDL*	12.8	BDL*	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	6.4	6	6.2	5.8	6.2	6	6.1	5.9	6.2	6.0	6.1	5.9	IS3025(P38)89Re.99
6	Salinity	ppt	34.5	34.1	34.3	34.1	34.6	34.3	34.8	35.1	35.5	35.9	35.6	35.8	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	µmol/L	10.4	6.2	9.37	7.79	7.4	6.2	8.2	7.2	3.45	2.12	6.84	4.7	IS3025(P34)88
9	Nitrite as NO_2	µmol/L	5.1	3.4	1.96	1.57	2.1	2.4	1.5	1.3	1.47	0.87	1.36	1.94	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	µmol/L	2.8	2.4	3.71	3.34	2.7	2.9	3.6	3.3	1.75	1.59	1.58	1.35	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	µmol/L	2.36	1.8	2.67	2.14	2.85	2.45	2.1	1.8	1.04	1.49	1.3	1.5	APHA(22nd Edi) 4500 C
12	Total Nitrogen	µmol/L	18.3	12	15.04	12.71	12.20	11.50	13.41	11.95	6.67	4.6	9.78	6.99	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	12	6	16	8	18	BDL*	11	BDL*	18	BDL*	14.3	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	34814	34518	35810	35334	35511	35273	35710	35994	36394	36996	36534	36840	IS3025(P16)84Re.02
15	COD	mg/L	16	BDL*	13	BDL*	15	BDL*	21.0	10.0	26.0	7.0	15.0	BDL*	APHA(22nd Edi) 5520-D Open Reflux
A	**Flora and Fauna**														
16	Primary productivity	mgC/L /day	1.55	1.21	1.95	1.32	2.46	2.1	4.1	2.8	7.42	5.62	8.1	5.17	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
17.1	Chlorophyll	mg/m³	1.94	1.12	2.13	1.25	2.2	1.98	2.9	2.10	3.24	2.60	3.4	2.74	APHA (22nd Edi) 10200-H
17.2	Phaeophytin	mg/m³	2.18	0.7	0.96	0.7	1.6	0.86	1.8	1.1	2.45	1.44	2.77	1.97	APHA (22nd Edi)

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17.3	Cell Count	No. x 10^3/L	150	106	192	106	202	124	193	89	240	73	210	60	10200-H APHA (22nd Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	**Rhizosolenia** *Melosira* *Nitzschia* *Biddulphia* *Coscinodiscus* **Cyclotella**	**Pleurosigma** *Navicula* *Rhizosolenia* -- -- --	**Cyclotella sp.** *Nitzschia sp.* *Skeletonema sp.* *Cheatocerous sp.* *Pleurosigma sp.* *Biddulphia sp.* --	**Navicula sp.** *Rhizosolenia sp.* *Synedra sp.* *Fragillaria sp.* -- -- --	Thallasiosira sp. Coscinodiscus sp. Cyclotella sp. Ceratizam	Navicula sp. Biddulphia sp. Gyrosigma sp. --	*Thallasiosira sp.* Nitzschia sp. Rhizosolenia sp. Coscinodiscus sp.	*Navicula sp.* Biddulphia sp. Thallasiosira sp.	*Synedra sp.* *Coscinodiscus sp.* *Biddulphia sp.* *Navicula sp.*	*Nitzschia sp.* *Pleurosigma sp.* *Skeletonema sp.* --	*Nitzschia sp.* *Pleurosigma sp.* *Biddulphia sp.* *Coscinodiscus sp.*	*Thallasiosira sp.* *Skeletonema sp.* *Nitzschia sp.* --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
18.1	Abundance (Population)	noX10^3/ 100 m^3	51		56		38		63		52		60		APHA (22nd Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Hydrozoans Polychaetes Cheatocerous --		Polychaetes Decapods Crustaceans Fish Larve		Ostracods Polychaetes Foraminiferans		Polychaete Foraminiferans Ostracodes Decapods		Polychaetes Bivalves Amphipods		Foraminiferans Ostracodes Bivalves		APHA (22nd Edi) 10200-G
18.3	Total Biomass	ml/100 m^3	9.6		9.3		5.6		5.9		4.3		3.95		APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
19.1	Total Bacterial Count	CFU/ml	1650		1980		1820		1860		1720		1740		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22nd Edi)9221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi. 2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

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RESULTS OF SEDIMENT ANALYSIS [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018	NOVEMBER 2018	DECEMBER 2018	JANUARY 2019	FEBRUARY 2019	MARCH 2019	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.7	0.74	0.52	0.68	0.82	0.63	FCO:2007
2	Phosphorus as P	µg/g	216	283	210	296	319	270	APHA(22nd Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.2	5.18	4.9	5	4.86	5.1	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/g	158	163	170	192	218	158	AAS 3111B
5.3	Manganese as Mn	µg/g	1710	1599	1248	1336	1492	1206	AAS APHA 3111 B
5.4	Iron as Fe	%	5	4.92	5.1	4.97	5.16	4.82	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/g	62	34.6	26	48	40	21	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/g	56.4	50.2	64	42	33	48.4	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/g	344	256	296	310	347	203	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/g	4.6	2.7	2	3.6	3.2	1.2	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/g	BDL*	BDL*	0.01	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Hydrozoa Gastropods Mysids	Amphipods Mysids Bivalves	Gastropods Bivalves Echinoderms	Gastropods Bivalves --	Gastropods Brachyurans --	Bivalves Gastropods --	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Bruchyrans Nematodes --	Hydrozoan Foraminiferans ---	Nematodes -- --	Foraminiferans -- --	Nematodes -- --	Foraminiferans Brachyurans --	APHA (22nd Edi) 10500-C
6.3	Population	no/m2	397	469	557	616	733	850	APHA (22nd Edi) 10500-C

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Lab Manager

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RESULTS OF MARINE WATER [M7 EAST PORT N 22°47'120" E 069°47'110"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018		NOVEMBER 2018		DECEMBER 2018		JANUARY 2019		FEBRUARY 2019		MARCH 2019		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.37	8.24	8.3	8.16	8.31	8.24	8.19	8.16	8.13	8.11	8.15	8.10	IS3025(P1 1)83Re. 02
2	Temperature	oC	30.4	30.2	30.5	30.3	30.8	30.5	30.6	30.4	30.2	30.1	30.3	30	IS3025(P9)84Re.0 2
3	Total Suspended Solids	mg/L	342	296	370	308	348	314	270	286	208	231	274	296	IS3025(P1 7)84Re. 02
4	BOD (3 Days @ 27°C)	mg/L	7	3	8	2	5	3	7.4	BDL*	5.6	BDL*	5.9	BDL*	IS 3025 (P44)1993Re.03Ed ition2.1
5	Dissolved Oxygen	mg/L	6.6	6.2	6.4	6.1	6.6	6.1	6.2	5.9	6.1	5.7	6.2	5.9	IS3025(P38)89Re. 99
6	Salinity	ppt	34	33.8	34.8	3	34.3	34.2	34.7	34.9	35.4	35.6	35.5	35.8	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	34.5	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)552 0D
8	Nitrate as NO_3	µmol/L	7.9	5.2	6.68	5.23	6.2	5.4	7.2	6.8	5.78	4.23	8.34	6.9	IS3025(P34)88
9	Nitrite as NO_2	µmol/L	1.6	1.2	1.57	1.47	1.2	1.6	1.39	0.78	1.24	1.47	1.56	1.73	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	µmol/L	2.8	2.4	2.98	2.41	3.1	2.4	3.5	3.1	2.36	2.08	2.51	2.3	IS3025(P34)88Cla .2.3
11	Phosphates as PO_4	µmol/L	2.46	2.15	1.76	1.44	2.1	1.84	2.5	1.6	1.3	1.48	1.58	1.74	APHA(22nd Edi) 4500 C
12	Total Nitrogen	µmol/L	12.3	8.8	11.23	9.11	10.50	9.40	12.24	10.81	9.38	7.78	12.41	10.93	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	28	14	21	10	18	BDL*	14.8	BDL*	16	BDL*	9.4	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	34327	34218	35930	35634	35227	35108	35698	35846	36274	36480	36570	36984	IS3025(P16)84Re. 02
15	COD	mg/L	22	15	25	11	18	10	26	12.0	21	7.0	15	BDL*	APHA(22ndEdi) 5520-D Open Reflux
A	**Flora and Fauna**														
16	Primary productivity	mgC/L /day	1.75	1.14	2.58	1.91	2.94	2.5	4.23	3.78	7.31	4.77	7.87	5.62	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
17.1	Chlorophyll	mg/m³	1.72	1.26	2.52	2.4	2.82	2.24	2.41	2.02	2.69	2.31	2.5	2.28	APHA (22nd Edi) 10200-H
17.2	Phaeophytin	mg/m³	1.86	0.502	1.49	1.03	2.36	1.96	1.86	1.3	2.27	2.12	1.2	1	APHA (22nd Edi) 10200-H

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17.3	Cell Count	No. x 10^3/L	151	97	178	104	270	130	187	99	201	87	231	76	APHA (22nd Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	**Biddulphia** *Navicula Cheatoceros Nitzschia* ***Melosira*** *Gyrosigma*	**Navicula** *Synedra Melosira* -- -- --	**Navicula sp.** *Cyclotella sp. Biddulphia sp. Surirella sp. Cheatoceros sp.* --	**Fragillaria sp.** *Rhizosolenia sp. Navicula sp.* -- -- --	Thallasiosira sp. Nitzschia sp. Coscinodiscus sp. Biddulphia sp.	Navicula sp. Cheatoceros sp. Gyrosigma sp. --	*Thallasiosira sp. Biddulphia sp. Synedra sp. Pleurosigma sp.*	*Nitzschia sp.* Gyrosigma sp. *stauroneis* --	*Cheatoceros sp. Rhizosolenia sp. Biddulphia sp. Navicula sp.*	*Nitzschia sp. Fragillaria sp. Navicula sp.* --	*Cheatoceros sp. Rhizosolenia sp. Coscinodiscus sp. Thallasiosira sp.*	*Nitzschia sp. Gyrosigma sp. Fragillaria sp.* --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
18.1	Abundance (Population)	noX10^3/ 100 m^3	44		56		68		63		51		59		APHA (22nd Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Polychaetes Bivalves Decapods --		Copepods Mysids mollusca Echinoderms		Siphonophores Gastropods Chaetognathes		Gastropods mollusca Crustaceans --		Polychaetes Bivalves Ostracods		Gastropods Copepods Bivalves		APHA (22nd Edi) 10200-G
18.3	Total Biomass	ml/100 m^3	7.1		7.8		6.1		5.15		3.7		3.45		APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
19.1	Total Bacterial Count	CFU/ml	1820		1740		1860		1800		1840		1820		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22ndEdi)9221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi.2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

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RESULTS OF MARINE WATER [M8 RIGHT SIDE OF BOCHA CREEK N 22°45'987" E 069°43'119"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018		NOVEMBER 2018		DECEMBER 2018		JANUARY 2019		FEBRUARY 2019		MARCH 2019		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.29	8.06	8.26	8.12	8.24	8.17	8.21	8.17	8.16	8.14	8.15	8.12	IS3025(P11)83Re .02
2	Temperature	oC	30.5	30.2	30.3	30.1	31	30.8	30.9	30.6	30.1	29.9	30.2	30	IS3025(P9)84Re. 02
3	Total Suspended Solids	mg/L	298	242	318	276	382	319	264	283	204	276	228	263	IS3025(P17)84Re .02
4	BOD (3 Days @ 27 °C)	mg/L	4	3	6	BDL*	3	BDL*	5.2	BDL*	7.8	BDL*	5.9	BDL*	IS 3025 (P44)1993Re.03E dition2.1
5	Dissolved Oxygen	mg/L	6.4	5.6	6.3	5.9	6.4	6	6.2	6.1	6.6	6.2	6.1	5.8	IS3025(P38)89Re .99
6	Salinity	ppt	34.3	34.1	34.4	34.1	34.1	33.9	34.5	34.7	35.3	35.7	35.6	35.9	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520 D
8	Nitrate as NO_3	µmol/L	7.2	6	8.76	7.01	5.72	3.98	6.68	5.59	5.81	4.42	6.94	4.8	IS3025(P34)88
9	Nitrite as NO_2	µmol/L	1.9	1.6	1.14	0.88	0.68	0.52	1.06	0.98	1.14	1.08	1.33	1.14	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	µmol/L	2.4	1.8	1.69	1.43	2.32	1.8	3.74	2.63	1.9	1.65	1.81	1.42	IS3025(P34)88Cla .2.3
11	Phosphates as PO_4	µmol/L	2.68	1.95	2.46	1.87	1.9	1.72	2.28	2.63	1.07	2.47	1.24	1.37	APHA(22nd Edi) 4500 C
12	Total Nitrogen	µmol/L	11.5	9.4	11.59	9.32	8.72	6.30	11.49	9.21	8.85	7.15	10.08	7.36	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	30	20	28	20	24	17	14	BDL*	19	BDL*	15.2	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	34772	34596	35618	35213	35418	34832	35684	35840	36320	36619	36498	37348	IS3025(P16)84Re .02
15	COD	mg/L	20	10	18	BDL*	13	BDL*	19	7	25	6	19.8	7	APHA(22nd Edi) 5520-D Open Reflux
A	Flora and Fauna														
16	Primary productivity	mgC/L /day	1.28	1.19	2.25	1.93	3.1	2.9	4.36	3.93	7.2	6	7.87	5.06	APHA (22nd Edi) 10200-J
B	Phytoplankton														
17.1	Chlorophyll	mg/m³	2.14	1.12	2.54	1.05	2.84	1.84	2.9	2.41	3.2	2	2.76	2.2	APHA (22nd Edi) 10200-H
17.2	Phaeophytin	mg/m³	2.4	1.04	0.64	0.32	1.7	1.1	2.2	1.49	2.9	1.9	2	1.6	APHA (22nd Edi) 10200-H

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17.3	Cell Count	No. x 10^3/L	154	89	184	96	260	170	201	73	226	84	251	79	APHA (22nd Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	**Rhizosolenia** *Melosira* *Navicula* *Nitzschia* **Coscinodiscus** --	**Guinardia** *Synedra* *Nitzschia* -- -- --	**Navicula sp.** *Thallasiosira sp.* *Cyclotella sp.* *Synedra sp.* *Coscinodiscus sp.* --	**Nitzschia sp.** *Rhizosolenia sp.* *Synedra sp.* -- -- --	Navicula sp. Melosira sp. Thallasiosira sp. Rhizosolenia sp.	Nitzschia sp. Cheatoceros sp. Fragillaria sp. --	Biddulphia sp. *Nitzschia sp.* Pleurosigma sp. *Thallasionema sp.*	Navicula sp. *Gyrosigma sp.* Synedra sp. --	*Rhizosolenia sp.* *Biddulphia sp.* *Thallasiosira sp.* *Coscinodiscus sp.*	*Synedra sp.* *Nitzschia sp.* *Thallasiosira sp.* --	*Biddulphia sp.* *Coscinodiscus sp.* *Thallasiosira sp.* *Gyrosigma sp.*	*Nitzschia sp.* *Pleurosigma sp.* *Fragillaria sp.* --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
18.1	Abundance (Population)	noX10^3/ 100 m^3	49		60		76		65		59		42		APHA (22nd Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Polychaetes Copepods Isopods Mysids		Copepods Gastropods Bivalves Crustaceans		Ctenophores Ostracods Gastropods		Crustaceans Gastropods Decapods --		Copepods Polychaetes Bivalves		Crustaceans Ostracods Copepods		APHA (22nd Edi) 10200-G
18.3	Total Biomass	ml/100 m^3	6.55		8.15		6.92		5.6		4.8		4.95		APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
19.1	Total Bacterial Count	CFU/ml	1925		2120		1860		1920		1960		1940		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22nd Edi)9221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi. 2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

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RESULTS OF SEDIMENT ANALYSIS [M8 RIGHT SIDE OF BOCHA CREEK – N 22°45'987" E 069°43'119"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018	NOVEMBER 2018	DECEMBER 2018	JANUARY 2019	FEBRUARY 2019	MARCH 2019	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.51	0.56	0.48	0.59	0.64	0.69	FCO:2007
2	Phosphorus as P	µg/g	270	332	290	318	370	252	APHA(22nd Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.28	5.16	4.96	4.84	4.7	4.93	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/g	216	298	280	230	248	218	AAS 3111B
5.3	Manganese as Mn	µg/g	1680	1534	1346	1276	1424	1240	AAS APHA 3111 B
5.4	Iron as Fe	%	5.14	4.85	5.1	5.2	4.86	4.92	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/g	48	68	21	33	57	23.6	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/g	51	62.4	28	48	33	42.8	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/g	286	324	260	271	302	268	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/g	4.7	3.2	2.18	3.3	2.8	1.9	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/g	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Crustaceans Polychaetes Chaetognaths	Polychaete worms Bivalves Crustaceans	Polychaete Crustaceans Gastropods	Gastropods Echinoderms --	Gastropods Polychaetes --	Polychaetes Crustaceans --	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Copepods Bryozoans --	Nematodes Hydrozoan --	-- -- --	Nematodes -- --	Copepods Foraminiferans --	Copepods Nematodes --	APHA (22nd Edi) 10500-C
6.3	Population	no/m^2	265	411	559	647	824	794	APHA (22nd Edi) 10500-C

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-7

Dr. Arun Bajpai
Lab Manager (Q)

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RESULTS OF MARINE WATER [M11 MPT T1 JETTY N 22°42'278" E 069°43'450"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018		NOVEMBER 2018		DECEMBER 2018		JANUARY 2019		FEBRUARY 2019		MARCH 2019		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.19	8.06	8.24	8.11	8.17	8.15	8.12	8.09	8.2	8.17	8.15	8.1	IS3025(P11)83Re.02
2	Temperature	oC	30.1	30	30.4	30.3	30.3	30.2	30.1	30	30.1	30	30.2	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	382	316	364	304	319	287	246	281	199	218	236	253	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	7	5	6	BDL*	4	BDL*	5.0	BDL*	6.7	BDL*	5.4	BDL*	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	6.6	5.9	6.5	BDL*	6.6	6.4	6.1	5.9	6.1	5.9	6.2	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	34.3	33.8	34.8	34.3	35.1	34.7	34.9	35.1	35.3	35.5	35.4	35.6	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	µmol/L	13.4	8.2	9.09	8.76	10.4	9.6	8.1	7.14	5.75	4.38	6.2	4.63	IS3025(P34)88
9	Nitrite as NO_2	µmol/L	2.6	2	1.78	1.43	1.96	1.54	1.14	0.88	0.96	1.18	1.28	1.34	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	µmol/L	4.4	3.6	3.82	2.77	2.6	1.2	3.99	3.71	2.72	1.91	2.5	2.14	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	µmol/L	2.5	2.4	1.82	1.29	2.16	1.75	2.13	1.81	1.84	1.36	1.7	1.46	APHA(22nd Edi) 4500 C
12	Total Nitrogen	µmol/L	20.4	13.8	14.69	12.96	14.96	12.34	13.23	11.72	9.43	7.47	9.98	8.11	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	35	24	28	16	16	BDL*	10	BDL*	8	BDL*	14.6	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	34718	34448	35218	34972	35767	35415	35634	35410	36184	36474	36314	36679	IS3025(P16)84Re.02
15	COD	mg/L	28	22	27	BDL*	16	10	18	11.0	23	6.0	19.6	7.4	APHA(22nd Edi) 5520-D Open Reflux
A	**Flora and Fauna**														
16	Primary productivity	mgC/L /day	1.58	1.03	2.48	1.8	2.64	2.28	5.63	3.82	7.29	5.89	7.43	4.95	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
17.1	Chlorophyll	mg/m³	1.9	1.57	1.62	1.78	2.4	1.96	3.6	2.70	3	2.54	3.6	2.79	APHA (22nd Edi) 10200-H
17.2	Phaeophytin	mg/m³	1.1	0.58	1.28	0.42	1.7	1.02	2.24	1.92	2.56	1.13	2.16	1.74	APHA (22nd Edi)

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17.3	Cell Count	No. x 10^3/L	157	99	176	80	284	110	230	181	201	97	223	76	10200-H APHA (22nd Edi) 10200-H
17.4	Name of Group Number and name of group species of each group	--	**Nitzschia** *Thallasiosira* *Coscinodiscus* *Synedra* *Rhizosolenia* --	**Nitzschia** *Navicula* *Fragillaria* -- -- --	**Navicula sp.** *Thallasiosira sp.* *Coscinodiscus sp.* *Biddulphia sp.* *Rhizosolenia sp.* *Nitzschia sp.* *Navicula sp.*	**Nitzschia sp.** *Fragillaria sp.* *Synedra sp.* *Gyrosigma sp.* -- -- --	**Rhizosolenia sp.** Nitzschia sp. Thallasiosira sp. --	**Cheatoceros sp.** Biddulphia sp. Cyclotella sp. --	*Navicula sp.* *Cheatoceros sp.* *Thallasionema sp.* --	*Rhizosolenia sp.* *Skeletonema sp.* -- --	*Cheatoceros sp.* *Nitzschia sp.* *Rhizosolenia sp.* *Coscinodiscus sp.*	*Navicula sp.* *Pleurosigma sp.* *Synedra sp.* --	*Nitzschia sp.* *Thallasiosira sp.* *Coscinodiscus sp.* *Navicula sp.*	*Nitzschia sp.* *Rhizosolenia sp.* -- --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
18.1	Abundance (Population)	no$X10^3$/ 100 m^3	45		51		62		58		62		55		APHA (22nd Edi) 10200-G
18.2	Name of Group Number and name of group species of each group	--	Bivalves Polychaetes Decapods Foraminiferans		Polychaetes Gastropods Nematodes Mysids		Lamellibranches Ctenophores Polychaetes		Gastropods molluscan Bivalves --		Gastropods molluscans Bivalves		Gastropods Copepods Mysids		APHA (22nd Edi) 10200-G
18.3	Total Biomass	ml/100 m^3	5.7		6.6		5.92		4.3		5		2.95		APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
19.1	Total Bacterial Count	CFU/ml	1800		1760		1860		1820		1720		1860		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22nd Edi)9221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi. 2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

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RESULTS OF MARINE WATER [M12 SPM N 22°40'938" E 069°39'191"]

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2018		NOVEMBER 2018		DECEMBER 2018		JANUARY 2019		FEBRUARY 2019		MARCH 2019		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.25	8.11	8.24	8.05	8.35	8.17	8.19	8.14	8.17	8.13	8.15	8.12	IS3025(P11)83Re.02
2	Temperature	oC	30.3	30	30.1	29.8	30.6	30.3	30.2	30	30.2	29.9	30.2	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	296	236	286	244	252	257	210	232	213	256	228	249	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	4	2	3	BDL*	BDL*	BDL*	5.0	BDL*	6.8	BDL*	4.5	BDL*	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	6.8	6	6.3	5.8	6.4	6.2	6.0	5.8	6.4	5.7	6.1	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	34.5	34.3	34.3	34.1	34.8	34.5	34.4	34.5	35.4	35.6	35.5	35.7	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	µmol/L	13.2	9.2	11.72	8.7	8.9	7.1	7.86	6.65	2.84	1.87	2.27	1.63	IS3025(P34)88
9	Nitrite as NO_2	µmol/L	3.4	2.8	1.98	1.74	1.15	2.45	1.49	1.1	0.43	0.37	0.68	0.89	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	µmol/L	4.6	4	3.39	2.87	4.6	3.9	3.85	3.54	2.37	1.99	2.2	1.93	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	µmol/L	2.95	2.16	2.36	1.82	2.5	2.41	2.23	1.86	0.98	0.9	0.84	0.72	APHA(22nd Edi) 4500 C
12	Total Nitrogen	µmol/L	21.1	16	17.09	13.31	14.65	12.45	13.21	11.29	5.64	4.23	5.15	4.45	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	32	10	25	12	16	10	14	BDL*	18.2	BDL*	13.5	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	34983	34649	35860	35648	35117	34992	35528	35664	36520	36796	36718	36984	IS3025(P16)84Re.02
15	COD	mg/L	20	8	18	BDL*	10	BDL*	19	8	27	8	22.6	7	APHA(22nd Edi) 5520-D Open Reflux
A	**Flora and Fauna**														
16	Primary productivity	mgC/L /day	1.71	1.57	2.11	2.04	3.2	2.6	5.1	3.3	7.09	4.6	5.62	3.37	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
17.1	Chlorophyll	mg/m³	1.99	1.51	2.17	1.8	2.9	2.3	3.2	2.6	3.8	2.85	3.27	2.67	APHA (22nd Edi) 10200-H
17.2	Phaeophytin	mg/m³	1.6	1.44	1.6	1.46	2.2	1.96	2.5	1.5	2.7	1.4	2.56	1.54	APHA (22nd Edi) 10200-H

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17.3	Cell Count	No. x 10^3/L	173	90	198	112	230	170	217	213	213	96	236	81	APHA (22nd Edi) 1020O-H
17.4	Name of Group Number and name of group species of each group	--	**Rhizosolenia** *Nitzschia Melosira Cyclotella Cosmarium* --	**Amphiprora** *ceratium Nitzschia* -- -- --	**Rhizosolenia sp.** *Nitzschia sp. Synedra sp. Biddulphia sp. coratizum sp. Melosira sp.*	**Nitzschia sp.** *Navicula sp. Fragillaria sp.* -- -- --	**Rhizosolenia sp.** Navicula sp. Thallasiosira sp. Coscinodiscus sp.	**Nitzschia sp.** Cyclotella sp. Cheatoceros sp. --	*Thallasiosira sp. Rhizosolenia sp. Coscinodiscus sp.* --	*Navicula sp. Synedra sp. Fragillaria sp.* --	*Coscinodiscus sp. Rhizosolenia sp. Thallasiosira sp. Synedra sp.*	*Synedra sp. Navicula sp. Gyrosigma a sp.* --	*Coscinodiscus sp. Rhizosolenia sp. Fragillaria sp. Synedra sp.*	*Navicula sp. Pleurosigma sp. Biddulphia a sp.* --	APHA (22nd Edi) 1020O-H
C	**Zooplanktons**														
18.1	Abundance (Population)	noX10^3/ 100 m^3	43		40		58		45		64		53		APHA (22nd Edi) 1020O-G
18.2	Name of Group Number and name of group species of each group	--	Foraminiferans Chaetognaths Gastropods --		Polychaetes Bivalves Crustaceans Copepods		Bivalves Gastropods Crustaceans		molluscan Crustaceans Gastropods --		Polychaetes molluscans		Polychaetes Foraminiferans Bivalves		APHA (22nd Edi) 1020O-G
18.3	Total Biomass	ml/100 m^3	5.1		5.6		3.2		4.4		3.9		3.4		APHA (22nd Edi) 1020O-G
D	**Microbiological Parameters**														
19.1	Total Bacterial Count	CFU/ml	2100		1870		1860		1850		1720		1820		IS 5402:2002
19.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA(22nd Edi)9221-D
19.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi. 2.4(2003-05)
19.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 15186 :2002
19.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
19.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
19.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)

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RESULTS OF ETP WATER OUTLET

SR. NO.	PARAMETERS	UNIT	RESULTS OF ETP WATER OUTLET						GPCB Limit	TEST METHOD
			03/10/2018	11/05/2018	04/12/2018	04/01/2019	05/02/2019	04/03/2019		
1	Colour	Co-pt	70	50	60	50	70	80	**100**	IS3025(P4)83Re.02
2	pH	--	7.1	7.52	8.4	7.3	8.1	7.45	**6.5 TO 8.5**	IS3025(P11)83Re.02
3	Temperature	°C	32.4	30.8	31.2	30.8	31.6	31.9	**40**	IS3025(P9)84Re.02
4	Total Suspended Solids	mg/L	34	25	39	52	72	64	**100**	IS3025(P17)84Re.02
5	Total Dissolved Solids	mg/L	1024	1712	1698	1318	1560	1921	**2100**	IS3025(P16)84Re.02
6	COD	mg/L	88	92	76	94	84	68	**100**	APHA(22nd Edi) 5520-D Open Reflux
7	BOD (3 Days @ 27 °C)	mg/L	26	18	20	24	20	19	**30**	IS 3025 (P44)1993Re.03Edition2.1
8	Chloride as Cl	mg/L	429	510	529	399	489	596	**600**	IS3025(P32)88Re.99
9	Oil & Grease	mg/L	3.8	2.4	3.2	2.4	4	7.8	**10**	APHA(22nd Edi)5520D
10	Sulphate as SO_4	mg/L	72	110	98	112	156	172	**1000**	APHA(22nd Edi)4500 SO_4 E
11	Ammonical Nitrogen as NH_3	mg/L	2.7	3.4	4.6	3.2	5.2	7.2	**50**	IS3025(P34)88Cla.2.3
12	Phenolic Compound	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	**1**	IS3025(P43)92Re.03
13	Copper as Cu	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	**3**	AAS APHA(22nd Edi)3111 B
14	Lead as Pb	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	**0.1**	AAS APHA(22nd Edi)3111 B
15	Sulphide as S	mg/L	1.8	1.4	1.1	1.4	1.8	1.2	**2**	APHA(22nd Edi) 4500-S
16	Cadmium as Cd	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	**2**	AAS APHA(22nd Edi)3111 B
17	Fluoride as F	mg/L	0.75	0.65	0.45	0.5	0.6	0.5	**2**	APHA(22nd Edi) 4500 F D SPANDS

*Below detection limit

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RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI PORT – T1 TERMINAL NR. (MARINE BUILDING)								
Sr.No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
31	15/01/2019	89.40	52.44	10.24	38.64	0.37	BDL*	BDL*
32	16/01/2019	96.32	48.20	22.45	32.49	1.02	BDL*	BDL*
33	21/01/2019	86.50	36.54	14.53	46.55	0.23	BDL*	BDL*
34	23/01/2019	99.53	58.38	27.52	39.49	0.81	BDL*	BDL*
35	28/01/2019	83.64	46.55	16.25	29.43	0.97	BDL*	BDL*
36	30/01/2019	95.43	54.30	24.80	36.29	1.10	BDL*	BDL*
37	04/02/2019	76.51	32.38	13.59	39.36	0.30	BDL*	BDL*
38	06/02/2019	81.53	44.53	16.74	37.67	0.54	BDL*	BDL*
39	11/02/2019	94.37	56.48	19.88	43.45	0.74	BDL*	BDL*
40	13/02/2019	84.64	50.26	8.64	36.83	0.50	BDL*	BDL*
41	18/02/2019	90.58	33.20	11.26	38.65	0.78	BDL*	BDL*
42	20/02/2019	95.32	53.43	22.43	35.47	0.61	BDL*	BDL*
43	25/02/2019	74.60	41.65	12.48	24.27	0.93	BDL*	BDL*
44	27/02/2019	91.64	49.19	25.67	33.50	0.69	BDL*	BDL*
45	04/03/2019	77.51	42.43	22.73	36.48	0.60	BDL*	BDL*
46	06/03/2019	84.37	36.79	12.58	44.26	0.49	BDL*	BDL*
47	11/03/2019	74.36	38.23	18.22	41.63	0.39	BDL*	BDL*
48	13/03/2019	92.49	56.28	20.55	38.68	0.78	BDL*	BDL*
49	18/03/2019	69.46	32.42	15.30	35.38	0.23	BDL*	BDL*
50	20/03/2019	86.27	44.29	24.20	39.55	0.48	BDL*	BDL*
51	25/03/2019	78.30	40.25	13.64	25.41	0.63	BDL*	BDL*
52	27/03/2019	81.21	46.18	27.20	45.39	0.52	BDL*	BDL*
	TEST METHOD	IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob & Hochheiser (NaOH-NaAsO2)	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

*Below detection limit

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RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI PORT – T1 TERMINAL NR.MARINE BUILDING								
Sr. No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
1	02/10/2018	84.33	43.68	13.61	20.68	0.70	BDL*	BDL*
2	05/10/2018	92.48	57.62	21.29	42.31	0.41	BDL*	BDL*
3	09/10/2018	89.64	39.44	14.36	35.61	0.39	BDL*	BDL*
4	12/10/2018	72.66	29.46	16.42	30.44	0.33	BDL*	BDL*
5	16/10/2018	87.60	48.35	24.29	39.35	0.57	BDL*	BDL*
6	19/10/2018	79.45	37.40	10.44	38.26	0.31	BDL*	BDL*
7	23/10/2018	86.30	45.39	19.44	32.51	0.17	BDL*	BDL*
8	26/10/2018	97.29	59.24	17.55	43.24	0.72	BDL*	BDL*
9	30/10/2018	88.40	40.27	18.42	27.50	0.49	BDL*	BDL*
10	02/11/2018	88.55	38.64	14.30	23.51	0.31	BDL*	BDL*
11	06/11/2018	96.60	58.46	20.32	35.65	0.36	BDL*	BDL*
12	09/11/2018	78.56	37.57	11.56	29.26	0.22	BDL*	BDL*
13	13/11/2018	85.61	49.23	19.60	32.49	0.52	BDL*	BDL*
14	16/11/2018	73.92	31.56	13.60	24.26	0.48	BDL*	BDL*
15	19/11/2018	95.34	52.32	15.66	30.52	0.11	BDL*	BDL*
16	21/11/2018	84.38	35.35	18.48	36.63	0.34	BDL*	BDL*
17	26/11/2018	79.37	42.60	8.64	28.49	0.87	BDL*	BDL*
18	28/11/2018	90.41	39.34	12.52	33.60	0.27	BDL*	BDL*
19	03/12/2018	85.65	48.24	9.69	31.71	0.27	BDL*	BDL*
20	05/12/2018	97.52	42.64	14.54	27.73	0.46	BDL*	BDL*
21	10/12/2018	87.38	50.67	22.71	33.25	0.87	BDL*	BDL*
22	12/12/2018	79.44	34.36	12.31	39.39	0.70	BDL*	BDL*
23	17/12/2018	92.47	44.25	21.34	42.65	0.50	BDL*	BDL*
24	19/12/2018	86.58	57.39	20.39	35.92	0.82	BDL*	BDL*
25	24/12/2018	99.55	40.66	11.31	32.48	0.76	BDL*	BDL*
26	26/12/2018	87.39	37.57	25.61	40.25	0.96	BDL*	BDL*
27	31/12/2018	83.56	55.37	13.62	45.38	0.18	BDL*	BDL*
28	02/01/2019	92.66	57.55	23.42	45.76	0.63	BDL*	BDL*
29	07/01/2019	88.35	39.59	15.59	43.59	0.90	BDL*	BDL*
30	09/01/2019	98.30	42.31	12.50	35.83	1.00	BDL*	BDL*

Continue ...

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-7

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Lab Manager (Q)

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Environmental Auditors, Consultants & Analysts.
Cleaner Production / Waste Minimization Facilitator

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Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

RESULT OF AMBIENT AIR QUALITY MONITORING

NEAR FIRE STATION								
Sr. No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
1	02/10/2018	89.34	47.50	26.40	36.30	0.79	BDL*	BDL*
2	05/10/2018	97.69	50.58	14.61	33.49	0.62	BDL*	BDL*
3	09/10/2018	84.65	36.56	21.62	39.37	0.23	BDL*	BDL*
4	12/10/2018	79.35	33.44	11.60	26.46	0.52	BDL*	BDL*
5	16/10/2018	80.30	39.46	20.61	25.62	0.63	BDL*	BDL*
6	19/10/2018	93.67	45.63	18.39	41.32	0.45	BDL*	BDL*
7	23/10/2018	77.34	30.36	10.37	30.32	0.38	BDL*	BDL*
8	26/10/2018	92.63	53.57	24.25	37.20	0.90	BDL*	BDL*
9	30/10/2018	82.46	34.56	16.36	24.42	0.36	BDL*	BDL*
10	02/11/2018	82.31	36.74	12.98	18.49	0.21	BDL*	BDL*
11	06/11/2018	91.53	48.35	18.29	30.25	0.55	BDL*	BDL*
12	09/11/2018	89.32	40.58	16.35	34.62	0.46	BDL*	BDL*
13	13/11/2018	78.42	39.63	10.56	20.63	0.41	BDL*	BDL*
14	16/11/2018	85.72	35.66	17.52	28.76	0.45	BDL*	BDL*
15	19/11/2018	67.93	41.20	7.52	24.67	0.24	BDL*	BDL*
16	21/11/2018	57.81	24.50	8.52	32.37	0.53	BDL*	BDL*
17	26/11/2018	83.55	45.66	21.64	36.77	0.73	BDL*	BDL*
18	28/11/2018	61.33	23.64	19.22	27.51	0.47	BDL*	BDL*
19	03/12/2018	96.35	55.70	14.35	36.29	0.69	BDL*	BDL*
20	05/12/2018	79.66	33.89	17.64	25.53	0.30	BDL*	BDL*
21	10/12/2018	82.41	37.65	20.41	22.53	0.60	BDL*	BDL*
22	12/12/2018	92.39	53.56	16.67	29.48	0.53	BDL*	BDL*
23	17/12/2018	65.68	30.62	25.59	35.81	0.89	BDL*	BDL*
24	19/12/2018	80.47	42.85	23.46	30.35	0.78	BDL*	BDL*
25	24/12/2018	68.64	29.51	22.45	28.25	0.62	BDL*	BDL*
26	26/12/2018	91.18	51.20	10.51	38.29	0.57	BDL*	BDL*
27	31/12/2018	89.48	36.53	7.58	34.42	0.36	BDL*	BDL*
28	02/01/2019	74.69	46.32	26.55	40.53	0.98	BDL*	BDL*
29	07/01/2019	68.37	29.46	17.61	32.36	0.65	BDL*	BDL*
30	09/01/2019	78.50	35.37	23.58	28.65	0.72	BDL*	BDL*

Continue ...

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-7.

Dr. Arun Bajpai
Lab Manager (Q)

RESULT OF AMBIENT AIR QUALITY MONITORING

NEAR FIRE STATION								
Sr.No.	Date of Sampling	Particulate Matter (PM10) $\mu g/m^3$	Particulate Matter (PM 2.5) $\mu g/m^3$	Sulphur Dioxide (SO2) $\mu g/m^3$	Oxides of Nitrogen (NO2) $\mu g/m^3$	Carbon Monoxide as CO mg/m^3	Hydrocarbon as CH_4 mg/m^3	Benzene as C_6H_6 $\mu g/m^3$
31	15/01/2019	85.60	48.62	19.31	41.26	0.87	BDL*	BDL*
32	16/01/2019	91.57	42.65	20.48	35.64	0.70	BDL*	BDL*
33	21/01/2019	60.43	24.50	8.68	38.54	0.45	BDL*	BDL*
34	23/01/2019	72.13	45.66	10.48	31.24	0.71	BDL*	BDL*
35	28/01/2019	67.50	36.32	18.20	25.50	0.44	BDL*	BDL*
36	30/01/2019	90.27	50.25	21.31	29.49	0.78	BDL*	BDL*
37	04/02/2019	54.78	23.55	7.58	32.49	0.60	BDL*	BDL*
38	06/02/2019	60.44	30.50	19.51	27.57	0.46	BDL*	BDL*
39	11/02/2019	86.36	52.23	24.57	37.57	0.97	BDL*	BDL*
40	13/02/2019	78.68	45.66	16.24	29.86	1.05	BDL*	BDL*
41	18/02/2019	69.34	28.43	15.61	24.35	0.87	BDL*	BDL*
42	20/02/2019	82.37	46.53	14.41	31.78	1.01	BDL*	BDL*
43	25/02/2019	59.81	31.49	18.59	21.28	0.52	BDL*	BDL*
44	27/02/2019	66.30	38.39	11.56	40.26	0.98	BDL*	BDL*
45	04/03/2019	73.28	39.55	19.19	40.30	0.50	BDL*	BDL*
46	06/03/2019	63.47	29.67	17.07	28.45	0.66	BDL*	BDL*
47	11/03/2019	55.35	26.78	21.26	38.75	0.36	BDL*	BDL*
48	13/03/2019	86.46	51.45	25.49	43.47	0.74	BDL*	BDL*
49	18/03/2019	51.44	20.46	8.68	25.32	0.44	BDL*	BDL*
50	20/03/2019	75.32	34.26	16.39	33.31	0.78	BDL*	BDL*
51	25/03/2019	58.68	27.36	20.57	22.50	0.39	BDL*	BDL*
52	27/03/2019	62.81	30.54	12.87	39.53	0.76	BDL*	BDL*
	TEST METHOD	**IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)**	**Gravimetric-CPCB - Method (Vol.I,May-2011)**	**IS:5182(Part II):Improved West and Gaeke**	**IS:5182(Part VI):Modified Jacob & Hochheiser (NaOH-NaAsO2)**	**NDIR Digital Gas Analyzer**	**SOP: HC: GC/GCMS/Gas analyzer**	**IS 5182 (Part XI):2006/CPCB Method**

*Below detection limit

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-7

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RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI HOUSE								
Sr. No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
1	02/10/2018	62.57	31.51	18.73	24.53	0.40	BDL*	BDL*
2	05/10/2018	84.35	44.38	11.35	29.67	0.55	BDL*	BDL*
3	09/10/2018	79.63	35.34	16.22	31.22	0.20	BDL*	BDL*
4	12/10/2018	57.24	27.55	13.52	22.43	0.46	BDL*	BDL*
5	16/10/2018	72.80	38.44	10.83	30.58	0.41	BDL*	BDL*
6	19/10/2018	67.89	30.42	8.65	25.69	0.26	BDL*	BDL*
7	23/10/2018	58.64	23.50	12.37	19.40	0.33	BDL*	BDL*
8	26/10/2018	71.58	38.63	15.62	26.19	0.50	BDL*	BDL*
9	30/10/2018	65.65	29.38	9.61	20.60	0.22	BDL*	BDL*
10	02/11/2018	63.77	27.26	7.64	16.26	0.14	BDL*	BDL*
11	06/11/2018	80.35	43.62	12.46	20.25	0.33	BDL*	BDL*
12	09/11/2018	70.43	33.23	6.81	23.70	0.17	BDL*	BDL*
13	13/11/2018	69.32	30.45	8.46	18.64	0.50	BDL*	BDL*
14	16/11/2018	56.38	23.51	11.37	22.48	0.29	BDL*	BDL*
15	21/11/2018	53.45	20.65	13.47	26.83	0.42	BDL*	BDL*
16	26/11/2018	73.64	39.29	16.50	19.53	0.64	BDL*	BDL*
17	28/11/2018	58.42	26.88	17.26	21.24	0.37	BDL*	BDL*
18	03/12/2018	80.24	44.50	6.56	25.71	0.39	BDL*	BDL*
19	05/12/2018	68.32	29.36	19.59	21.60	0.21	BDL*	BDL*
20	10/12/2018	76.34	31.67	13.64	18.65	0.33	BDL*	BDL*
21	12/12/2018	61.25	38.82	10.19	24.61	0.44	BDL*	BDL*
22	17/12/2018	58.35	24.35	8.92	27.60	0.61	BDL*	BDL*
23	19/12/2018	89.32	48.62	12.48	20.37	0.56	BDL*	BDL*
24	24/12/2018	63.57	24.69	17.55	17.69	0.65	BDL*	BDL*
25	26/12/2018	82.68	46.31	14.46	22.68	0.73	BDL*	BDL*
26	31/12/2018	67.87	31.29	9.56	30.23	0.48	BDL*	BDL*
27	02/01/2019	65.56	37.35	9.64	30.34	0.77	BDL*	BDL*
28	07/01/2019	76.51	34.58	11.41	27.70	0.57	BDL*	BDL*
29	09/01/2019	69.32	30.75	18.67	20.46	0.85	BDL*	BDL*
30	15/01/2019	70.20	39.63	7.54	15.63	0.38	BDL*	BDL*

Continue ...

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-7.

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Lab Manager (Q)

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Environmental Auditors, Consultants & Analysts.
Cleaner Production / Waste Minimization Facilitator

Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI HOUSE								
Sr. No.	Date of Sampling	Particulate Matter (PM10) $\mu g/m^3$	Particulate Matter (PM 2.5) $\mu g/m^3$	Sulphur Dioxide (SO2) $\mu g/m^3$	Oxides of Nitrogen (NO2) $\mu g/m^3$	Carbon Monoxide as CO mg/m^3	Hydrocarbon as CH_4 mg/m^3	Benzene as C_6H_6 $\mu g/m^3$
31	16/01/2019	81.27	32.56	13.61	23.92	0.66	BDL*	BDL*
32	21/01/2019	74.35	29.57	10.41	33.55	0.55	BDL*	BDL*
33	23/01/2019	91.39	51.53	8.51	24.72	0.36	BDL*	BDL*
34	28/01/2019	62.34	27.51	14.41	17.66	0.50	BDL*	BDL*
35	30/01/2019	85.45	33.57	19.30	26.62	0.41	BDL*	BDL*
36	04/02/2019	62.47	26.37	10.36	28.69	0.84	BDL*	BDL*
37	06/02/2019	70.53	37.52	13.37	23.74	0.73	BDL*	BDL*
38	11/02/2019	54.68	22.38	16.50	25.49	0.40	BDL*	BDL*
39	13/02/2019	63.59	34.24	19.38	18.69	0.65	BDL*	BDL*
40	18/02/2019	58.64	24.86	17.53	17.60	1.09	BDL*	BDL*
41	20/02/2019	76.49	33.48	11.36	22.70	0.48	BDL*	BDL*
42	25/02/2019	53.40	23.43	15.19	29.27	0.76	BDL*	BDL*
43	27/02/2019	84.28	45.30	7.54	26.54	0.47	BDL*	BDL*
44	04/03/2019	65.65	35.33	14.52	33.49	0.64	BDL*	BDL*
45	06/03/2019	54.35	25.62	21.54	21.75	0.82	BDL*	BDL*
46	11/03/2019	66.24	33.69	15.65	24.40	0.53	BDL*	BDL*
47	13/03/2019	50.22	23.47	18.39	28.52	0.26	BDL*	BDL*
48	18/03/2019	56.86	27.55	11.85	32.50	0.62	BDL*	BDL*
49	20/03/2019	70.42	41.22	12.36	25.79	0.33	BDL*	BDL*
50	25/03/2019	51.28	24.52	17.50	34.57	0.54	BDL*	BDL*
51	27/03/2019	75.59	39.62	8.91	29.50	0.34	BDL*	BDL*
	TEST METHOD	IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob & Hochheiser (NaOH-NaAsO2)	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

*Below detection limit

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-7.

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RESULT OF AMBIENT AIR QUALITY MONITORING

CT-3 DG HOUSE								
Sr.No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
1	02/10/2018	71.67	26.35	15.66	28.39	0.53	BDL*	BDL*
2	05/10/2018	63.62	38.23	19.61	37.34	0.29	BDL*	BDL*
3	09/10/2018	75.64	33.71	11.66	26.32	0.57	BDL*	BDL*
4	12/10/2018	50.32	20.45	8.28	18.35	0.42	BDL*	BDL*
5	16/10/2018	65.70	30.50	12.41	34.55	0.50	BDL*	BDL*
6	19/10/2018	57.40	27.35	16.21	21.31	0.22	BDL*	BDL*
7	23/10/2018	68.20	41.62	6.56	24.70	0.26	BDL*	BDL*
8	26/10/2018	85.46	50.32	13.32	29.36	0.69	BDL*	BDL*
9	30/10/2018	73.38	25.68	10.24	16.37	0.50	BDL*	BDL*
10	02/11/2018	73.41	40.26	8.40	13.59	0.40	BDL*	BDL*
11	06/11/2018	85.32	45.44	11.45	23.61	0.44	BDL*	BDL*
12	09/11/2018	54.62	26.44	14.54	17.58	0.15	BDL*	BDL*
13	13/11/2018	64.31	35.26	20.22	28.40	0.31	BDL*	BDL*
14	16/11/2018	50.35	20.40	6.62	14.65	0.25	BDL*	BDL*
15	19/11/2018	86.12	48.66	18.57	35.26	0.18	BDL*	BDL*
16	21/11/2018	75.86	31.62	15.45	30.62	0.30	BDL*	BDL*
17	26/11/2018	69.43	38.44	19.29	25.51	0.57	BDL*	BDL*
18	28/11/2018	79.63	34.51	9.63	19.67	0.66	BDL*	BDL*
19	03/12/2018	60.76	31.66	12.66	20.84	0.23	BDL*	BDL*
20	05/12/2018	81.62	34.64	9.27	17.63	0.58	BDL*	BDL*
21	10/12/2018	70.60	29.42	18.85	30.45	0.47	BDL*	BDL*
22	12/12/2018	55.90	42.87	6.55	36.55	0.80	BDL*	BDL*
23	17/12/2018	85.78	39.39	13.69	31.61	0.55	BDL*	BDL*
24	19/12/2018	93.82	53.63	10.68	26.39	0.66	BDL*	BDL*
25	24/12/2018	88.60	37.28	8.62	21.66	0.52	BDL*	BDL*
26	26/12/2018	77.17	33.44	16.61	32.60	0.86	BDL*	BDL*
27	31/12/2018	94.32	52.47	19.51	38.46	0.26	BDL*	BDL*
28	02/01/2019	98.69	51.52	15.40	35.33	0.69	BDL*	BDL*
29	07/01/2019	82.58	36.46	7.22	39.28	1.03	BDL*	BDL*
30	09/01/2019	92.38	46.84	9.21	24.57	0.64	BDL*	BDL*

H. T. Shah
Lab Manager

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RESULT OF AMBIENT AIR QUALITY MONITORING

CT-3 DG HOUSE								
Sr.No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
31	15/01/2019	76.30	56.32	13.38	21.60	0.29	BDL*	BDL*
32	16/01/2019	85.32	38.24	11.35	29.25	0.86	BDL*	BDL*
33	21/01/2019	79.66	33.64	23.37	42.71	0.32	BDL*	BDL*
34	23/01/2019	87.64	55.74	16.34	36.89	1.07	BDL*	BDL*
35	28/01/2019	75.60	42.17	21.59	40.35	0.74	BDL*	BDL*
36	30/01/2019	80.47	39.31	20.36	33.33	0.42	BDL*	BDL*
37	04/02/2019	69.64	29.50	20.40	37.40	0.41	BDL*	BDL*
38	06/02/2019	75.62	40.55	6.61	32.65	0.96	BDL*	BDL*
39	11/02/2019	59.32	34.51	13.64	29.51	0.85	BDL*	BDL*
40	13/02/2019	94.53	55.49	11.58	43.90	0.37	BDL*	BDL*
41	18/02/2019	80.96	36.46	8.78	20.43	0.90	BDL*	BDL*
42	20/02/2019	72.68	30.66	18.42	28.33	0.55	BDL*	BDL*
43	25/02/2019	66.25	33.56	21.57	33.73	0.94	BDL*	BDL*
44	27/02/2019	76.83	39.48	14.18	30.29	0.89	BDL*	BDL*
45	04/03/2019	85.32	49.45	10.49	27.52	0.56	BDL*	BDL*
46	06/03/2019	74.82	32.44	7.65	23.47	0.71	BDL*	BDL*
47	11/03/2019	67.63	30.42	23.43	36.48	0.62	BDL*	BDL*
48	13/03/2019	55.68	33.68	15.70	32.52	0.69	BDL*	BDL*
49	18/03/2019	62.49	24.37	21.37	42.50	0.32	BDL*	BDL*
50	20/03/2019	90.41	39.39	19.49	30.56	0.44	BDL*	BDL*
51	25/03/2019	83.32	44.24	24.26	38.37	0.74	BDL*	BDL*
52	27/03/2019	69.45	35.46	16.25	34.33	0.55	BDL*	BDL*
	TEST METHOD	IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob & Hochheiser (NaOH-NaAsO2)	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

*Below detection limit

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RESULTS OF NOISE LEVEL MONITORING

Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	T1 TERMINAL NR.MARINE BUILDING					
		Result [Leq dB(A)]					
	Sampling Date & Time	16/10/2018	16/11/2018	14/12/2018	04/01/2019	25/02/2019	18/03/2019
1	6:00-7:00	67.2	67.3	63.1	68.4	65.8	68.1
2	7:00-8:00	66.5	66.4	68.7	65.2	69.4	62.8
3	8:00-9:00	63.9	62.4	69.1	66.8	61.4	63.4
4	9:00-10:00	66.5	64.5	62.8	70.2	62.5	69.9
5	10:00-11:00	61.7	61.6	65.8	62.8	68.4	72.4
6	11:00-12:00	66.2	64.3	70.4	68.3	65.2	74.1
7	12:00-13:00	68.7	65.7	69.7	63.7	60.4	70.1
8	13:00-14:00	70.6	68.2	65.7	62.9	67.4	66.4
9	14:00-15:00	71.9	72.5	63.1	68.5	63.4	68.4
10	15:00-16:00	70.3	67.9	62.8	65.1	62.4	62.8
11	16:00-17:00	62.3	62.9	68.4	70.3	68.1	65.6
12	17:00-18:00	64.7	65.6	65.5	71.8	61.4	68.8
13	18:00-19:00	64.6	64.6	69.1	69.4	60.8	64.1
14	19:00-20:00	63.6	65.7	62.8	62.8	69.4	63.4
15	20:00-21:00	64.9	67.7	65.0	65.1	70.6	68.9
16	21:00-22:00	70.1	73.0	66.7	62.5	72.4	66.8
Day Time Limit*		75 Leq dB(A)					

Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	T1 TERMINAL NR.MARINE BUILDING					
		Result [Leq dB(A)]					
1	Sampling Date & Time	16/10/2018 & 17/10/2018	16/11/2018 & 17/11/2018	14/12/2018 & 15/12/2018	04/01/2019 & 05/01/2019	25/02/2019 & 26/02/2019	18/03/2019 & 19/03/2019
2	22:00-23:00	69.5	67.8	63.8	63.1	63.1	65.1
3	23:00-00:00	66.5	64.4	65.7	61.8	65.3	60.8
4	00:00-01:00	64.4	66.9	64.1	65.1	66.3	68.4
5	01:00-02:00	61.9	61.6	62.8	68.7	62.4	67.4
6	02:00-03:00	58.3	60.8	63.7	65.4	62.7	68.4
7	03:00-04:00	66.1	65.6	63.9	62.9	68.3	65.1
8	04:00-05:00	62.8	60.8	69.8	69.4	65.3	62.5
9	05:00-06:00	64.7	66.6	62.7	68.5	66.2	66.1
Night Time Limit*		70 Leq dB(A)					

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Lab Manager (Q)

RESULTS OF NOISE LEVEL MONITORING

Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	NEAR FIRE STATION					
		Result [Leq dB(A)]					
	Sampling Date & Time	12/10/2018	20/11/2018	04/12/2018	16/01/2019	04/02/2019	11/03/2019
1	6:00-7:00	62.0	62.3	65.4	62.5	68.4	68.1
2	7:00-8:00	63.8	61.2	66.3	68.4	62.1	62.7
3	8:00-9:00	69.2	69.3	66.9	72.4	65.4	65.1
4	9:00-10:00	67.5	69.1	67.4	74.1	73.1	65.9
5	10:00-11:00	63.4	62.5	63.2	70.4	64.1	68.2
6	11:00-12:00	61.8	64.5	62.4	69.9	68.1	63.7
7	12:00-13:00	68.1	70.7	67.4	63.4	62.4	65.4
8	13:00-14:00	62.5	61.7	65.3	60.4	68.4	62.8
9	14:00-15:00	61.1	61.5	62.5	62.4	62.4	69.1
10	15:00-16:00	67.1	64.9	68.4	64.5	69.4	67.1
11	16:00-17:00	69.0	71.4	68.3	65.1	61.4	63.4
12	17:00-18:00	67.7	67.2	68.7	63.4	60.4	69.1
13	18:00-19:00	64.6	65.4	64.3	62.5	62.7	71.1
14	19:00-20:00	64.7	66.3	62.7	63.4	68.4	68.1
15	20:00-21:00	65.2	63.3	65.8	65.2	64.3	65.2
16	21:00-22:00	61.4	64.5	63.6	66.8	61.5	68.1
	Day Time Limit*	75 Leq dB(A)					

Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	NEAR FIRE STATION					
		Result [Leq dB(A)]					
1	Sampling Date & Time	12/10/2018 & 13/10/2018	20/11/2018 & 21/11/2018	04/12/2018 & 05/12/2018	16/01/2019 & 17/01/2019	04/02/2019 & 05/02/2019	11/03/2019 & 12/03/2019
2	22:00-23:00	68.0	68.4	64.1	63.2	67.3	65.1
3	23:00-00:00	59.8	60.1	63.4	59.4	64.2	68.7
4	00:00-01:00	67.6	66.3	62.1	60.3	65.3	59.4
5	01:00-02:00	60.8	59.6	60.4	60.3	62.1	60.8
6	02:00-03:00	62.8	65.8	68.4	65.3	67.3	63.1
7	03:00-04:00	65.6	65.1	63.4	62.3	66.3	62.4
8	04:00-05:00	64.9	67.5	65.4	60.2	63.9	60.4
9	05:00-06:00	60.8	58.7	67.1	62.4	61.5	60.8
	Night Time Limit*	70 Leq dB(A)					

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RESULTS OF NOISE LEVEL MONITORING

Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	ADANI HOUSE					
		Result [Leq dB(A)]					
	Sampling Date & Time	02/10/2018	13/11/2018	18/12/2018	02/01/2019	15/02/2019	01/03/2019
1	6:00-7:00	65.0	62.6	60.3	60.3	62.5	65.4
2	7:00-8:00	67.7	68.1	63.4	63.4	68.4	62.8
3	8:00-9:00	67.1	68.7	62.3	62.3	68.1	68.1
4	9:00-10:00	73.0	71.8	67.4	67.4	63.4	72.1
5	10:00-11:00	72.4	71.3	65.6	65.6	72.4	71.5
6	11:00-12:00	64.6	62.8	68.4	68.4	70.4	69.4
7	12:00-13:00	60.3	59.5	70.4	70.4	70.9	65.2
8	13:00-14:00	65.5	69.0	65.3	65.3	68.1	62.8
9	14:00-15:00	64.4	67.4	69.4	69.4	62.4	62.8
10	15:00-16:00	62.5	65.3	69.7	69.7	65.1	62.1
11	16:00-17:00	71.1	72.8	67.3	67.3	62.8	65.1
12	17:00-18:00	69.9	72.0	65.3	65.3	66.8	69.1
13	18:00-19:00	70.9	70.0	63.8	63.8	69.4	63.4
14	19:00-20:00	63.1	60.9	64.3	64.3	62.1	65.1
15	20:00-21:00	57.9	56.0	67.4	67.4	68.4	61.8
16	21:00-22:00	64.9	62.4	63.8	63.8	68.2	60.4
Day Time Limit*		75 Leq dB(A)					

Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	ADANI HOUSE					
		Result [Leq dB(A)]					
1	Sampling Date & Time	02/10/2018 & 03/10/2018	13/11/2018 & 14/11/2018	18/12/2018 & 19/12/2018	02/01/2019 & 03/01/2019	15/02/2019 & 16/02/2019	01/03/2019 & 02/03/2019
2	22:00-23:00	67.8	69.5	60.4	67.4	60.4	62.5
3	23:00-00:00	66.8	64.4	65.1	68.3	65.1	65.1
4	00:00-01:00	64.3	66.8	65.4	63.2	65.4	65.7
5	01:00-02:00	63.8	64.0	61.8	60.1	61.8	60.8
6	02:00-03:00	62.3	61.2	63.4	60.4	63.4	60.7
7	03:00-04:00	62.0	61.2	62.4	62.4	62.4	62.4
8	04:00-05:00	61.3	60.1	65.7	65.3	65.7	58.1
9	05:00-06:00	61.3	63.8	67.1	63.6	67.1	61.8
Night Time Limit*		70 Leq dB(A)					

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Lab Manager

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RESULTS OF NOISE LEVEL MONITORING

Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	CT-3 DG HOUSE					
		Result [Leq dB(A)]					
	Sampling Date & Time	05/10/2018	23/11/2018	21/12/2018	10/01/2019	27/02/2019	07/03/2019
1	6:00-7:00	56.7	56.0	58.1	62.7	58.4	61.2
2	7:00-8:00	59.2	59.2	60.1	65.2	60.4	68.7
3	8:00-9:00	62.2	65.1	59.7	61.4	69.7	65.2
4	9:00-10:00	65.4	66.7	63.4	60.8	64.0	64.3
5	10:00-11:00	66.1	67.3	65.7	65.2	61.5	63.8
6	11:00-12:00	65.3	65.6	69.7	63.1	62.4	69.9
7	12:00-13:00	69.1	71.3	65.1	61.8	61.8	62.7
8	13:00-14:00	69.8	71.4	62.4	65.9	64.7	62.3
9	14:00-15:00	64.3	65.6	68.7	68.2	62.8	65.1
10	15:00-16:00	61.8	62.5	68.4	67.4	61.8	65.4
11	16:00-17:00	65.4	67.4	67.1	64.3	63.4	65.3
12	17:00-18:00	66.8	64.5	65.8	63.5	61.8	68.1
13	18:00-19:00	60.8	62.2	63.8	65.5	67.4	64.2
14	19:00-20:00	64.7	62.1	66.1	66.1	61.9	62.8
15	20:00-21:00	59.2	62.5	69.1	61.4	65.1	65.1
16	21:00-22:00	67.0	67.5	65.8	65.2	62.4	63.4
Day Time Limit*		75 Leq dB(A)					

Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	CT-3 DG HOUSE					
		Result [Leq dB(A)]					
1	Sampling Date & Time	05/10/2018 & 06/10/2018	23/11/2018 & 24/11/2018	21/12/2018 & 22/12/2018	10/01/2019 & 11/01/2019	27/02/2019 & 28/02/2019	07/03/2019 & 08/03/2019
2	22:00-23:00	62.0	60.9	68.7	65.1	65.1	63.1
3	23:00-00:00	64.7	66.9	65.1	59.8	59.8	68.4
4	00:00-01:00	58.7	60.5	62.8	57.4	57.4	64.1
5	01:00-02:00	64.5	66.3	68.4	60.4	60.4	60.4
6	02:00-03:00	63.2	66.0	64.9	61.4	61.4	62.8
7	03:00-04:00	66.3	66.0	69.1	58.7	58.7	64.7
8	04:00-05:00	66.1	67.7	67.5	58.1	58.1	66.1
9	05:00-06:00	59.0	58.2	68.2	60.4	60.4	63.7
Night Time Limit*		70 Leq dB(A)					

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RESULT OF STACK MONITORING

SR. NO.	TEST PARAMETERS	UNIT	STD. LIMIT	THERMIC FLUID HEATER (BITUMEN-01)	THERMIC FLUID HEATER (BITUMEN-02)	HOT WATER SYSTEM-1	HOT WATER SYSTEM-2	TEST METHOD
				OCTOBER 2018				
1	Particulate Matter	mg/Nm^3	**150**	19.37	--	16.83	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	3.94	--	5.91	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	23.70	--	34.60	--	IS:11255 (Part-VII):2005
				NOVEMBER 2018				
1	Particulate Matter	mg/Nm^3	**150**	23.54	--	19.63	14.28	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	2.93	--	6.68	4.86	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	28.49	--	39.45	32.79	IS:11255 (Part-VII):2005
				DECEMBER 2018				
1	Particulate Matter	mg/Nm^3	**150**	20.40	--	16.38	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	3.89	--	5.44	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	31.19	--	35.67	--	IS:11255 (Part-VII):2005
				JANUARY 2019				
1	Particulate Matter	mg/Nm^3	**150**	24.57	--	--	18.33	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	4.70	--	--	5.67	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	34.60	--	--	38.27	IS:11255 (Part-VII):2005
				FEBRUARY 2019				
1	Particulate Matter	mg/Nm^3	**150**	18.75	16.51	20.62	--	IS.11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	5.22	4.81	6.60	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	32.35	28.65	38.65	--	IS:11255 (Part-VII):2005
				MARCH 2019				
1	Particulate Matter	mg/Nm^3	**150**	16.83	--	24.62	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	4.64	--	5.66	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	30.44	--	35.59	--	IS:11255 (Part-VII):2005

*Below detection limit
Results on 11 % O_2 Correction when Oxygen is greater than 11 %. And 12% CO_2correction when $CO_2$is less thsn 12%

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Minimum Detection Limit [MDL]

Ambient Air Parameters		
Sr. No.	**Test Parameter**	**MDL**
1	Particulate Matter (PM10) ($\mu g/m^3$)	10
2	Particulate Matter (PM 2.5) ($\mu g/m^3$)	10
3	Sulphur Dioxide (SO_2) ($\mu g/m^3$)	5
4	Oxides of Nitrogen ($\mu g/m^3$)	5
5	Hydrogen Sulphide as H_2S ($\mu g/m^3$)	6

Stack Parameters		
Sr.No.	**Test Parameter**	**MDL**
1	Particulate Matter (mg/Nm^3)	10
2	Sulphur Dioxide (ppm)	1.52
3	Oxides of Nitrogen (ppm)	2.65
4	Carbon Monoxide (mg/Nm^3)	0.1
5	Haydro Carbon NMHC (ppm)	1.0

Sea Water Parameters			
SR. NO.	**TEST PARAMETERS**	**UNIT**	**MDL**
1	pH	--	2
2	Temperature	°C	2
3	Total Suspended Solids	mg/L	2
4	BOD (3 Days @ 27 °C)	mg/L	1
5	Dissolved Oxygen	mg/L	0.1
6	Salinity	ppt	1
7	Oil & Grease	mg/L	2
8	Nitrate as NO_3	µmol/L	0.5
9	Nitrite as NO_2	µmol/L	0.01
10	Ammonical Nitrogen as NH_3	µmol/L	0.2
11	Phosphates as PO_4	µmol/L	0.5
12	Petroleum Hydrocarbon	µg/L	1
13	Total Dissolved Solids	mg/L	10
14	COD	mg/L	3
15	Primary productivity	mgC/L/day	0.1
16	Chlorophyll	mg/m^3	0.1
17	Phaeophytin	mg/m^3	0.1
18	Cell Count	No. x 10^3/L	1

Sea Sediment Parameters			
SR. NO.	**TEST PARAMETERS**	**UNIT**	**MDL**
1	Organic Matter	%	0.1
2	Phosphorus as P	µg/g	1
3	Petroleum Hydrocarbon	µg/g	1
4	Aluminum as Al	%	0.1
5	Manganese as Mn	µg/g	1
6	Mercury as Hg	µg/g	0.1

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"HALF YEARLY ENVIRONMENTAL MONITORING REPORT"

FOR

adani™

BORE HOLE WATER

ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED

TAL: MUNDRA, KUTCH, MUNDRA – 370 421

MONITORING PERIOD:

OCTOBER 2018 TO MARCH 2019

PREPARED BY:

Pollucon

POLLUCON LABORATORIES PVT.LTD.

**PLOT NO.5/6 "POLLUCON HOUSE", OPP. BALAJI INDUSTRIAL SOCIETY,
OLD SHANTINATH SILK MILL LANE, NEAR GAYTRI FARSAN MART,
NAVJIVAN CIRCLE, UDHANA MAGDALLA ROAD, SURAT-395007.
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E-mail: pollucon@gmail.com Web: www.polluconlab.com**

TC - 5945 ISO 9001:2015 ISO 14001:2015 OHSAS 18001:2007

STP Water parameter(mg/L)		
Sr. No.	**Test parameter**	**MDL**
1	pH	2
2	Total Suspended Solids (mg/L)	2
3	BOD (3 days @ 270 C) (mg/L)	1
4	Residual Chlorine (mg/L)	0.2
5	Fecal Coliform (MPN INDEX/100 mL)	1.8

ETP Water Parameters			
SR. NO.	**TEST PARAMETERS**	**UNIT**	**MDL**
1	Colour	Co-pt	2
2	pH	--	2
3	Temperature	°C	2
4	Total Suspended Solids	mg/L	2
5	Total Dissolved Solids	mg/L	10
6	COD	mg/L	3
7	BOD (3 Days @ 27 °C)	mg/L	1
8	Chloride as Cl	mg/L	1
9	Oil & Grease	mg/L	2
10	Sulphate as SO_4	mg/L	1
11	Ammonical Nitrogen as NH_3	mg/L	0.2
12	Phenolic Compound	mg/L	0.005
13	Copper as Cu	mg/L	0.01
14	Lead as Pb	mg/L	0.01
15	Sulphide as S	mg/L	0.1
16	Cadmium as Cd	mg/L	0.002
17	Fluoride as F	mg/L	0.05

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RESULTS OF BORE HOLE WATER

SR. NO	TEST PARAMETERS	UNIT	RESULTS			TEST METHOD
			LIQUID TERMINAL PUMP HOUSE-1	LIQUID TERMINAL NEAR ENCLOSURE – 3	NEAR LIQUID TERMINAL ETP OFFICE	
	GPS Location		N 22° 44.554′ E 069° 41.453′	N 22° 44.554′ E 069° 41.453′	N 22° 44.554′ E 069° 41.453′	
	Sampling Date		31/12/2018	31/12/2018	31/12/2018	
1	pH	--	7.42	8.14	7.79	IS3025(P11)83Re.02
2	Salinity	ppt	12.45	1.28	17.33	APHA 2520B
3	Oil & Grease	mg/L	BDL*	BDL*	2.4	APHA(22ndEdi)5520D
4	Hydrocarbon	mg/L	BDL*	BDL*	BDL*	GC/GC-MS
5	Lead as Pb	mg/L	0.094	0.96	0.031	AAS APHA(22ndEdi)3111 B
6	Arsenic as As	mg/L	BDL*	BDL*	BDL*	AAS APHA 3114 B
7	Nickel as Ni	mg/L	BDL*	BDL*	BDL*	AAS APHA(22ndEdi)3111 B
8	Total Chromium as Cr	mg/L	BDL*	BDL*	BDL*	AAS 3111B
9	Cadmium as Cd	mg/L	0.014	BDL*	BDL*	AAS APHA(22ndEdi)3111 B
10	Mercury as Hg	mg/L	BDL*	BDL*	BDL*	AAS APHA- 3112 B
11	Zinc as Zn	mg/L	2.10	BDL*	0.072	AAS APHA(22ndEdi)3111 B
12	Copper as Cu	mg/L	BDL*	0.84	BDL*	AAS APHA(22ndEdi)3111 B
13	Iron as Fe	mg/L	9.8	0.74	0.25	AAS APHA(22ndEdi)3111 B
14	Insecticides/Pesticides	mg/L	Absent	Absent	Absent	GC/GC-MS
15	Depth of Water Level from Ground Level	meter	1.02	1.05	0.9	--

*BDL: Below Detection Limit

POLLUCON LABORATORIES PVT. LTD. SURAT-7

H. T. Shah
Lab Manager

Dr. Arun Bajpai
Lab Manager (Q)

3853

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POLLUCON LABORATORIES PVT. LTD.
Environmental Auditors, Consultants & Analysts.
Cleaner Production / Waste Minimization Facilitator
Recognised by MoEF New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

SR. NO	TEST PARAMETERS	UNIT	RESULTS		TEST METHOD
	GPS Location		LIQUID TERMINAL PUMP HOUSE-2 N 22° 44.554' E 069° 41.453'	LIQUID TERMINAL PUMP HOUSE-3 N 22° 44.554' E 069° 41.453'	
	Sampling Date		31/12/2018	31/12/2018	
1	pH	--	7.80	7.97	IS3025(P11)83Re.02
2	Salinity	ppt	1.26	6.54	APHA 2520B
3	Oil & Grease	mg/L	BDL*	2.0	APHA(22ndEdi)5520D
4	Hydrocarbon	mg/L	BDL*	BDL*	GC/GC-MS
5	Lead as Pb	mg/L	0.075	0.14	AAS APHA(22ndEdi)3111 B
6	Arsenic as As	mg/L	BDL*	BDL*	AAS APHA 3114 B
7	Nickel as Ni	mg/L	BDL*	BDL*	AAS APHA(22ndEdi)3111 B
8	Total Chromium as Cr	mg/L	BDL*	BDL*	AAS 3111B
9	Cadmium as Cd	mg/L	0.044	0.058	AAS APHA(22ndEdi)3111 B
10	Mercury as Hg	mg/L	BDL*	BDL*	AAS APHA- 3112 B
11	Zinc as Zn	mg/L	1.84	0.17	AAS APHA(22ndEdi)3111 B
12	Copper as Cu	mg/L	0.92	BDL*	AAS APHA(22ndEdi)3111 B
13	Iron as Fe	mg/L	7.2	1.10	AAS APHA(22ndEdi)3111 B
14	Insecticides/Pesticides	mg/L	Absent	Absent	GC/GC-MS
15	Depth of Water Level from Ground Level	meter	0.98	0.95	--

*BDL: Below Detection Limit

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-7

Dr. Arun Bajpai
Lab Manager (Q)

PLOT NO.5/6 "POLLUCON HOUSE", OPP. BALAJI INDUSTRIAL SOCIETY, OLD SHANTINATH SILK MILL LANE, NEAR GAYTRI FARSAN MART,
NAVJIVAN CIRCLE, UDHANA MAGDALLA ROAD, SURAT-395007. PHONE: [0261] 2635750, 2635751
EMAIL: pollucon@gmail.com WEBSITE: www.pollucon.com

3854

POLLUCON LABORATORIES PVT. LTD.
Environmental Auditors, Consultants & Analysts,
Cleaner Production / Waste Minimization Facilitator
Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

Borehole Water Parameters			
SR. NO.	**TEST PARAMETERS**	**UNIT**	**MDL**
1	pH	--	2
2	Salinity	mg/L	0.5
3	Oil & Grease	mg/L	2
4	Hydrocarbon	mg/L	0.01
5	Lead as Pb	mg/L	0.01
6	Arsenic as As	mg/L	0.001
7	Nickel as Ni	mg/L	0.02
8	Total Chromium as Cr	mg/L	0.025
9	Cadmium as Cd	mg/L	0.002
10	Mercury as Hg	mg/L	0.005
11	Zinc as Zn	mg/L	0.06
12	Copper as Cu	mg/L	0.01
13	Iron as Fe	mg/L	0.1
14	Insecticides/Pesticides	mg/L	0.1

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-7

Dr. Arun Bajpai
Lab Manager (Q)

ANNEXURE – 5

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Details of Greenbelt development at APSEZ, Mundra

LOCATION	Total Green Zone Detail Till Up to March - 2019				
	Area (In Ha.)	Trees (Nos.)	Palm (Nos.)	Shrubs (SQM)	Lawn (SQM)
SV COLONY	69.53	32480.00	7298.00	68327.00	95019.00
PORT & NON SEZ	79.87	139992.00	19205.00	74210.78	61295.18
SEZ	114.72	227835.00	17302.00	220583.60	28162.03
MITAP	2.48	8168.00	33.00	3340.00	4036.00
WEST PORT	86.04	186827.00	51342.00	24112.00	22854.15
AGRI PARK	8.94	17244.00	1332.00	5400.00	2121.44
SOUTH PORT	14.25	25530.00	3470.00	3882.00	3327.26
Samundra Township	55.63	52481.00	11818.00	20078.07	46571.67
Productive Farming (Vadala Farm)	23.79	27976.00	0.00	0.00	0.00
TOTAL (APSEZL)	**455.23**	**718533.00**	**111800.00**	**419933.45**	**263386.73**

Details of Mangrove Afforstation done by APSEZ

Sl. no.	Location	Area (ha)	Duration	Species	Implementation agency
1	Mundra Port	24.0	-	Avicennia marina	Dr. Maity, Mangrove consultant of India
2	Mundra Port	25.0	-	Avicennia marina	Dr. Maity, Mangrove consultant of India
3	Luni/Hamirmora (Mundra, Kutch)	160.8	2007 - 2015	Avicennia marina, Rhizophora mucronata, Ceriops tagal	GUIDE, Bhuj
4	Kukadsar (Mundra, Kutch)	66.5	2012 - 2014	Avicennia marina	GUIDE, Bhuj
5	Forest Area (Mundra)	298.0	2011 - 2013	Avicennia marina	-
6	Jangi Village (Bhachau, Kutch)	50.0	2012 - 2014	Avicennia marina	GUIDE, Bhuj
7	Jakhau Village (Abdasa, Kutch)	310.6	2007-08 & 2011-13	Avicennia marina, Rhizophora mucronata, Ceriops tagal	GUIDE, Bhuj
8	Sat Saida Bet (Kutch)	255.0	2014-15 & 2016-17	Avicennia marina & Bio diversity	GUIDE, Bhuj
9	Dandi Village (Navsari)	800.0	2006 - 2011	Avicennia marina, Rhizophora mucronata, Ceriops tagal	SAVE, Ahmedabad
10	Talaza Village (Bhavnagar)	50.0	2011-12	Avicennia marina	SAVE, Ahmedabad
11	Narmada Village (Bhavnagar)	250.0	2014 - 2015	Avicennia marina	SAVE, Ahmedabad
12	Malpur Village (Bharuch)	200.0	2012-14	Avicennia marina	SAVE, Ahmedabad
13	Kantiyajal Village (Bharuch)	50.0	2014-15	Avicennia marina	SAVE, Ahmedabad
14	Devla Village (Bharuch)	150.0	210-16	Avicennia marina	SAVE, Ahmedabad
15	Village Tala Talav (Khambhat, Anand)	100.0	2015 - 2016	Avicennia marina	SAVE, Ahmedabad
16	Village Tala Talav (Khambhat, Anand)	38.0	2015 - 2016	Avicennia marina	GEC, Gandhinagar
17	Aliya Bet, Village Katpor (Hansot, Bharuch)	62.0	2017-18	Avicennia marina & Rhizophora spp.	GEC, Gandhinagar
Total Mangrove Plantation:		**2889.90 Ha**			

adani

Date: 01.10.2018

APSEZ/MARINE/CG/04

The Commander
(For Regional Pollution Response Officer)
Headquarter Coast Guard Region (NW)
Gandhinagar

Sub: **Annual Updating of Oil Spill Contingency Response Plan (Tier 1) – APSEZ, Mundra**

Dear Sir,

The Oil Spill Contingency Plan was approved vide your letter no 7563 dated 07th November 2016.

The annual updating of Oil Spill Contingency Plan was done on 01 Oct 2018. The details of changes incorporated are mentioned below:

Sl No	Amendment	Page No
1	Shore line resources updated	26
2	Annex 3- Tug details updated	75
3	Annex 4- Contact details of APSEZ personnel updated	78

The above is for your kind information and updating your records.

Thanking you,

Yours faithfully,

For Adani Ports and SEZ Ltd

Capt Anubhav Jain
Head– Marine Services
E Mail: ANUBHAV.JAIN@ADANI.COM
Mob: +91 8980015245

Capt. Anubhav Jain
AGM - Marine & PFSO
Adani Ports & SEZ Ltd.
Mundra - Kutch - Gujarat

CC: The Commanding Officer, Indian Coast Guard Station, Mundra

ANNEXURE – 6

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adani™

OIL SPILL CONTINGENCY RESPONSE PLAN TIER 1

(To be used in conjuction with OSRA Vol-1 and Vol-2)

ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED
POST BAG NO. 1
NAVINAL ISLAND
MUNDRA 370 421
PH. : (02838) 289221 / 289371
FAX : (02838) 289170 / 289270

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When the controlled copy holder ceases to be the authorized recipient of this document, the document should be returned to the HOD (Marine), Mundra Office.

This document is distributed as per Oil Spill Contingency Response plan. In addition, documents on a "need based" basis will be distributed.

All documents so distributed will be controlled documents & identified by a unique control number as per Oil Spill Contingency Response plan.

The holder of the control copy shall ensure that the persons working under him, who are responsible for any activity described in this document are made aware of such responsibility. These persons shall be given this document to read and as acknowledgment of having read shall sign the **OSCRP – Section 01 Record of Circulation** page of this document.

All persons to whom the documents have been circulated shall also be made aware of any revisions thereto by the holder of the controlled copy of the document. The person shall, after reading, sign in the **OSCRP – Section 01 Record of Circulation** page of this document as acknowledgment of having read and under stood the document.

DISTRIBUTION LIST OF OIL SPILL CONTINGENCY RESPONSE PLAN			
SN.	**Issued To**	**Copy No.**	**Date of Issue**
1.	Chief Operating Officer	01	01/01/2014
2.	Management Representative	02	01/01/2014
3.	Marine Control Room	03	01/01/2014
4.	Sr. Manager (Fire Services)	04	01/01/2014
5.	Auditor's Copy	05	01/01/2014
6.	Systems Co-ordinator	Original Copy	01/01/2014
7.	HOD (Marine)	06	01/01/2014
8.	Coast Guard	07	01/01/2014
.			

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.
MUNDRA
OIL SPILL CONTINGENCY RESPONSE PLAN

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RECORD OF CIRCULATION

The holder of the copy thereto shall circulate this document and any revisions to concerned persons. After reading, this document shall be signed and returned to the holder.

Name	Rank	Date read	Signature

Section 02: Amendment Records

AMENDMENT RECORD SHEET							
Sr. No.	**Section**	**Sub-section**	**Page No.**	**Revision No.**	**Revision Date**	**Description of Revision**	**Approved**
1.	Annex 3		75			Location of Oil Spill Equipment mentioned	Approved
2.	Annex 15		91			List of recycler approved by state of Gujarat	Approved
3.			96			Contingency Planning Compliance Checklist	Approved
4	Annex 16		92		29.08.2017	List of agency for support & guidance for rescue & rehabilitation of oiled bird & mangroves management during oil spill	Approved
5	03	3.6	45		29.08.2017	Additional information added	Approved
6	02	2.6	26		01.10.2018	Shore line resources updated	Approved
7	Annex 3		75		01.10.2018	Tug details updated	Approved
8	Annex 4		78		01.10.2018	Contact details of APSEZ personnel updated	Approved

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.
MUNDRA
OIL SPILL CONTINGENCY RESPONSE PLAN

Section 03: Strategy

1 Introduction

1.1 Authorities and responsibilities
1.2 Coordinating committee
1.3 Statutory requirements
1.4 Mutual aid agreements
1.5 Geographical limits of plan
1.6 Interfaces with ROSDCP and NOSDCP

2 Risk assessment

2.1 Identification of activities and risks
2.2 Types of oil likely to be spilled
2.3 Probable fate of spilled oil
2.4 Development of oil spill scenarios including worst case discharge
2.5 Shoreline sensitivity mapping
2.6 Shoreline resources, priorities for protection
2.7 Special local considerations

3 Response strategy

3.1 Philosophy and objectives
3.2 Limiting and adverse conditions
3.3 Oil spill response in offshore zones
3.4 Oil spill response in coastal zones
3.5 Shoreline oil spill response
3.6 Storage and disposal of oil and oily waste

4 Equipment

4.1 Marine oil spill response equipment
4.2 Inspection, maintenance and testing
4.3 Shoreline equipment, supplies and services

5 Management

5.1 Crisis manager and financial authorities
5.2 Incident organization chart
5.3 Manpower availability (on-site, on call)
5.4 Availability of additional manpower
5.5 Advisors and experts – spill response, wildlife and marine environment
5.6 Training / safety schedules and drill / exercise programme

6 Communications

6.1 Incident control room and facilities
6.2 Field communications equipment
6.3 Reports, manuals, maps, charts and incident logs

Action and operations

7 Initial procedures

7.1 Notification of oil spill to concerned authorities,
7.2 Preliminary estimate of response tier
7.3 Notifying key team members and authorities
7.4 Manning Control Room
7.5 Collecting information (oil type, sea / wind forecasts, aerial surveillance, beach reports)
7.6 Estimating fate of slick (24, 48, 72 hours)
7.7 Identifying resources immediately at risk, informing parties

8 Operations planning

8.1 Assembling full response team
8.2 Identifying immediate response priorities
8.3 Mobilizing immediate response
8.4 Media briefing
8.5 Planning medium-term operations (24, 48 and 72 hour)
8.6 Deciding to escalate response to higher tier
8.7 Mobilizing or placing on standby resources required
8.8 Establishing field command post communications

9 Control of operations

9.1 Establishing a Management team with experts and advisors
9.2 Updating information (sea, wind, weather forecasts, aerial surveillance, beach reports)
9.3 Reviewing and planning operations
9.4 Obtaining additional equipment, supplies, manpower
9.5 Preparing daily incident log and management reports
9.6 Preparing operations accounting and financial reports
9.7 Preparing releases for public and press conferences
9.8 Briefing local and government officials

10 Termination of operations

10.1 Deciding final and optimal levels of beach clean-up
10.2 Standing down equipment, cleaning, maintaining, replacing
10.3 Preparing formal detailed report
10.4 Reviewing plans and procedures from lessons learnt

Data Directory

Maps / Charts

1. Coastal facilities, access roads, telephones, hotels etc.

2. Coastal charts, currents, tidal information (ranges and streams), prevailing winds
3. Risk locations and probable fate of oil
4. Shoreline resources for priority protection
5. Shoreline types
6. Sea zones and response strategies
7. Coastal zones and response strategies
8. Shoreline zones and clean up strategies
9. Oil and waste storage / disposal sites
10. Sensitivity Maps/ Atlas

Lists

1. **Primary Oil spill Equipment:** booms, skimmers, spray equipment, dispersant, absorbents, oil storage, Radio communications etc. (Manufacturer, type, size, location, transport, contact, delivery time, cost and conditions)
2. **Auxiliary Equipment:** Tugs and work boats, aircraft, vacuum trucks, tanks and barges, loaders and graders, plastic bags, tools, protective clothing, communication equipment etc. (Manufacturer, type, size, location, transport, contact, delivery time, cost and conditions)
3. **Support Equipment:** Aircraft, communications, catering, housing, transport, field sanitation and shelter etc. (Availability, contact, cost and conditions)
4. **Sources of Manpower:** Contractors, local authorities, caterers, security firms (Availability, numbers, skills, contact, cost and conditions)
5. **Experts and Advisors:** Environment, safety, auditing (Availability, contact, cost and conditions)
6. **Local and National Government contacts:** Name, rank and responsibility, address, telephone, fax, telex.

Data

1. Specifications of oils commonly traded
2. Wind and weather
3. Information sources

Annexures

Annexure 1	Initial Oil Spill Report
Annexure 2	POLREP Report
Annexure 3	List of resources available
Annexure 4	List of Telephone numbers of Expert and advisors
Annexure 5	Responsibilities: Marine Officer / SPM Officer
Annexure 6	Responsibilities: Marine Manager / On Scene Commander
Annexure 7	Responsibilities: SPM Pilot
Annexure 8	Responsibilities: HOD – Marine
Annexure 9	Oil Spill Progress report
Annexure 10	Emergency response Log
Annexure 11	Classification of oils
Annexure 12	Response Guidelines
Annexure 13	Site Specific Health and Safety Plan.
Annexure 14	Indian Chart 2079
Annexure 15	List of recycler approved by state of Gujarat
Annexure 16	List of agency for support & guidance for rescue & rehabilitation of oiled bird & mangroves management during oil spill

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Strategy

1. Introduction

The movement of Petroleum/ Petroleum-products from the production centre in middle east to Adani Ports and SEZ Ltd and various other ports in Gulf of Kutch is handled through ships at sea and to refineries using pipe lines on ground. Like any other port, Adani Port is very much vulnerable to oil spill disaster arising due to collision, leakage or grounding of vessels in sea and damage to pipelines on ground.

This action plan prepared by Adani Ports and SEZ Ltd, Mundra is to combat the oil spill (LOS-DCP) is in accordance with the NOS-DCP, International Petroleum Industry Environmental Conservation Association (IPIECA).

1.1 Authorities and responsibilities

Adani Ports and SEZ Limited

APSEZL has responsibility for dealing with oil spillages which occur within port limit if the estimated quantity of product lost is 700 tons or less.

Should the spill migrate to other areas, the Coast Guard Monitor will assume the position of On Scene Commander and will direct the response effort. In both cases, APSEZL will act and deploy their resources as required by the relevant On Scene Commander.

This operational version of Oil Spill Contingency Response Plan for the Adani Ports and SEZ Ltd, Mundra is intended for use by all such personnel like Marine Personnel, Tug Masters and all others as indicated in the Spill Response Organization who may be involved in the response to oil spills which may occur within Adani Port Limits.

This plan has been prepared as per the stipulation of Ministry of Environment and Forest Clearance (MoEF) and Coast Guard Requirements.

Gujarat Maritime Board

While responsibility for oil spill contingency remains with conservator of the port – Gujarat Maritime Board Port Officer, this plan (Tier 1) demonstrates the readiness of Adani Port for mitigating oil spill incidents.

Port Conservator will monitor and provide the necessary assistance required for administering the oil spill operation within the port limit.

Indian Coast Guard

The Indian Coast Guard has a statutory duty to protect the maritime and other national interests of India in the Maritime Zones of India and to prevent and control marine pollution. Coast Guard is also the Central Co-coordinating Authority for marine pollution control in the country. The Indian Coast Guard is responsible for implementation and enforcement of the relevant marine pollution laws.

The National Oil Spill Disaster Contingency Plan stipulates the organizational and operational details to effectively combat a national oil spill contingency. The plan promotes the development of Regional and Local Contingency Plans in the three Coast Guard Regions.

The Coast Guard Monitor will assume the role of On Scene Commander in the event that any oil spill involving PLL operations exceeds 700 tons.

Gujarat Pollution Control Board

The Gujarat Pollution Control Board is responsible for, and control, waters up to 5 km from the shoreline. They require to be advised of all pollution incidents.

Ministry of Environment, Gujarat

The Ministry requires to be informed of all pollution incidents.

Emergency Response Team

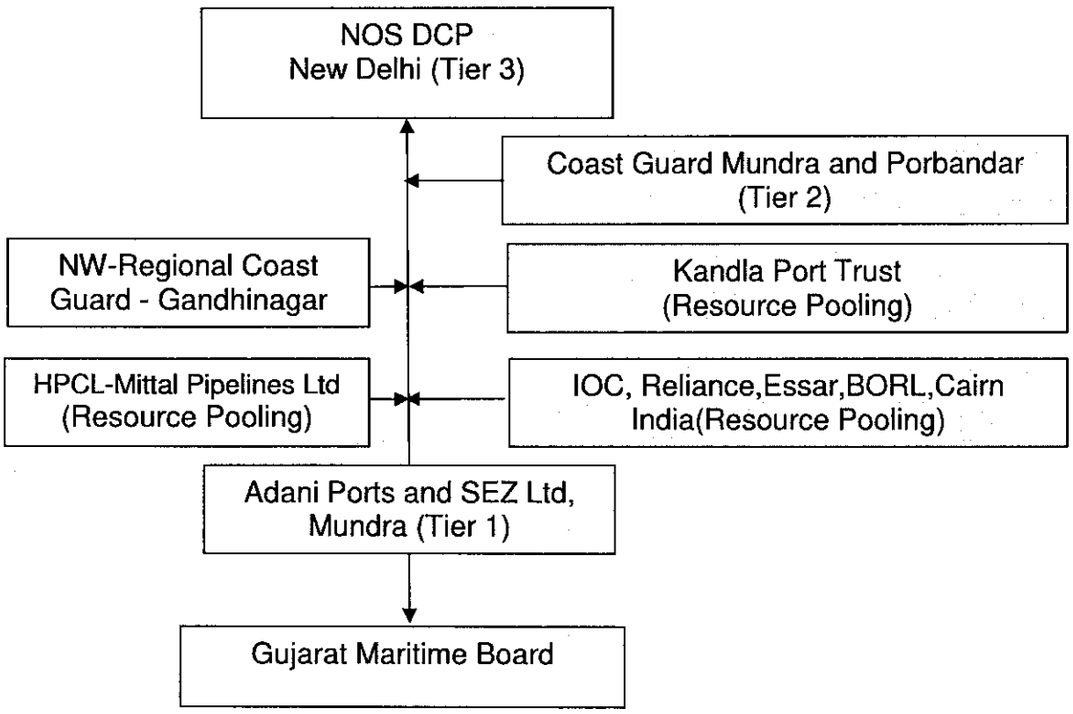
Emergency Response Team (ERT) is the nomenclature used to describe the command and control team established for an oil spill incident at the jetty or in the jetty approaches, with representatives of organisations attending as described in section 2.4.

The ERT will convene at the Terminal Control Room, under the chairmanship of the Terminal Manager, and will consist of a Management Team and a Support Team as noted in section 2.3.

It is a strategic plan to quickly call on additional resources in a systematic manner firstly from Adani port and subsequently from other ports.

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1.2 Coordinating Committee



1.3 Statutory requirements

The Indian Government is a signatory to the International Convention on Oil Pollution Preparedness, Response and Co-operation which came into force in May 94. Under the NOSDCP, it is obligatory for a port to have a Local Oil Spill Contingency Plan to combat oil spills within port limits.

This oil spill contingency response plan (Tier 1) is the response plan in accordance with the facilities available at Adani Port only.

This plan is prepared in accordance with:

a) Marine Environmental Impact Assessment of SPMs, COTs and connecting pipelines of APSEZL at Mundra dated February 2001, prepared by National Institute of Oceanography, Mumbai.

b) Report on Risk assessment study and On-site disaster management Plan for SPMs, COTs and connecting Pipelines of Adani Ports and Special Economic Zone Limited, by TATA AIG Risk Management Services Limited, dated February 2001.

c) HAZOP study report of SPM Terminal pipeline project by Intec Engineering, dated 26/02/2004.

d) IPIECA guide to Contingency planning for oil spills on water.

e) Oil spill risk assessment and contingency plan study done by M/s Environ Software Pvt. Ltd. (Copy enclosed)

1.4 Mutual aid agreements

APSEZL signed MOU with HPCL Mittal Pipelines Limited, Mundra operating in the region of Gulf of Kutch to have mutual aid agreement for the purpose of assisting each other within stipulated time frame with best combination of resources to combat and overcome any large and worst spill with the intent of maximizing the availability of the private, public and government sector response resources during oil spills where assistance is requested by another member.

As per agreement, the member agencies of the affected member state or province may directly request cascadable response resources located in oil handling agencies operating in the region of Gulf of Kutch.

1.5 Geographical limits of plan

Adani Ports and SEZ Ltd, Mundra is situated at the North head of Gulf of Kutch which is at the west coast of India. Ships calling Adani Port therefore have to traverse across the GOK. This oil spill contingency response plan (Tier 1) is applicable for the following:

1) Loading and Unloading of liquid cargo at the Multi-purpose terminal jetty at the Adani Port.

2) Unloading of the crude oil the vessels at the single point mooring (SPM) to offload 70,000 to 3,00,000 DWT.

3) Bunkering operations carried out within the port limits.

4) Any spill that occurs from any source within port limit (including West Basin, South Basin and LNG Terminal) whether at berths, anchorages or in the channel.

APSEZL falls within the area jurisdiction of The Commander, No.1 Coast Guard District (Gujarat), located at Porbandar. Mundra has a full-fledged Indian Coast Guard Station. The Port limit of APSEZL, Mundra is shown in enclosed chart in annexure 14.

1.6 Interface with ROSDCP and NOSDCP

For responding to oil spill, the Indian Coast Guard has developed the National Oil Spill Disaster Contingency Plan NOSDCP which has the approval of the Committee of Secretaries and has been in operation since 1996. The NOSDCP brings together the combined resources of the various organizations and departments, Coast Guard, Ports and Oil handling Agencies, and related industries, to provide a level of preparedness to the threat posed to the marine environment by oil spills.

The NOSDCP sets out a clear definition of the responsibilities of the major participants, such as the Coast Guard, various ministries and departments, ports and oil industry.

The national oil spill contingency plan hierarchy outlined in Figure 1 consists of NOSDCP at the apex level to coordinate significant or disaster type spills, the Regional Oil Spill Disaster Contingency plan (ROSDCP) to coordinate spill in the Gulf of Kutch, utilizing the resources available within the region.

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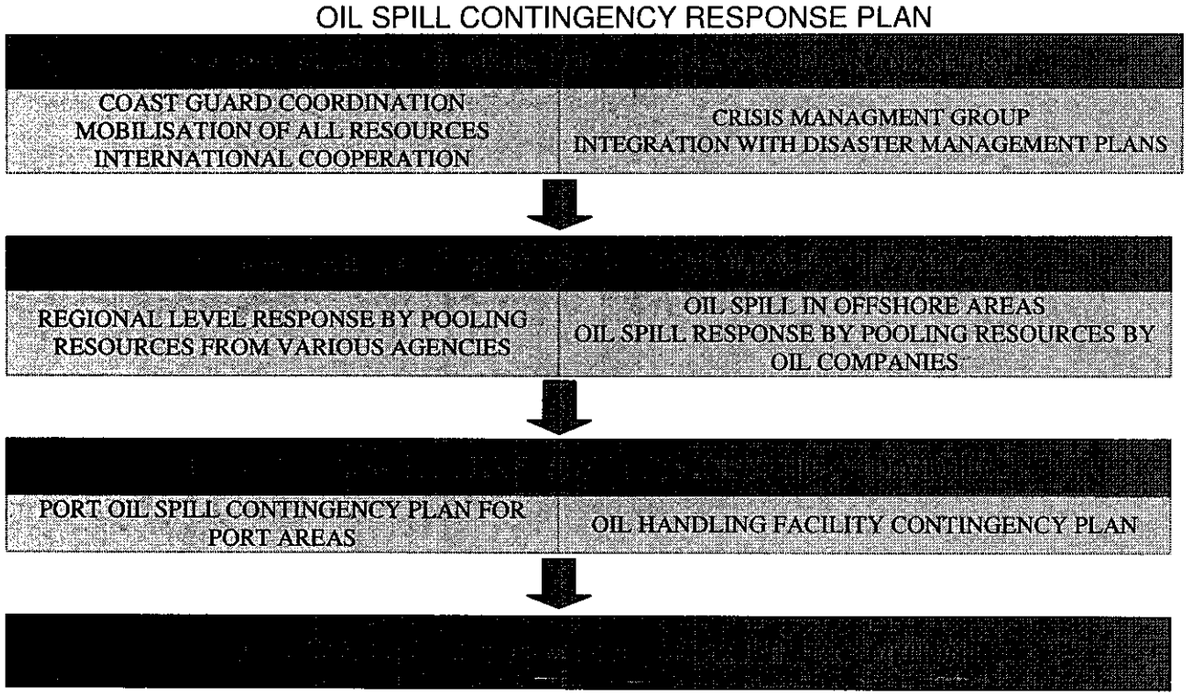


Figure 1 - Contingency Plan hierarchy

The aim of Local Contingency Plan - for the Mundra Port, is to outline arrangements for responding to oil spills in the coastal and shoreline areas, with the aim of protecting against environmental pollution as a result of oil spill or, where this is not possible, minimise the effect and respond the oil spill in an environment friendly manner and dispose the collected oil/debris in according to the existing laws/regulations/orders in force. CONTINGENCY PLAN FOR SHORELINE PROTECTION
ISTRICT OIL SPILL CONTINGN

2 Risk Assessment

The number of vessels calling annually at APSEZL is more than 3000 including Chemical and oil tankers. The threat of oil spill is much high in Gulf of Kutch and is very oil spill sensitive area. A marine national park is located in the Southern shore of GOK. There is a popular beach spot on the Northern shore namely Mandvi. Lastly, as GOK is a closed system, any oil spilled will arrive to the shores.

2.1 Identification of activities and risks

The scenario of the spill are classified under two categories :

- Oil Spill at Mundra Port Multi-Purpose Terminals
- Oil Spill at SPM

The oil spill could occur due to various reasons at any of the APSEZL's marine facilities (SPMs, Basins/ berths, anchorage or approach channel) within the new Mundra Port limit. The spills beyond these areas are not covered in this plan. Both the categories are discussed in detail

Accidental oil spill at Multipurpose terminals/ Basins/ berths, anchorage or approach channel is possible from overflow of slop tanks, bunker tanks, reception facility and road tankers (generally a low pressure operation).

Accidental oil spill at the SPM may be due to hose puncture while unloading, failure of swivel joint of SPM or Leakage of Crude Oil at PLEM or from the submarine pipeline.

Following risks are being addressed to mitigate incident of oil pollution:

- Connection of hoses with established work instructions for use of blank flanges, drip trays etc.
- Thorough understanding of use of OSD and limitations of vessel surging due to slack mooring ropes in given weather conditions.
- Monitoring of ships pump room atmosphere, display of fire notices and acknowledging accidental explosion through the use of IMO ship / shore check list.
- Spillage of F.O. during bunkering operations by using bunkering check list
- Ballast discharge contamination or malfunction of ship's sea side valves by prohibiting such operations without written permission of the port.
- Non use of reception facility of the port by ships on cost plus basis.

Operational leakage

Spill due to floating hose failure at SPM: (183 t, at pumping rate of 10000 m^3/h of crude oil for 75 sec): (Spill points - S1 at HMEL SPM & S2 at Mundra SPM)

Crude oil pumping rate from the tanker to the shore tanks will be varying between 5000 m^3/hr and 10000 m^3/hr. In the present study, the maximum pumping rate of 10000m^3/hr has been considered to assess the risk on a higher side. The Safety Break Away Coupling in the crude oil transfer hose will be activated within a few seconds in the event of hose rupture or hose failure. Again for the sake of assessing higher risk, a response time of 60 sec – 75 sec (worst case scenario) is considered to estimate the amount of oil that would spill at the SPM. Thus the quantity of crude oil spill has been estimated to be a maximum of 183 tons in the event of hose failure or rupture.

Spill due to rupture of sub-sea crude oil pipeline from SPM to shore tanks: (384 tons of crude oil, at pumping rate of 10000 m^3/hr for 60 sec): Spill point S3 taken at midpoint of the pipeline from HMEL SPM to LFP)

Crude oil pumping rate from the tanker will be in the range of 5000 m^3/hr to10000 m^3/hr. In the present study, to assess the maximum risk, pumping rate of 10000 m^3/hr has been considered. The minimum wall thickness of sub-sea crude oil pipeline is 15.6 mm and the maximum thickness is 24 mm. Moreover all along, 5 inches concrete cladding (weight coating) is provided on the surface of the pipeline. Crude oil pipelines designed, constructed and laid as per the international norms are safe and leakages are extremely rare during their designed life. However, a rupture of size 1 cm x 12.7 cm has been assumed for assessing the quantum of oil spill through sub-sea pipeline.

The maximum manifold pressure will be 12 kg/cm^2 and crude oil will be pumped to the shore tanks without any boosting device in-between. As the level in the tanker depletes, discharge pressure would also be reduced. Moreover, with the flow distance the crude oil pressure inside the pipe drops. For the sake of assessing the amount of oil spill in case of rupture of sub-sea pipeline, an average pressure of 10 kg/cm^2 and a water column height of 35 m have been considered.

Accordingly the quantity of Crude oil spill has been estimated using the formula given by

$Q = C_d A (2gH)^{1/2}$

Where,

Q = quantity of spill (m^3/s)

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C_d = coefficient of discharge (0.9)
A = Area of rupture (m^2) (1 cm x 12.7 cm)
H = Net head (m) (6.5 kg/cm^2 = 65 m)

This would give a value of 0.04 m^3 of crude oil per sec spilling out of the pipeline through the rupture as the pump will be in operation.

The availability of solenoid operated hydraulic shutoff valves in the sub-sea pipeline, which will get activated in less than 15 seconds time as soon as the pressure falls, will limit the amount of oil leaked in case of pipe rupture and consequent drop inside the pipeline. However 60 sec response time has been considered for quantification of oil spill. Accordingly the quantity of Crude oil spill has been estimated to be 2.4 m^3 before the pump discharge valve closes. However, there will be high pressure inside the pipeline initially and the oil inside the pipeline will start leaking into the waters through the hole as the pressure inside the pipe line is higher than the outside pressure, even after the valve is closed and pumping is stopped. Even after the pipeline inside pressure equalises the outside static pressure acting on the rupture, oil continues to start leaking as the density difference between the oil and water; oil being lighter and LFP is higher in elevation compared to the pipeline elevation. Two factors need to be considered here; the specific gravity of the crude oil inside the pipeline is less than 1 whereas the sea water specific gravity is more than 1. Also depending on the location of the hole/leak, there will always be a static head of sea water acting on the leak when the oil tries to flow out and sea water trying to flow in to occupy the place vacated by the leaked oil. Hence all the oil in the pipeline will not leak and there would be an equilibrium point reached when there would be no more oil leaking from the hole as the sea water pressures effectively blocks the oil leak. Also, the leak would be attended to within the stipulated time as per the standard maintenance procedures followed by the organisation. For the purpose of this study and as a worst case scenario before the leak is repaired by the established maintenance procedures, it is assumed that a maximum of 5% of the pipeline oil volume would leak and though it would be a continuous leak, this total quantity is taken to be instantaneous for the purpose of the study.

The pipeline length is approximately 10 km (from SPM to LFP) and the pipeline size is 42" NB. The pipeline volume works out to be approximately 8662 m^3 or 7622 t.
Hence the total oil leaked due to rupture in sub-sea pipeline will be 2.15 t + 5% of pipeline volume of oil in t (0.05 x 7622 =381 t) which works out to be a maximum of 383.45 t, say 384 t of crude oil.
For the purpose of simulation studies, this spill on the pipeline is assumed to have taken place at the midway point from HMEL SPM to LFP (designated as spill point **S3** in the report) and is taken on the sub-sea pipeline from HMEL SPM to LFP. As the pipeline from HMEL SPM to LFP and the Mundra SPM to LFP run very close only one leak point in the pipeline is studied as it gives a representative oil spill study for the pipeline leakage scenario.

Spill due to collision at SPM: (Spill points S1 & S2)

Crude Oil is received at SPM by ocean tankers having capacity between 90,000-360,000 metric tons. Crude Oil is pumped to shore tanks through pipeline/s from the SPM. In the present scenario, collision of the vessel at the SPM or tanker route with another vessel enroute to other terminals can cause partial damage to the vessels cargo tanks (not more than 3 nos. of cargo tanks) leading to a maximum oil spill of about 700 tons to 25,000 tons of crude oil. In the present study, the probable quantity of crude oil spill due collision at SPM is considered as 700 tons at the minimum and as 25,000 tons at the maximum.

Spill due to collision or grounding in the tanker route: (Spill point S4)

Tankers are expected to call at the SPMs frequently depending upon the demand for the refineries for the crude oil. These tankers may meet accidents like collision with other vessels or grounding in the vicinity of the SPM. In case of such accidents, the spillage may vary depending on the size of the tanker and the extent of damage and number of cargo tanks ruptured etc. In the present study the probable quantity of spill in the tanker route considered for modelling is 25000 tons at a point which lies on the tanker route to SPM not exactly within Mundra port limit; but a spill point is taken along the tanker route in the Gulf but close to the Mundra port limit.

Spills at the berths (applicable to berths at West Basin, South Basin, East Basin, North Basin, LNG berth and existing cargo berths of Mundra port.)

Oil spills can take place at the berths in the basins during the loading / unloading as well as berthing and traversing operations. The likely spill scenarios are discussed below:

a) **Spills during the navigation of the vessel along the approach channel: (Spill point S7 for West Basin)**
The spill location can be anywhere in the path. One location along the approach path has been selected for carrying out for model runs.

b) **Spills around the jetty (in the maneuvering basin / turning circle): (Spill point S6 for West Basin and Spill point S10 for South Basin)**
This can occur due to tug boat impacting the vessel and grounding of the vessel. One location around the jetty at the turning circle has been considered for the computational runs

c) **Spills at the berths: (Spill point S5 for West Basin, Spill point S9 for South Basin, Spill point S13 for East Basin, Spill point S14 for North Basin, Spill point S8 for LNG jetty, Spill point S11 for MMPT 1 and Spill point S12 for MICT / AMCT berth locations)**

During the loading/unloading operations spills may take place due to one or more of the following: –

Hose/ loading arm leakage (liquid products handled at the liquid berth), overflow on the vessel deck, vessel grounding at the jetty, vessel colliding with jetty, fire and explosion on the vessel or at the jetty, during bunkering operations etc.

Spills along approach Channel / Route

Vessels to the port berths follow the Deep Water route in Gulf of Kutch and Pilot boards at Pilot Boarding Ground "A" or "B", subject to tide and the berth allotted to the tanker.

While the risk of grounding is low, it cannot be wholly eliminated; the most likely causes are steering or propulsion system failure or navigational error, any of which could result in grounding on the channel margins. Given that the bed of the Gulf is rocky at some places the likelihood of any significant hull damage cannot be ruled out. In a general case scenario, weld fractures in the forward bunker tanks could give rise to a release of approximately 10 Tons of diesel oil and in a worst case scenario extensive damage to the bunker tanks may occur which would cause a spill of 500 to 700 t of FO spill.

Collision

The risk of collision while transiting the channel is negligible given the reason that port authorities use sophisticated ship tracking and navigational systems as the Gulf traffic has increased. These systems would ensure that the chances of any collision are remote or non-existent when ships / marine craft traverses / transits through the channel. However, even if any collision occurs, it is beyond reasonable

doubt that such an incident would result in the fore part rather than the parallel mid-body of the vessel and the loss of integrity of hull plating of a cargo tank is most unlikely. A spill quantity of 700 t can be the maximum in such a scenario.

Berthing Incident

Oil and/ or liquid chemical spill can occur as a result of hull coming in contact with the corners of the jetty structure during ship berthing or un-berthing maneuvers. Such incidents are generally due to failure of a

vessel's main propulsion or steering systems, loss of control onboard on support tug in attendance or Master error or wrong judgment.

The potential spill quantities involved depend on the vessel type and the location and extent of the impact damage; hull damage to a 20000 DWT – 80000 DWT tanker / vessel in way of a forward or aft wing tank, for example, could give rise to a release of some 500 Tons of product. The potential spill quantity, should hull plating be ruptured in way of an aft wing diesel oil bunker tank can, historically, be up to 100 Tons.

Tug Impact

There are well-documented incidents where cargo or bunker oil has been released as a result of hull impact damage by tugs. This can occur when tugs are approaching a vessel underway prior to berthing, or when coming alongside a moored vessel prior to un-berthing. The potential spill quantities again depend on the location and extent of the impact damage but can be over 20 tons for Diesel oil and 100 Tons for cargo (FO) oil. Spills from this cause are considered to be of low likelihood but the risk is acknowledged.

Loading Arms / Flexible hoses

The operation of loading arms / flexible hoses can lead to minor releases of oil. Common sources are vent valves, swivel joints and hydraulic lines. Such spillage seldom exceeds 0.1 Tons.

Cargo Tank Overflow

Cargo tank overflows can occur on board loading vessels; spills of this nature can be due to instrumentation failure, tank valve mismanagement or operator error. The spill quantity is a function of the flow rate and also the number of tanks being loaded at the time of the incident. Some of the oil and/or chemical will be retained on deck but, in a worst case scenario, up to 3 tons could escape overboard.

Hull Failure

The incidence of oil pollution due to hull failure is low and some 84% of the incidents attributed to this cause by ITOPF involved spill quantities of less than 7 tons; these spills were caused mainly by minor hull fractures and weld failures. The potential for more serious incidents with spill quantities in excess of 700 tons must however is acknowledged.

Fire and Explosion

Fires and explosions on board ship represent a safety hazard with the risk of pollution as a secondary impact. Most tankers engaged for trading will be equipped with inert gas systems. Given the controls, which are imposed and enforced by APSEZL authorities in respect of the oxygen content of cargo tanks, the risk of fire and/or explosion in the cargo spaces must be regarded as minimal, insofar as cargo transfer operations are concerned.

Strict monitoring and control of the main cargo pump room atmosphere will minimize the fire and explosion risks associated with this space.

Fires resulting from uncontrolled smoking in the accommodation, unauthorized hot work such as welding, and engine room fires can spread rapidly if not dealt with swiftly and can give rise to incidents of a very serious nature.

While the likelihood of fire or explosion occurring on board vessels berthed at the Mundra port berths is low, the risk is nevertheless acknowledged. Such an incident could give rise to a spillage of 700 tons or more.

Bunkering – spillage of fuel oil

Bunkering at the port may sometimes give rise to spills due to hose failure and / or bunker tank overflow etc. in spite of the strict regulatory supervision of the port operations. These spills could be as small as a few kgs to a maximum of 500 t of FO.

As can be seen from the spill scenarios mentioned above, the spills range from extremely negligible quantities to enormous quantities in rare catastrophic events. The simulation of oil spills does not vary significantly in various scenarios except for the magnitude of impact zone and the quantity involved in such impacts. Though the software is intended to be used for specific scenarios so as to get the trajectory and other weathering information; in this study, a few hypothetical scenarios have been simulated and computations carried out considering the worst-case scenarios of oil spills at the different likely locations in the domain.
Based on the above deliberations, the following scenarios for computations have been selected for carrying out modeling studies for the oil spill trajectory and weathering processes.

Computational Scenarios:

Spill Locations	**Pre-monsoon (Jan)**	**Monsoon (July)**	**Post monsoon (Nov)**
SPM			
Crude oil spill of 183 t at the pumping rate of 10000 m^3/hr (for 75 sec release) at the SPMs (due to Hose failure) Spill points: **S1** and **S2** During spring and neap tide conditions (tide conditions : PF and PE)	▪	▪	•
Instantaneous crude oil spill of 700t at the SPMs Spill points: **S1** and **S2**	▪	▪	•
Instantaneous crude oil spill of 25000t at the SPMs -- Spill points: **S1** and **S2**	▪	▪	•
Pipeline Leakage			
Crude oil spill of 384 t at the pumping rate of 10000 m^3/hr (for 60 sec release) along the pipeline corridor at a select (midway) point of subsea pipeline in the pipeline routes. -- Spill point: **S3**	▪	▪	•
Tanker route			
Instantaneous crude oil spill of 25000t along the tanker route at select location. Spill point: **S4**	▪	▪	•

West Basin (berths)			
100 tons (due to Berthing incident/ collision) at the West Basin berths (FO) Spill point: **S5**	▪	▪	•
50 Tons (due to Berthing incident/ collision (diesel oil tanks) at the West Basin berths (HSD) Spill point: **S5**	▪	▪	•
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berths -- Spill point: **S5**	▪	▪	•
In the maneuvering basin: o 20 Tons of HSD oil due to Tug Impact (HSD) o 100 Tons of FO due to Tug Impact Spill point: **S6**	▪	▪	•
Along the vessel route at one location: Instantaneous oil spill of 700t along the tanker route at a select location.(FO): Spill point: **S7**	▪	▪	•
LNG Berth			
100 tons (due to Berthing incident/ collision) at the LNG berth (FO) -- Spill point: **S8**	▪	▪	•
50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the LNG berth (HSD) – Spill point: **S8**	▪	▪	•
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth-- Spill point: **S8**	▪	▪	•
South Basin (Berths)			
100 tons (due to Berthing incident/ collision) at the South Basin berths (FO) -- Spill point: **S9**	▪	▪	•
50 Tons (due to Berthing incident/ collision (diesel oil tanks) at the South Basin berths(HSD) – Spill point: **S9**	▪	▪	•
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth -- Spill point: **S9**	▪	▪	•
At the turning circle: o 20 Tons of HSD oil due to Tug Impact o 100 Tons of FO due to Tug Impact Spill point: **S10**	▪	▪	•
At the existing MMPT 1 Berth: **: Spill Point S11**			
100 tons (due to Berthing incident/ collision) at the berth(FO) -- Spill point: **S11**	▪	▪	•
50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the berth (HSD) – Spill point: **S11**	▪	▪	•
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth	▪	▪	•

At the existing MICT / AMCT Berths: : Spill point S12			
100 tons (due to Berthing incident/ collision) at the (FO) - Spill point **S12**	▪	▪	•
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth - Spill point **S12**	▪	▪	•
At the East Basin: Spill point S13			
100 tons (due to Berthing incident/ collision) at the East Basin berth (FO) - Spill point **S13**	▪	▪	•
At the North Basin: Spill point S14			
100 tons (due to Berthing incident/ collision) at the North Basin berth (FO) - Spill point **S14**	▪	▪	•

2.2 Types of oil likely to be spilled

Mundra Port mainly deals with Vegetable oils, Furnace oil, Naphtha, Methanol, High Speed Diesel, Super Kerosene Oil and other light oils at its Multi-Purpose terminal. The vessels calling at the port (or the designated anchorage areas) may spill fuel, diesel or a minimal quantity of lubricating oils. The SPM is being used to discharge crude oils from tankers.

At Berths:

- Vegetable oils,
- Furnace oil,
- Naphtha,
- Methanol,
- High Speed Diesel,
- Super Kerosene Oil,
- Carbon Black Feed Stock (CBFS),
- Motor Spirit,
- Other light oils

At SPM:

- Crude oil

At anchorages or within port limits:

- Fuel oil,
- Diesel oil,
- Minimal quantity of lubricating oil.

2.3 Probable fate of spilled oil

APSEZL is all weather, commercial port with geographical and hydrological advantages on the West Coast of India, in the Gulf of Kutch. Tidal range is between +0.37 m during Neaps and + 6.40 m during springs. Tidal streams flow 070^0 – 250^0 at an average rate of 3 kts and 4-5 kts during spring tides.

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It has been observed from the modeling study that during pre-monsoon season, the spills occurring at the APSEZL marine facilities move towards the southern / southwestern part of the Gulf of Kutch nearer to the facilities depending on tide phase.

The spills taking place at the APSEZL marine facilities move towards northern coast of Gulf of Kutch during monsoon season and affect the coast near Mundra, Kandla etc.
During post - monsoon season, the spills taking place at the APSEZL marine facilities move towards south / southwest and affect the islands /coast on southern side of the Gulf of Kutch.

The surface or subsurface oil spill consists of slick floating on the water surface, which partially dissolves in the water and partially evaporates into the atmosphere. There is a continuous exchange between the suspended and surface oil (floating oil). The assumption made in deriving the governing equations is that the thickness of the oil layer is negligible in comparison with the water depth.

In addition to the location, size and physico-chemical properties of the spill, other major factors affect the fate of the oil slick are governed by complex interrelated transport (turbulence) and weathering processes (evaporation, emulsification and dissolution). The spilled oil spreads and moves by the forces of winds and currents. A small portion of hydrocarbons begin to go into solution in the underlying water column, but most of the oil is lost through evaporation into the atmosphere. In the present model, all these processes are considered in the transport of Oil Slick.

Out of the above mentioned oils the vegetable or light oils do not pose any significant threat to the environment.

The spilled 'persistent' crude oil (or fuel oil) undergoes a number of physical and chemical changes known as "weathering". The major weathering processes are spreading, evaporation, dispersion, emulsification, dissolution, oxidation sedimentation and biodegradation.

> *The term persistent is used to describe those oils which, because of their chemical composition, are usually slow to dissipate naturally when spilled into the marine environment and are therefore likely to spread and require cleaning up. Non-persistent oils tend to evaporate quickly when spilled and do not require cleaning up. Neither persistence nor non-persistence is defined in the Conventions. However, under guidelines developed by the 1971 Fund, an oil is considered non-persistent if at the time of shipment at least 50% of the hydrocarbon fractions, by volume, distill at a temperature of 340°C (645°F), and at least 95% of the hydrocarbon fractions, by volume, distill at a temperature of 370°C (700°F) when tested in accordance with the American Society for Testing and Materials Method D86/78 or any subsequent revision thereof."*

a) **Spreading**: is one of the most significant processes during early stages of a spill is initially due to gravity. The oil spreads as a coherent slick and the rate is influenced by its activity. After a few hours, the slick begins to break-up and after this stage, spreading is primarily due to turbulence. Wind and wave actions also tend to fragment the slick, breaking it up into islands and windrows.

b) **Evaporation**: The rate and extent of evaporation depends primarily on the volatility of the oil. In general, oil components with a boiling point below 200 D C evaporate within 4 to 16 hours in tropical conditions. Spills of refined products such as kerosene and gasoline evaporate completely and light crude lose up to 40 % of its volume within a few hours. In contrast, heavy crude and fuel oils undergo little evaporation.

c) **Dispersion**: Waves and turbulence act on the slick to produce droplets of oil of different sizes. Small droplets remain in suspension while the larges ones rise to the surface. The rate of dispersion mainly depends on the nature of the oil and the sea state. Oils which remain fluid can spread unhindered by other weathering processes can disperse completely in moderate sea conditions within a few days. Viscous oils tend to form thick lenses on the water surface with slow tendency to disperse, which can persist for several weeks.

d) **Emulsification**: Several oils have tendency to absorb water to form water-in-oil emulsions thereby increasing the volumes of the emulsified mass by a factor of 3 to 4. The arte at which the oil is emulsified is largely a function of sea state though viscous oils absorb water slowly. In turbulent sea conditions, low viscosity oils can incorporate as high as 80 % water by volume within 2 to 3 hours.

e) **Dissolution**: The heavy components of crude oil are virtually insoluble in sea water while lighter compounds are slightly soluble. Hence levels of dissolved PHc rarely exceed 1 mg/l following a spill. Therefore, dissolution, does not make a significant contribution to the removal of oil from the sea surface.

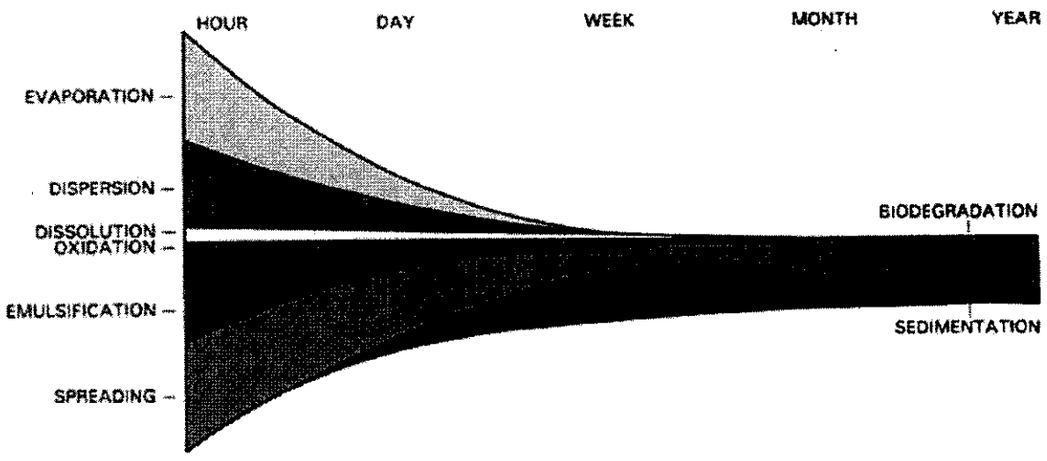
f) **Sedimentation**: Very few oils are sufficiently heavy to sink in sea water. However, the weathered residue gets mixed up with the suspended substances in water and may sink. This process becomes significant when water-in-oil emulsions attain specific gravity near to one and therefore need very little suspended substances to exceed the specific gravity of sea water (1.025).

g) **Oxidation:** Hydrocarbon molecules react with oxygen and either breaks down into soluble products or combine to form persistent tars. Many of these oxidation reactions are promoted by sunlight and their effect on overall dissipation is minor in relation to other weathering processes.

h) **Biodegradation** : Sea water contains a range of marine bacteria, moulds and yeasts which can use oil as source of carbon and energy. The main factors affecting the rate of biodegradation are temperature and the availability of oxygen and nutrient, principally compounds of nitrogen and phosphorous. Each type of micro-organism tends to degrade a specific group of hydrocarbons and whilst a range of bacteria exists between them which are capable of degrading most of the wide variety of compounds in crude oil, some components are resistant to attack.

Because the micro-organisms live in sea water, biodegradation can only take place at an oil/water interface. At sea, the creation of oil droplets, either through natural or chemical dispersion, increases the interfacial area available for biological activity and so enhances degradation.

The processes of spreading, evaporation, dispersion, emulsification and dissolution are most important during the early stages of a spill whilst oxidation, sedimentation and biodegradation are long-term processes, which determine the ultimate fate of oil. Fig.3.1 shows schematic diagram of weathering processes with time.



Schematic diagram of weathering processes with time

It should be appreciated that throughout the lifetime of an oil slick, it continues to drift on the sea surface, independent of these processes. The actual mechanism governing movement is complex but experience shows that oil drift can be predicted by taking into account wind-induced effects and surface water currents. These can be calculated using mathematical modeling to determine the oil spill trajectory. The wind-induced effect is normally taken as 1-3% of the wind velocity, and the current effect as 110% of the current velocity. Reliable prediction of slick movement is clearly dependent upon the availability of good wind, tide and current data.

An understanding of the way in which weathering processes interact is important in forecasting their combined effect in changing the characteristics of different oils and the lifetime of slicks at sea. In order to predict such interactions, numerical models have been developed, based on theoretical and empirical considerations.

Accidental oil spills as indicated in 'Oil Spill Scenario' in section 2.1 of this plan might occur in the area of SPM. On the basis of the data modeled, the results indicate that

a) about 38 % of hydrocarbons are lost by evaporation, 2.8 % by emulsification and 0.75 % by dissolution within 5 hours;
b) the quantum of dissolved oil increases up to initial 5 hours and thereafter decreases as lighter (more soluble) hydrocarbons evaporate;
c) after 50 hour, no oil dissolves;
d) the trend of emulsified oil is similar to that of evaporated oil but emulsification occurs at a slow rate;
e) the radius of oil slicks increases to nearly 1400 m at the end of 148 hours; and
f) the maximum PHc concentration in water is about 39 µg/l.

The spill trajectories clearly reveal the dominance of wind in deciding the location of landfall of the weathered oil. Thus during June-August, the spill will be preferentially transported in the north east direction under the influence of south west winds while during October-November, and possible up-to February, the oil will be predominantly carried to the southern shore. It is also evident that under the influence of the southwest winds, the oil will be deposited on the northern shore within 60 hours, while it might take about 80 hours to reach the southern shore during north east winds.

2.4 Development of oil spill scenarios including worst case discharge

The scenario of the spill are classified under two categories:

1. Oil Spill at Mundra Port Multi-Purpose Terminals/ Basins
2. Oil Spill at SPM

Oil Spill at Mundra Port Multi-Purpose Terminals/ Basins

a) Leak during cargo transfer operations Minor (250 liters)

This can occur at the start of cargo operations, during operation due to leakage in pipes, expansion joints, and at the time of disconnection of hose at manifold. However, such instances are remote on implementation of International Safety Management by Ships and Quality Management systems by Port.

b) Slop tank / bunker tank overflow at, Jetty / Ship Minor (250 - 1000 ltrs.)

This source of pollution is purely of an accidental nature. The ship is expected to be ship shape with good trained crew and this has been emphasized to the Master of the vessel at the time of cargo transfer / bunkering. Based on a rate of 20 cbm/hr. and reaction time of 1 min, and hose content of 150 ltrs., likely spill is only 250 litres. A ship shore check list for cargo operations and bunkering is employed. A joint declaration is made by Marine Staff and Chief Officer / Master and enforced by Marine Manager. This results in good ship / shore co-ordination.

c) Spill during berthing (tug impact) Moderate (3000 liters)

Accidental contact with tugs or another marine structure is a possibility but quantum is not going to be significant because of Fendering system employed and training given to tug crews. Also with concept of double hull tanker the entire cargo compartments are protected by another hull, thus cargo spillage due to impact of tug is remote.

d) Grounding / Hull Damage :

APSEZL operates dry cargo & liquid cargo berths. Tankers mainly carry Furnace oil, Naphtha, Methanol, High Speed Diesel, Super Kerosene Oil and Vegetable oil. Oil transfer operations at the jetty are supervised by Liquid terminal staff. Manifold area has receptacle facilities to prevent accidental spills at connection / disconnection time. Berthing is done under controlled conditions and spill due to contact damage to underwater oil tanks is very remote. Radio officer controls movement of vessels in and around the berth and traffic presently is insignificant to pose any collision damage risk. Under water sea bed characteristic is soft sand. The berth area of about 500^2 m is surveyed monthly for any changes and underwater obstructions; hence grounding resulting into oil spill is very remote.

Oil Spill at SPM

a) Hose Puncture while unloading:

In such an event, crude oil, about 10670 Kgs may spill onto water. On spillage the oil slick will be carried away at a distant location depending upon water current and wind direction. The trained crew of the maintenance vessel patrolling the area during unloading, would control the oil slick movement by using booms and subsequently, the oil will be collected by the skimmer.

b) Failure of Swivel joint of SPM:

In this event about 17780 Kgs of crude oil may spill onto water. In this case the leakage may be detected visually by the personnel monitoring the operation from the ship tanker or by the detectors provided on the SPM.

c) Leakage of Crude oil at PLEM or from the submarine pipeline:

This case will occur at least 20 m below the water surface, oil being lighter than water will travel upward and float on to water. By the time oil water reaches the sea water surface, the oil droplets may start undergoing "weathering process" and it may form emulsion along with water.

d) Ship Collision Frequency :

Based on the statistical data and its analysis carried out by National Institute of Oceanography, the probability of this type of accident is about one in every seven years for the traffic projection and hence, this case is ignored.

e) Ship Grounding Frequency :

Based on the statistical data and its analysis carried out by National Institute of Oceanography, the probability of this type of accident is about one in eleven years for the traffic projection and hence, his case is also ignored. Also with concept of double hull tanker the entire cargo compartments are protected by another hull, thus cargo spillage due to grounding is remote.

2.5 Shoreline sensitivity mapping

Gulf of Kutch is a typical semi-enclosed basin where the tidal forces interact with the open ocean waters of the sea, across its western open boundary at Okha. The currents of the region are tidal-driven and the water column is vertically well mixed. These features make the numerical modeling task easier, as a 2-D hydrodynamic model is sufficient to accurately reproduce the tides and currents for the study region in the Gulf of Kutch at Mundra.

The model domain of longitudes of 68° 50' 56.7" E and 70^0 27' 36.9'' E and the latitudes of 22°14' 58.8" N and 23° 01' 49.1'' N is selected for carrying out sensitivity analysis and predicting the fate and transport of oil spill that may take place at APSEZL's SPMs, Basins, berths and tanker route near Mundra coast in Gulf of Kutch.

The bottom roughness in the Gulf of Kutch varies due to the variation of bed sediment grain sizes. The bed consists of various sizes of clay, sand, silt and rocky soils. In the present study a uniform Manning's roughness coefficient has been used for numerical runs of hydrodynamic processes. The filled contours of Chezy's roughness coefficient are shown in Fig. A.1.4. The same roughness coefficient has been used to predict tides and tidal velocities in the Mundra area for prediction of oil spill trajectory.

The interpolated Chezy's coefficient calculated based on Manning's roughness and total water depth is shown in Fig.A1.4. The sensitivity analysis has been carried out with various Manning's value, which is the combined effect of d_{50} sediment size and bed configuration, to calibrate the model with respect to the tide data of March and October 1994, at Sikka. The computational runs were continued with various sets of various bed roughness values till computed and measured tide levels are within the acceptable limit.

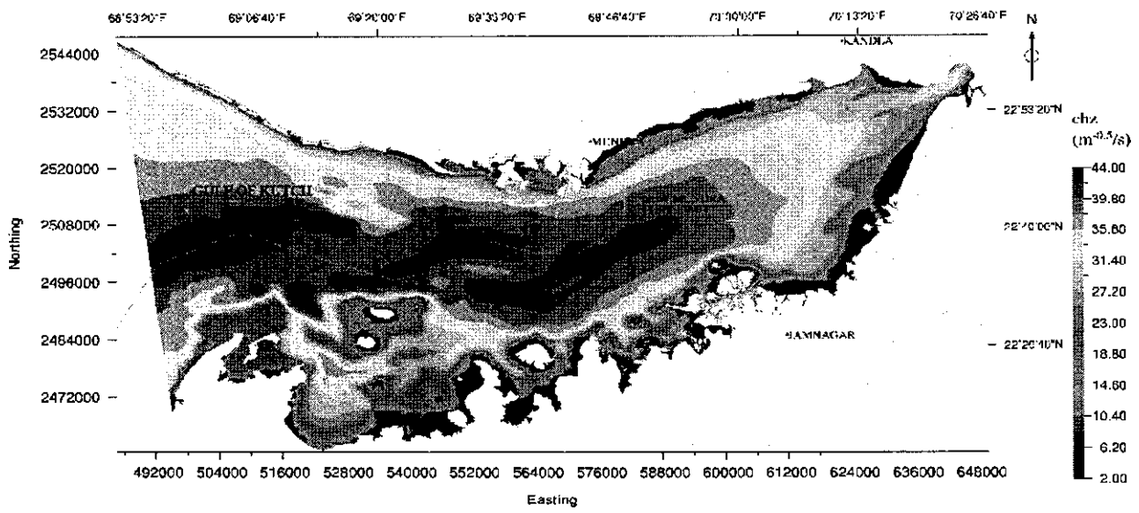


Fig.A1.4 Chezy's coefficient

For Shoreline sensitivity mapping refer Volume 2 (Annexure-V, VI and VII) of Oil Spill Risk Assessment.

2.6 Shoreline resources, priorities for protection

The SPMs and the Marine facilities (Existing Berths, South Basin, West Basin, North Basin, East Basin and LNG Berth etc.) are located in the Northern side of Gulf of Kutch at Mundra. VLCCs bring Crude oil and unload at the two SPMs which are connected to the Shore tanks by means of Submarine pipelines. The Crude unloaded at these SPMs is pumped through Submarine pipeline to Shore tank farm area.

Various Marine craft / solid cargo/ liquid cargo vessels traverse through the Gulf waters to berth at the various Terminals / Berths located in the new Mundra port limit. The general layout of the various facilities like SPMs, terminals etc. within the Mundra port limit area are shown in Fig.1.1 to Fig.1.4 in chapter 1. There is a probability of spillage at SPMs, along the sub-sea pipelines and tanker route during unloading operations and transportation. Apart from these operations at the SPMs, loading / unloading operations at the different berths of the Mundra port – South Basin, West Basin, North Basin, East Basin, LNG jetty and existing berths also may give raise to accidental spills at the berth locations. The spills at these locations may affect the shore and other facilities along the coast of Gulf of Kutch. The coast of Mundra has tidal flats, sand bars and not much in the way of mangroves. The mangroves, Marine Park / Marine Sanctuary etc. are on the Southern side of Gulf of Kutch. As it was observed that the spills occurring at the various locations of the APSEZL Marine facilities may reach the Coast on the Northern side as well as on the Southern side of the Gulf depending upon the season, there is a need to protect the environment in the event of an oil spill at any of the APSEZL Marine facilities.

Shoreline Resources available with APSEZL, Mundra for deployment during shoreline cleanup/ emergent situation:

Item	Quantity
Oil Spill Dispersants	15000 liters
Sorbent pads	2000 nos.
Portable dispersant storage tank: 1000 ltr capacity	1 no.
Portable pumps	2 nos.
Oil discharge hose, 3", 2 x 10 m	1 set
Tanker Trucks	04 nos.
Mini Vacuum Pump (30 m3 / hr)	05 nos.
Sorbent Boom Pack(12.5cm x 4 M)	500 mtr
Slurry Pump (60 m3 / hr)	01 no.
Start Tank with capacity 10000 liter(10 m^3)	02 nos.
OSD Applicator- Oil Dispersant Spry Unit(20 ltr) for use on beach and inter tidal zones	02 nos.

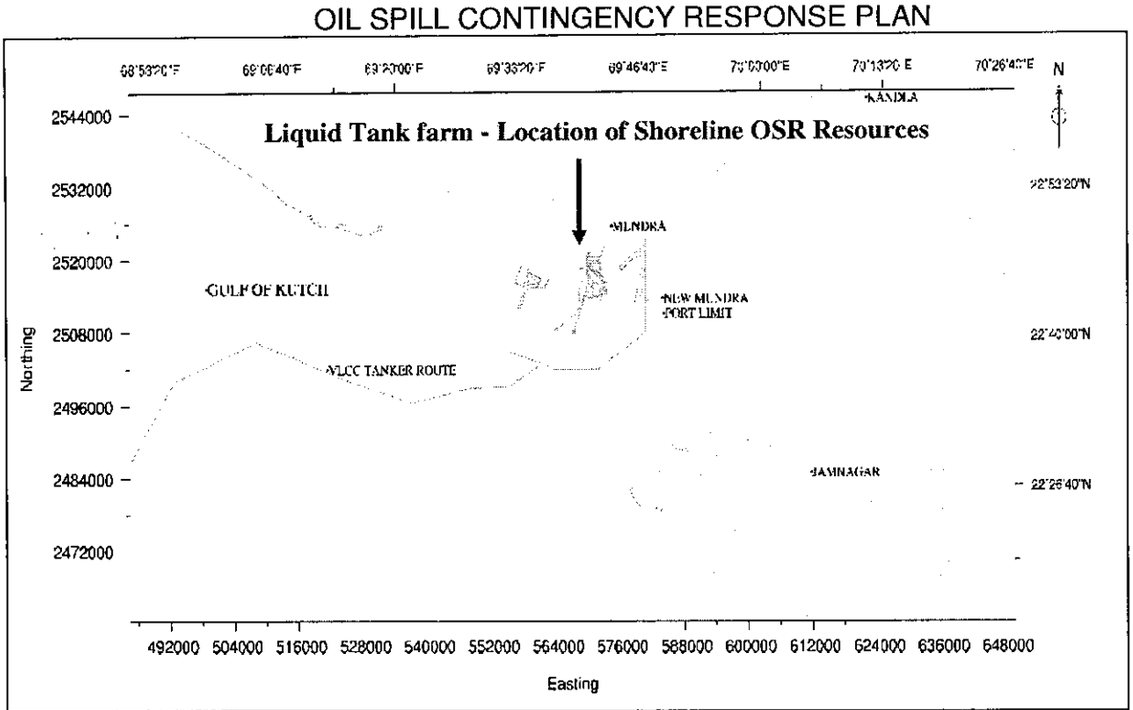


Fig.1.1 :General Arrangement of the marine facilities at Mundra port showing the VLCC route and facilities within the new Mundra port limit considered for carrying out the oil spill risk assessment studies.

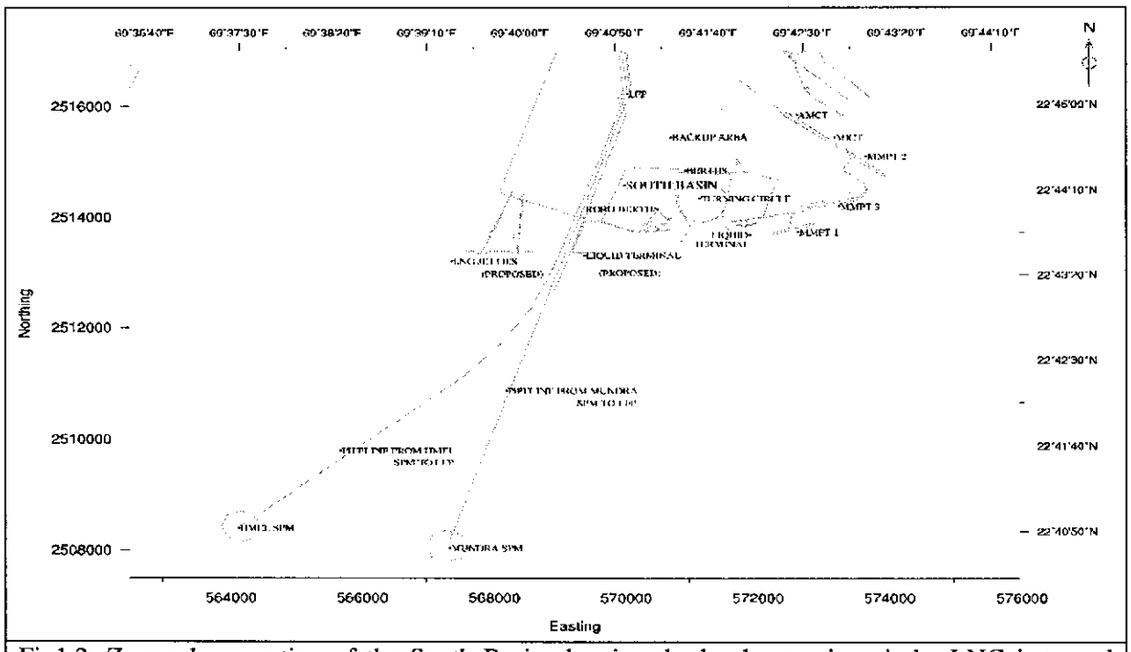


Fig1.2: Zoomed up portion of the South Basin showing the berths, turning circle, LNG jetty and existing berths as well as SPMs.



Fig.1.3 Zoomed up portion of the West Basin showing the berth locations and the approach channel for the vessels

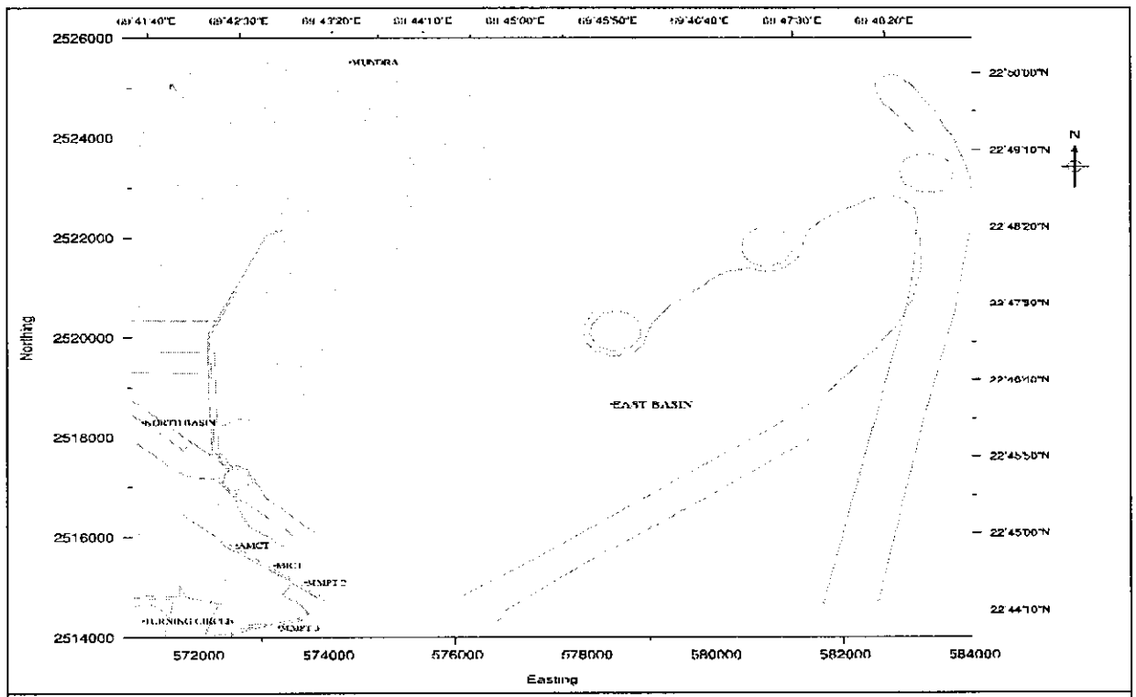


Fig.1.4 Zoomed up portion showing the East Basin & North Basin

Marine resources in Gulf of Kutch

Phytoplankton

Phytoplanktons are vast array of minute and microscopic plants passively drifting in natural waters and mostly confined to the illuminated zone. In an ecosystem these organisms constitute primary producers forming the first link in the food chain. Phytoplankton long has been used as indicators of water quality. Some species flourish in highly eutrophic waters while others are very sensitive to organic and/or chemical wastes. Some species develop noxious blooms, sometimes creating offensive tastes and odours or anoxic or toxic conditions resulting in animal death or human illness. Because of their short life cycles, plankton responds quickly to environmental changes. Hence their standing crop in terms of biomass, cell counts and species composition are more likely to indicate the quality of the water mass in which they are found. Generally, phytoplankton standing crop is studied in terms of biomass by estimating chlorophyll and primary productivity, while in terms of population by counting total number of cells and their generic composition. When under stress or at the end of their life cycle, chlorophyll in phytoplankton decomposes to phaeophytin as one of the major products.

Phytopigments

During April 2010, the phytoplankton pigments viz. chlorophyll a (1.7 – 2.4 mg/m3; av 1.9 mg/m3) and phaeophytin (0.3 – 1.2 mg/m3; av 0.7 mg/m3) varied considerably. In October 2010, chlorophyll a ranged from 2.0 – 4.2 mg/m3 (av 3.1 mg/m3) and phaeophytin from 0.7 - 1.1 mg/m3 (av 0.7 mg/m3) (Tables 8.1 and 8.2). The average concentration (mg/m3) of chlorophyll a off Vadinar during different sampling events (2010) is listed in Table 8.1:

Table 8.1: Average chlorophyll a (mg/m3) off Vadinar (April 2010 to October 2010)

Area	Pathfinder	Nearshore	ESSAR DP	IOC SPM	ESSAR SPM	Salaya Creek	Gulf
April 2010	2.4	2.1	1.9	1.4	2.0	2.0	1.7
Oct 2010	2.1	4.2	2.8	4.1	2.0	-	3.7

The values of phaeophytin during the present monitoring period are given in Tables 8.2, while, the average concentrations (mg/m3) between different sampling events (April 2010 and October 2010) are listed in Table 8.2.

Table 8.2: Average phaeophytin (mg/m^3) off Vadinar (April 2010 to October 2010)

Month	Pathfinder	Nearshore	ESSAR DP	IOC SPM	Essar SPM	Salaya Creek	Gulf
April 2010	1.2	0.6	0.8	0.3	0.6	0.8	0.6
Oct 2010	1.1	0.9	1.1	0.9	0.7	-	0.8

Phytoplankton population

As is generally the case with Coastal waters, the phytoplankton population density (68-332 nox10^3/l; av 186 no x 10^3/l) and generic diversity (11-30 no; av 18 no) varied over a wide range and in a random manner during April 2010 (Table 8.3). In October 2010 the phytoplankton population density ranged from 100-789.6 nox10^3/l (av 329.4 no x 10^3/l) and generic diversity ranged from 12-25 no (av 19 no) (Table 8.4) off Vadinar.

Table 8.3: Average phytoplankton population density (no x 10^3/l) and total genera (no) off Vadinar (April 2010 to October 2010)

Month	Pathfinder		Nearshore		ESSAR DP		IOC SPM	
	Cell count (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/l)	Total genera (no.)
Apr-10	216.2	19	200.5	17	192.7	15	127.7	18
Oct 2010	203.1	19	446.6	20	323.6	23	360.4	18

Month	Essar SPM		Salaya Creek		Gulf	
	Cell count (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/l)	Total genera (no.)
Apr-10	124	16	198.5	18	211	15
Oct 2010	260	16	-	-	487.6	14

The above results indicated wide temporal and spatial fluctuations in the standing stock of phytoplankton between April 2010 and October 2010 off Vadinar. In general, the coastal waters revealed high average cell counts during October 2010 as compared to previous data. The generic diversity of phytoplankton during April 2010 widely varied with the dominance of genera such as Nitzschia (17.7%), Guinardia (16.7%), Skeletonema (9.1%), Thalassiosira (7.4%), Hemiaulus (7.2%), Navicula (6.1%), Rhizosolenia (4.5%), Biddulphia (3.4%) and Leptocylindrus (3.4%). In October 2010, the dominant phytoplankton genera were Leptocylindrus (57.6%), Guinardia (13.9%), Nitzschia (8.1%) and Chaetoceros (7.2%)

Mangroves

According to one estimate the dense mangrove cover of Narara Bet is spread over an area of 5.5 km^2. The mangrove area has increased in recent years due to extensive plantations made by the Forest Department. Mangrove cover and mudflat areas (km^2) in Jamnagar, Lalpur, Khambalia and Kalyanpur Talukas estimated based on satellite data are given in Table 8.4 below:

Table 8.4: Mangrove areas (km^2) along Jamnagar coast

Taluka	Mangroves (Dense)	Mangroves (Sparse)	Tidal mudflats
Jamnagar	12.03	23.91	83.53
Lalpur	1.96	3.95	50.50
Khambalia	3.86	11.48	101.94
Kalyanpur	0.04	0.01	0.78

*Singh H.S., 2000. Mangrove in Gujarat, GEER foundation

Mangroves at Vadinar

The intertidal expanse in the vicinity of Dargah ranged in 1 – 1.2 km. Lower intertidal zone was muddy with dense algal growth. The mid and upper intertidal zone sustained mangrove vegetation of ~ 500 m width. The zone around HTL was dominated by a sandy beach with ~ 5 m width and a narrow beam at the backshore. The distribution of mangroves at Vadinar during the present monitoring (April 2010) is given in Table 8.5 below:

Table 8.5: Distribution of mangroves at Vadinar (Dargah - North side)

	Location	Species	% FQ	Density	Height (m)	DBH (cm)	Seedling (no/m^2)
D1	22° 26'42.6''N 69° 42' 07.8''E	*A. marina*	100	Sep-67 -38	0.5 - 3.5	<2.6 - 6	0 - 2
D2	22° 26' 50.5''N 69° 41' 52.9''E	*A. marina*	40	0 - 5 -2	0.5 - 1.5	<2.5 - 4	0 - 1
Vadinar (Dargah - south side; afforested area)							
D3	22° 26' 30.8''N 69° 42' 05.6''E	*A. marina*	100	(20 - 75) -50	1.0 - 2.3	<1.5 - 5	0 - 15

As evident from above data, the stand density of *A.marina* at two locations (D1 and D2) along North-east of Vadinar Dargah varied from nil to 67 plants/100 m^2 with higher density of plants noticed at location D1. Frequency of occurrence ranged from 40 - 100% in the mid and upper intertidal zones. The height varied from 0.5 to 3.5 m. Mostly the plants were dwarf (av 1 m) with occasional tall plants of 3.5 m. Diameter at Breadth Height (DBH) varied from <2.5 to 6 cm. The seedling density was poor and varied from 0 - 2 no/m^2. The mid intertidal segment was the popular feeding site for flocks of flamingos.

The upper intertidal expanse along South-west of Vadinar Dargah (D3) showed good growth of afforested mangroves (Table 8.5). The density of mangroves ranged from 20 - 75 plants/100 m^2 with an average of 50 plants/100 m^2. The plant height varied from 1.0 to 2.3 m and the DBH ranged from <1.5 to 5 cm. The seedling density was low (0-15 no/m^2), however, better than that noticed along North-east of Vadinar - Dargah (D1 & D2). Present results are comparable with earlier monitoring studies (2007 - 2009).

Mangroves at Narara

The intertidal expanse along the IOCL pipeline corridor varied from 2000 - 2200 m. The mangroves vegetation from upper intertidal region was observed to be healthy, dominated by *A.marina* on both sides of the pipeline corridor. Four locations (N1 to N4) were selected for monitoring of mangroves at Narara as detailed in below given Table 7.6.

Table 8.6: Distribution of mangroves at Narara

	Location	Species	% FQ	Density	Height (m)	DBH (cm)	Seedling (no/m^2)
N1	22° 27' 56.8''N 69° 43' 43.2''E	*A.marina* *C.tagal* *R.mucronata*	100 10 5	20-45 (38) 0.7* 0.2*	2-3 - -	3-8 - -	0-85 - -
N2	22° 27' 59.1''N 69° 43' 21.3''E	*A.marina*	100	60-90 (85)	2-4	25-12	0-7
N3	22° 28' 03.5''N 69° 43' 27.4''E	*A.marina* *R mucronata*	100 3	28-85 (50)	0.5-2.5 -	<15-7 -	0-55 -
N4	22° 28' 07.2''N 69° 43' 24.6''E	*A.marina*	100	30-130 (80)	0.5-3.5	<2.0- 3.5	0-10

* no/500 m^2

As can be noticed in the above table, the plant density of *A.marina* varied from 20 - 130 plants/100 m^2 with a frequency of occurrence of 100% at Narara. The species like *Ceriops tagal* (7 plants/500 m^2) and *Rhizophora mucronata* (2 plants/500 m^2 - 3 plants/100 m^2) were rarely noticed. The locations N2 (85 plants/100 m^2) and N4 (80 plants/100 m^2) revealed better average density of *A.marina* as compared to the rest. The height of *A.marina* varied from 0.5 to 4 m with N2 and N4 locations indicating better plant height than the rest. The DBH varied from <1.5 to 12 cm at the monitoring locations. The seedling density ranged from 0 - 85 no/m^2 with N1 and N3 locations sustained better seedling density than the rest. Few new plants (30 - 45 cm in height) of *C.tagal* and *R.mucronata* were noticed at the EOL pipeline corridor during the present monitoring.

Sand dune vegetation

The narrow beach of ~ 5 m width around HTL along Narara Bet is marked with berm of ~ 1.5-2 m width, followed by back shore sandy zone. Occasional shrubs of *Salicornia brachiata* and *Suaeda maritima* are observed on the backshore sandy zone. The sand dune flora is more predominant on berm and immediate back shore zone of ~5 m width. Sand dune flora is represented by seven species viz; *Crassa sp, Cyperus arenarius, Launea sp, Suaeda maritima, Salicornia brachiata,* unidentified *Poaceae* member and unidentified *Fabaceae* member.

Seaweeds and Seagrasses

Seaweeds, which are known as a source of food, fodder and manure, are mostly found attached to various substrata like sandy, muddy and coralline sediments as well as rocky areas and play a significant role in enriching the sea by adding dissolved organic matter, nutrients and detritus besides serving as nursery areas for the larvae and juveniles of innumerable marine organisms. Some green Seaweeds are edible, red algae are the important source of agar and some of the brown algae are used for manufacturing algin and alginic acid. Seaweeds are also used to produce some bioactive compounds.

The algal zone of Narara Bet is confined to 1.2-2.5 km width. A total of 62 species of algae and 3 species of sea grasses are recorded from this region. Among them *Lyngbya*, *Caulerpa*, *Cladophora*, *Ulva*, *Cystoceira*, *Dictyota*, *Hydroclathrus*, *Padina*, *Sargassum*, *Acanthopora*, *Amphiroa*, *Champia*, *Centraceros*, *Gracilaria*, *Hypnea* and *Polysiphonia* were common with the dominance of *Padina* and *Gracilaria* at the lower reef flat. The open mudflats of Narara Bet are dominated by algae like *Enteromorpha*, *Ulva*, *Lyngbya* and *Polysiphonia*, while, the upper sandy shore and mangrove areas are associated with *Enteromorpha* and *Ulva*. Seagrasses such as *Halophila ovata* and *Halodule uninervis* are common in patches on sandy regions of the reef, while, *Halophila beccarii* occasionally occurred on mudflats along the tidal channels.

Open mudflats near Dargah and Narara pipeline corridor supported growth of twelve marine algae dominated by Enteromorpha spp (Table 8.7). The biomass of Enteromorpha estimated at ~ 4 kg/m2.

Table 8.7: Marine algal flora along Narara/Vadinar

Sr. No.	Species	% FO*	ES*
1	*Enteromorpha clathrata*	100	D
2	*Enteromorpha intestinalis*	100	D
3	*Caulerpa racemosa*	50	C
4	*Ulva fasciata*	100	D
5	*Ulva lactuta*	100	D
6	*Ulva reticulate*	90	D
7	*Codium elongatum*	30	O
8	*Sargassum ilicifolium*	45	C
9	*Sargassum tenerimmum*	60	CD
10	*Gracilaria corticata*	55	C
11	*Gracillaria verrucosa*	85	C
12	*Polysiphonia platycarpa*	20	O

*%FO: Percentage Frequency Occurrence, ES: Ecological Status, D: Dominant (% FO = 80-100), CD: Co-dominant (% FO = 60-79), C: Common (% FO = 40-59), O: Occasional (% FO = 20-39).

The intertidal zone of Kalubhar Tapu harbours 47 species of marine algae and three species of seagrasses. The reef areas of this island are dominated by *Dictyota*, *Gracilaria*, *Padina*, *Hydroclathrus*, *Ulva* and *Hypnea*. The open mudflats and sandy areas at the upper intertidal are preferred by *Enteromorpha*, *Ulva*, *Lyngbya* and *Polysiphonia*. The sandy region of the reef flat supported seagrasses like *Halophila* and *Halodule*.

Zooplankton

The zooplankton standing stock in terms of biomass and population density during April 2010 (Table 8.8) varied from 0.2 to 121.2 ml/100m^3 (av 3.3 ml/100m^3) and 2.2-722.7 x 10^3/100m^3 (av 39 x 10^3/100m^3), respectively while during October 2010 the zooplankton biomass and abundance ranged from 0.2 to 12.0 ml/100m^3 (av 3.5 ml/100m^3) and 2.5-157.8 x 10^3/100m^3 (av 48.4 x 10^3/100m^3) respectively suggesting normal secondary production off Vadinar during the monitoring period.

The average zooplankton biomass (ml/100m^3), population density (nox10^3/100m^3) and total groups (no) off Vadinar during the monitoring period varied in accordance with the data presented in Table 8.8.

Table 8.8: Average values of zooplankton (A) biomass (ml/100m^3) (B) Population density (nox10^3/100m^3) and (c) total groups (no) off Vadinar (April 2010 – October 2010)

Area		Pathfinder	Nearshore	ESSAR DP	IOC SPM	Essar SPM	Salaya Creek	Gulf
April 2010	A	8.3	1.1	1.1	0.9	1.4	2.5	3.5
	B	89.9	24.6	14.4	22.7	12.7	20.4	37.4
	C	17	15	12	16	13	16	17
Oct 2010	A	4	3.9	1.5	3	5.7	-	2.1
	B	57.4	55.9	23.5	30.5	83.1	-	32.8
	C	13	11	10	10	9	-	7

The overall zooplankton standing stock was low and highly variable off Vadinar which could be due to high patchiness and seasonal variability in their distribution apart from high grazing pressure at higher trophic levels.

During April 2010, 24 faunal groups were identified in the coastal waters off Vadinar during the monitoring period while 17 faunal groups were present in the samples of October 2010. The most common faunal groups were copepods (40.5%), decapod larvae (19%), gastropods (22.5%), lamellibranchs (10.7%), and foraminiferans (2.1%) in April 2010. In addition to the above, groups like chaetognaths, siphonophores, *Lucifer* sp, polychaetes, ctenophores, medusae, amphipods, ostracods, mysids, heteropods, isopods, stomatopod larvae, appendicularians and fish larvae were also frequently noticed but in less numbers during April 2010. During October 2010, the dominant groups were copepods (93.6%) and decapod larvae (4.8%). In general, the coastal waters off Vadinar revealed a moderate production of zooplankton associated with random fluctuations and seasonal changes.

Macro benthos

The organisms inhabiting the sediment are referred as benthos. Depending upon their size, benthic animals are divided into three categories, macrofauna, microfauna and meiofauna and macrofauna. Benthic community responses to environmental perturbations are useful in assessing the impact of anthropogenic perturbations on environmental quality. Macrobenthic organisms which are considered for the present study are animals with body size larger than 0.5 mm. The presence of benthic species in a given assemblage and its population density depend on numerous factors, both biotic and abiotic.

Intertidal macrofauna

During April 2010, Intertidal macrofauna was studied along 5 transects viz. 1 transect (Transect I) at Kalubhar Island and 4 transects at Narara Bet. Several locations were sampled along each transect between the HTL and the LTL viz; High Water (HW), Mid Water (MW) and Low Water (LW). The intertidal macrofaunal standing stock in terms of population density (50-7800 no/m^2, av 2292 no/m^2) and biomass (0.1-37.2 g/m^2; wet wt, av. 9.2 g/m^2; wet wt) varied widely During the post monsoon, only the first three transects were sampled. In October 2010, the intertidal macrofaunal standing stock in terms of population density ranged from 0-3625 no/m^2 (av 1185 no/m^2) and biomass from 0-67.8 g/m^2; wet wt (av. 14.6 g/m^2; wet wt). These results are compared with historical data in Table 8.9.

Table 8.9 Average of intertidal macro benthos off Vadinar during April 2010 to October 2010, (A) Biomass (g/m^2) (B) Population density (no/m^2) and (C) Total groups

Transect		I	II	III	IV	V
April 2010	A	11.2	4.2	13.7	10.7	6.1
	B	3983	1172	1292	2401	2614
	C	5	3	6	6	3
Oct 2010	A	11.9	16.8	15.1	-	-
	B	1495	904	1156	-	-
	C	5	7	5	-	-

Overall, the intertidal region sustained good faunal standing stock and diversity and the contribution of major faunal components are comparable over the past many years at Narara Bet/Kalubhar.

Subtidal macrofauna

Subtidal macrofauna was studied at 13 stations in the coastal system off Vadinar during April 2010 and at 10 stations during October 2010. The distribution of subtidal faunal standing stock in terms of biomass (0.3 - 41.0 g/m^2; av 8.0 g/m^2 wet wt) and population density (150-8925 no/m^2; av 1902 no/m^2) during April 2010. In October 2010 the biomass ranged from 0.3 – 23.9 g/m^2 (av 7.1 g/m^2; wet wt) and population density ranged from 125-14975 no/m^2 (av 2282 no/m^2) The current data is listed (April 2010 – Oct 2010) in Table 8.10.

Table 8.10 Average of subtidal macrobenthos off Vadinar during April 2010 to October 2010, (A) Biomass (g/m^2) (B) Population density (no/m^2) and (C) Total groups

Area		Pathfinder	Nearshore	ESSAR DP	IOC SPM	ESSAR SPM	Salaya Creek	Gulf
April 2010	A	11.2	2.9	2.0	6.1	1.3	15.5	6.4
	B	3833	338	388	694	2375	1553	1865.5
	C	7	3	4	6	5	6	4
Oct 2010	A	12.1	7.7	1.9	4.9	1.8	-	10.6
	B	5019	2967	400	1169	181	-	1652
	C	8	5	4	4	2	-	7

The macrobenthic population was dominated by polychaetes (50.1%), amphipods (18.5%), pelecypods (8.2%), decapod larvae (7.4%), tanaids (3.6%) and foraminiferans (3.2%) during April and by polychaetes (76.3%), amphipods (12.3%) and pelecypods (5%) during October 2010.

Corals and associated biota

Live corals at the Narara and Kalubhar reefs are mainly confined to the lower littoral (reef flat) and shallow subtidal zones (< 8 m). They are absent at the upper reef flat probably because of high rate of sedimentation and long exposure during low tide.

Narara Bet

The eastern segment of Narara Bet represents a formation of vast mud flat, which resulted in significant negative influence on the live coral population. Many regions along the reef flat on the western side are exposed during low tide for prolonged periods because of which the distribution of live corals was poor. In all 30 and 22 Scleractinian species have been identified in the intertidal and subtidal zones respectively of Narara Bet with *Montipora, Goniopora, Porites, Favia, Favites, Goniastrea, Platygyra, Cyphastrea, Pseudosiderastrea, Turbinaria, Leptastrea* and *Symphyllia* as the dominant genera.

In general, the live coral density decreased with depth. The live corals were absent beyond 8 m (CD). However, the subtidal area at Narara sustained good coral populations within 5 m (CD). Distance-wise corals were rich within 250 m towards the sea from the LTL. The corals of the genera *Montipora, Porites, Favites, Goniastrea, Goniopora, Cyphastrea, Leptastrea, Favia* and *Turbinaria* dominated the subtidal area.

Kalubhar

In general, Kalubhar reef sustained relatively healthy live corals at the lower intertidal and subtidal (<7 m depth) zones as compared to the population at the Narara reef. The north and north-west regions of Kalubhar had better coral density and diversity as compared to the east and south-east regions because of high sedimentation of the reef flat and the subtidal zones. Overall, 30 and 7 species of Scleractinians in the intertidal and subtidal zones respectively at Kalubhar have been identified. The corals at Kalubhar were mainly represented by genera *Montipora, Favia, Favites, Porites, Goniastrea, Goniopora, Cyphastrea, Platygyra,* and *Symphyllia* and *Turbinaria.* The live corals were absent at the reef edge of 50 m width due to total exposure for longer period whereas their coverage increased (90 to 100%) at the reef slope below 1 m depth.

A rich reef associated flora and fauna was noticed at Kalubhar. The common and dominant seaweed genera were *Sargassum*, *Gelidiella*, *Acanthophora*, *Ulva*, *Caulerpa*, *Codium*, *Dictyota*, *Padina*, *Halymenia*, *Enteromorpha*, and *Gracillaria*. Varieties of sponges were associated with coral boulders. The fauna consisted of coelenterates (*Zoanthus* sp., *Discosoma* sp., *Stoichactis*, *giganteum*, *Cerianthus* sp. and variety of corals), annelids (various polychaetes), echiuroid (*Ikedella misakiensis*), crustaceans (amphipods, isopods, *Acetes* sp., shrimps and crabs), molluscs (*Octopus* sp., *Sepia* sp., *Loligo* sp., gastropods, bivalves, nudibranchs etc.) echinoderms and variety of reef fishes.

Fishery

Gujarat ranks number one position in marine fish production in India. The Gulf contributes about 22% to the fish production of the state. The share of the Jamnagar District is between 5 and 14% (av 10%) to the State's total marine fish landings. The important fish landing centres in the vicinity of IOCL SPM area which falls under Khambalia zone are Vadinar, Bharana, Nana Amla and Salaya which together contributed about 6823 t, 8253 t and 5330 t of fish landings in 2006-07, 2007-08 and 2008-09 respectively to the total landings of the Jamnagar District. Similarly, the important fish landing centres in the vicinity of Sikka which falls under Jamnagar zone are Sachana, Baid, Sarmat, Bedi and Sikka which together contributed about 4768 t, 5122 t and 5848 t of fish landings in 2006-07, 2007-08 and 2008-09 respectively. Within the Jamnagar zone, the major landings (98%) were from Sachana (32%), Baid (27%), Sikka (19.7%) and Bedi (18.9%) during the last 3 years. Within the Khambalia zone, the major landings (81-89%) were at Salaya during the period 2006-09. On an average the Khambalia zone (56.5%) contributed to about 13% higher fish landings than Jamnagar zone (43.5%) for the last 3 years. However, the landings at Sikka (1.3%) and Vadinar (0.5%) to the total landings of the district were negligible during the period 2006-2009.

Reptiles and mammals

The reptiles are mainly represented by marine turtles Chelonia mydas and Lepidochelys olivacea which breed and spawn on the sandy beach along the Sikka-Vadinar coast as well as on the islands.

Dolphin (*Dolphinus delphis*) and whale (*Balanoptera* sp) are common in the Gulf. Though occurrence of Dugong (*Dugong dugon*) in the Gulf particularly along the Jamnagar coast has been reported, there are no recent sightings.

The resources discussed above likely to be threatened are tidal flats, Phytoplankton, Phytopigments, Mangroves, seaweeds and seagrasses, Zooplankton, Macrobenthos, Corals and associated biota, salt works fishing activities and other vocational related to marine sensitive areas in the coast of Vadinar and Sikka.

It has been observed from the modeling study that during pre-monsoon season, the spills occurring at the APSEZL marine facilities move towards the southern / southwestern part of the Gulf of Kutch nearer to the facilities depending on tide phase.

The spills taking place at the APSEZL marine facilities move towards northern coast of Gulf of Kutch during monsoon season and affect the coast near Mundra, Kandla etc.

During post - monsoon season, the spills taking place at the APSEZL marine facilities move towards south / southwest and affect the islands /coast on southern side of the Gulf of Kutch.

2.7 Special local considerations

Considering the distant proximity of various other installations with the port of Mundra, in case of a tier 1 spill, no other special considerations are deemed to be required apart from an active spill response close to the port facility itself.

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3 Response strategy

3.1 Philosophy and objectives

This plan is intended to assist APSEZL in dealing with an accidental release or discharge of oil. Its primary purpose is to set in motion the necessary actions to stop or minimize the discharge and to mitigate its effects. Effective planning ensures that the necessary actions are taken in a structured, logical and timely manner.

This plan guides the HOD– Marine and his Duty Staff through the decisions which will be required in an incident response. The tables, figures and checklists provide a visible form of information, thus reducing the chance of oversight or error during the early stages of dealing with an emergency situation.

For this plan to be effective, it must be:

- familiar to those APSEZL staff with key response functions;
- regularly exercised; and,
- Reviewed and updated on a regular basis.

This plan uses a tiered response to oil and chemical pollution incidents. The plan is designed to deal with Tier One spillage. The products handled are likely to pose a greater fire and safety, rather than an environmental risk; there may thus be additional factors involving the safety of personnel, which will take precedence over the pollution response. In this case, reference must be made to the APSEZL Emergency Procedures Manual. The salvage and casualty management of any vessel that poses a threat of pollution is priority considerations.

During oil spill response activities, account must be taken of the following:

- site hazard information
- adherence to permit procedures
- spill site pre-entry briefing
- boat safety
- APSEZL safety manual and material safety data sheets
- Personal protective equipment needs
- heat stress
- decontamination

3.2 Limiting and adverse conditions

APSEZL is situated in natural protected Gulf of Kutch and there are less incidences of heavy wind or any other factor affecting operation.

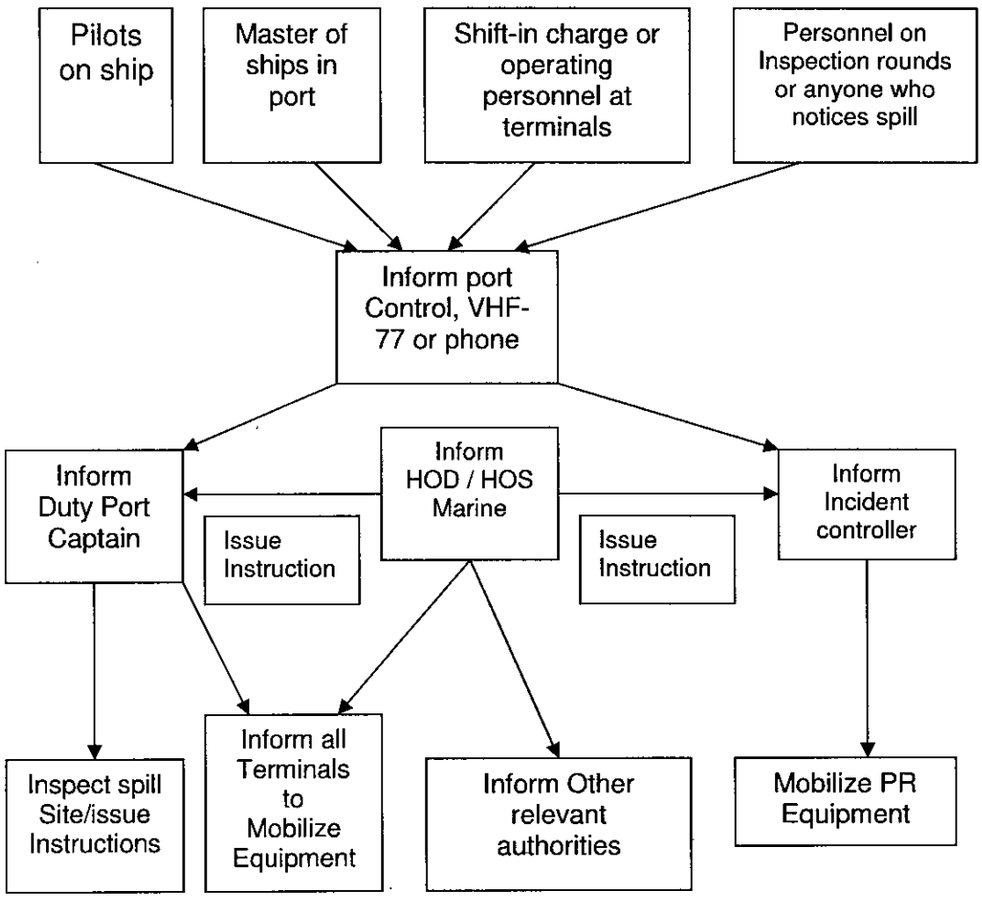
3.3 Oil spill response in offshore zones

SPM handles (unloading) crude oil and pumps it to shore tank farm area through sub-sea pipeline. The impact of such spills on marine environment is on the higher side. Hence, oil spill equipments are required for combating oil in case of such spills at the marine facilities at Mundra.

Based on the oil spill modeling study, it has been observed that crude oil spill of 700 tons (Tier-I) will spread over an area having radius of around 400 m within 4hr. APSEZL has already having facilities for combating a Tier-1 spill.

3.4 Oil spill response in coastal zones

Contingency Chart to deal with Oil Spill



On-site Crisis Management Group – Action Group

In an emergency, the personnel available at or near the incident site play vital role. This concept is made use of in nominating the Key Persons. It is necessary to nominate a functionary as the Incident Controller who is invariably a shift-in-charge of the facility. The Incident Controller tackling the emergency in real times requires the support from various other services i.e. Fire & Safety, Medical Services covering communication, transport and personal functions etc. A key person for each of these services therefore, is nominated.

Overall in charge of these activities is **Chief Operating Officer – Mundra Port.** The different functional coordinators, designated, will co-ordinate with Chief Controller in their respective functional areas. It is suggested that key personal chart be developed, giving the names, designation, telephone nos. of top level personnel who will act as coordinators in different disciplines/services. The duties and the responsibilities of various Key Persons and Coordinators need to be written down on a chart and should be made available across the organization at the site / location.

Roles & Responsibilities

Incident Control Officer – (HOS – Marine / Duty Port Captain)

- Directs and co-ordinates all field operations at the scene of the accident
- Assess incident/crisis at site, nature, location, severity, casualties, resource requirement
- Classifies incident - Advises Exe. Controller, Civil Defence, Dy. Conservator, Traffic Manager - regarding crisis severity status and emergency level, wind direction, temperature, casualties and resource requirements.
- **Conducts initial briefing to Chairman**
- Activates elements of the terminal emergency plan/ site response actions
- Protect port personnel and the public
- Directs security/fire fighting/oil spillage/gas leakage/vessel accidents/natural calamities, cargo operations shutdown
- Search for casualties and arrange first aid and hospitalization
- Brief or designate a person to brief, personnel at the incident scene
- Determine information needs and inform Crisis Management Group
- Coordinates all functional heads in field operations group to take action
- Manages incident operations to mitigate for re-entry and recovery
- Coordinate search and rescue operations
- Arrange evacuation of non-essential workers to assembly points –outside port
- Arranges tugs, mooring boats and pilot(s) for sailing vessel(s)
- Co-ordinates actions, requests for additional resources and periodic tactical and logistical briefings with Site Emergency Coordinator
- Coordinate incident termination and cleanup activities
- Instructs various emergency squads as necessary

Site Emergency Coordinator – (Senior Pilot and Duty Radio Officer)

- Direct operations from the emergency control center with assistance from Crisis Management Group
- Take over central responsibility from the Site incident controller (SIC)
- Decide level of crisis and whether to activate off site emergency plan
- Instruct SIC to sound appropriate alarm
- Direct the shutting down, evacuation and other operations at the port
- Monitor on site and off site personal protection, safety and accountability

- Monitor that causalities if any are given medical aid and relatives informed
- Exercise direct operational control of the works outside the affected works
- Monitor control of traffic movements within the port
- Coordinate with the senior operating staff of the fire, police and statutory authorities
- Issue authorized statements to the news media
- Review and assess possible developments to determine the most probable course of events
- Authorize the termination of the emergency situation by sounding the all clear siren-continuous long single tone siren for one minute
- Control rehabilitation of affected areas after emergency
- Arrange for a log of the emergency

Fire Coordinator – (HOS - Fire / HOS -Safety)
(Under the direction of the Incident Control Officer)

- Announces fire incident point over the public address system and evacuates workers to the assembly points
- Informs fire station immediately and leads fire fighting team to the incident location
- Informs SIC if external fire tender / fire-fighting equipment / materials/mutual aid is required
- If necessary, arranges and activates other fire-fighting equipment
- Arranges safety equipment e.g. fire suits, protective gloves and goggles, breathing apparatus
- In liaison with Civil Engineering Department, ensures that adequate water pressure is maintained in the fire hydrant system/at the area supply
- Maintains adequate records

HOS - Security / Duty Security Officer

- Directs, gate security and facilitates evacuation, transport, first aid, rescue
- Controls the entry of unauthorized persons and vehicles-disperses crowd
- Permits the entry of authorized personnel and outside agencies for rescues operations without delay. Liaises with State police
- Allows the entry of emergency vehicles such as ambulances without hindrances
- Ensures that residents within port area are notified about disaster and instructs to evacuate if necessary
- Ensure that all people are aware of the assembly points, where the transportation vehicles are available
- Ensure that the people are as per the head count available with the assembly point section of that area
- Liaise with the Chief Medical Officer to ensure first aid is available at the assembly points
- Carry out a reconnaissance of the evacuated area before declaring the same as evacuated and report to SIC.

Medical Superintendent

- Direct medical team
- Set up casualty collection centre arrange first aid posts
- Arrange for adequate medicine, antidotes, oxygen, stretchers etc
- Contact and cooperate with local hospitals and ensure that the most likely injuries can be adequately treated at these facilities e.g. burns
- Advise Chief Emergency Controller on industrial hygiene and make sure that the facility personnel are not exposed to unacceptable levels of toxic compounds

- Make arrangements for transporting and treating the injured
- Inform the hospitals of the situation in case of a toxic release and appraise them of the antidotes necessary for the treatment
- Maintain a list of blood groups of each employee with special reference to rare blood groups
- Liaise with Govt. Hospitals/Red Cross

Marine Pollution Coordinator – Manager (Marine / pollution control)

- Minimizes the impact of an accident on the environment for which it would develop methodologies to control hazardous spills
- Monitors cooperation with emergency response squads to conduct the actual cleanup work during and after the emergency.

HOD- Corporate affairs:

- Collect detailed information periodically and liaise with press about the incident
- Arrange transport facilities, if required
- Inform local authorities/District Collector about the incident (as per EAP)

HOS - Legal & HOD - Estate:

- Issue notice under Major Port Trusts Act, Indian Ports Act(Prevention & Control of Pollution) Rules, etc; to the defaulting master/owner/agent
- Arrange for settlement of claims related to the pollution(as per EAP)

3.5 Shoreline oil spill response

Most oil spills reach the shorelines and cause visible oil pollution which is particularly sensitive to public opinion. The selection and correct application of clean up techniques are therefore essential. When an oil spill occurs on open water the optimal solution is to intercept and recover the oil before it reaches the shoreline. This is because:-

- The environmental damage is normally less critical in the open water environment
- The logistics of oil removal becomes more complex in the varied natural environment of coastlines compared with the open sea.
- The costs of oil recovery increases dramatically when oil reaches sensitive shorelines compared with open water operations.

Experience has shown that it is very difficult to avoid some oil reaching the shorelines. Mechanical equipment and chemical treatment at sea are often insufficient to recover all oil spilled at sea. When the oil reaches the shoreline, a number of different parameters specific for this particular situation have to be taken into consideration:-

- Quantity of oil
- Characteristics of the oil (for instance, toxicity and viscosity)
- Prevailing on-site conditions (weather, season, tides, temperature)
- Shoreline type or combination of types (cliffs, pebble, sand, marsh)
- Special Considerations

The four main steps in a shoreline clean-up operation are:

Step 1: Assessment

- Determine the need to clean, setting priorities in line with this contingency plan
- Determine required degree of clean-up for each area in accordance with priorities
- Attain agreement between clean-up team, ecological experts, government authorities

Step 2: Select Clean-up Method

- Choose method appropriate to type of shoreline, access, degree of oiling
- Minimize damage caused by choice of clean-up technique, degree of clean-up
- Address conflicts of interest (e.g. needs of amenity use versus environment or response speed versus aggressiveness)

- In case of fire and specially if the fire involves toxic/flammable materials, to ensure responsible actions for containing the run off fire water and other water from the damaged units
- Determines the level of contamination of the site as a result of the accident
- During cyclones/floods arranges sand bags and transfers important plans and documents to higher levels

Traffic Coordinator – Duty Port Captain

- Directs operation staff
- Prepares vessels to vacate from berth
- Arranges to protect cargo in vicinity from damage
- Arranges to segregate and shift cargo in sheds
- Submits consolidated list of dangerous goods in port including tankers in port and tank farms in port area
- Coordinates with ship owners / agents/C & F agents/stevedores

Communications Officer – (Duty Port Captain / Marine Control In-charge)

- Ensure telephone operator/signal room advises entire emergency team
- On receipt of instructions from the chief Incident controller, notifies the fire brigade/police/hospitals/district collector/mutual aid partners
- Keep the switchboard open for emergency calls and transmit the same to the concerned personnel effectively
- Refrain from exchanging any information with authorized persons unless authorized to do so by the Chief Incident Controller
- Maintains contact with other vessels through VTMS

Chief Emergency Controller – (Head - HSE)

- Inform district emergency authorities-District Collector, Medical officer-Coast Guard Pollution control -Inspector of factories-Inspector of Dock Safety & Health,
- Activate the off site plan if necessary
- Liaise with Jt. Secy./Director MOST (Ministry of Shipping) or relevant Govt. authority
- Inform the media

Civil Coordinator – (HOS – Environment cell / HOS - Estate)

- Inform Gujarat Pollution Control Board and other environmental agencies about the incident for getting necessary guidance
- Instruct the contractors to carry out urgent civil works if required
- Hire the barges for collecting the spilled oil, if required

Marine Engineering Coordinator – (HOS – SPM / Diving Team in-charge)

- Organise the tugs for combating the pollution
- Start the rigging of pollution combating equipment on tugs/launches
- Hire additional crafts if required

Step 3: Clean-up Operations

- Monitor clean-up, confirm choices made above, re-evaluate if necessary
- Minimize disturbance of shoreline features
- Minimize collection of un-oiled debris, sediments

Step 4: Termination / Monitoring

- Ongoing assessment of clean-up operations
- Determine when clean-up objectives have been met
- Post-spill monitoring to confirm recovery of shoreline features, biota

The four main methods for shoreline clean-up are as follows:-

A. Pumping and Skimming Techniques

- Applicable to shorelines that are heavily oiled.
- Often the first step in cleaning a heavily contaminated shoreline.
- Preferred option because it results in fluid wastes that are relatively free of sediments and debris, which are more easily dealt with in disposal.
- Pumping and skimming techniques can also be used in conjunction with flushing techniques.

B. Flushing Techniques

- Use water or steam to flush oil from the beach, and direct it to a recovery location.
- Applicable to heavily contaminated beaches, and substrates that are relatively impermeable (e.g., mud and saturated beaches, boulders, and man-made structures) that will not allow the flushed oil to penetrate the beach surface.
- Typically carried out in conjunction with a skimming operation. The flushed oil is directed down-slope to skimmers positioned at the water's edge, with booms deployed around the skimmers to prevent any loss of the water.
- Options of using low or high pressure water, and of using ambient temperature water versus warm water or steam.
- Low pressure, cold water is generally the least effective, particularly with sticky oils and emulsions, but is least harmful on the environment.
- High pressure water and heated water and steam are more effective, but may remove and/or kill beach-dwelling organisms.

C. Sediment Removal Techniques

- Applicable to a variety of shoreline types, and in particular, when the shoreline is heavily contaminated, though likely to cause the greatest environmental impact
- The requirements are access for the heavy equipment required for transporting away oily debris and sediments for disposal and a surface which is able to support heavy equipment
- An important factor to consider is the depth of oil penetration
- Important to limit the depth of material removed in order to minimise disturbance to the beach, and to minimise disposal requirements
- The best option is to use manual labour to pick up the oily sediment and mechanical means to transport it away

D. Biodegradation Techniques

- Generally refers to "active" bioremediation, where nutrients and/or microorganisms are applied to enhance natural degradation
- Generally suitable for areas that are lightly oiled, especially lightly oiled salt marshes and tidal flats where the use of equipment could increase the environmental effects by forcing oil into the substrate
- It can also be used as a final clean-up step following more active efforts

The shoreline clean-up operation is normally not an emergency operation as is the case with an oil spill on open water. A clean-up project can last many weeks or months depending on the amount of oil spilled. Many wrong decisions can be made in planning and carrying out a shoreline clean-up operation. The contingency plan must be used in combination with consulting experts with experience of shoreline clean up. The agencies such as NIO, NEERI, Ports and Oil companies have experts with experience which is relevant for the specific oil spill situation and they should be consulted prior undertaking shoreline clean-up.

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3.6 Storage and disposal of oil and oily waste

After the natural degradation by coagulation and evaporation of oil on water, residual oil and waste material collected during a Tier 1 response will be disposed off by in-situ or terrestrial burning.

	Type of material	Separation methods	Disposal methods
LIQUIDS	Non-emulsified oils	Gravity separation of free water	Use of recovered oil as fuel or refinery feedstock
	Emulsified oils	Emulsion broken to release water by ; - Heat treatment - Emulsion breaking chemicals - Mixing with sand	Use of recovered oil as fuel or refinery feedstock. Burning Return of separated sand to source.
SOLIDS	Oil mixed with sand	Collection of liquid oil leaching from sand during temporary storage Extraction of oil from sand by washing with water or solvent Removal of solid oil by sieving	Use of recovered oil as fuel or refinery feedstock. Direct disposal Stabilization with inorganic material. Degradation through land farming or composting. Burning
	Oil mixed with cobbles, pebbles or shingle	Collection of liquid oil leaching from beach material during temporary storage Extraction of oil from beach material by washing with water or solvents	Direct disposal. Burning
	Oil mixed with wood, plastics, sea weeds, sorbents	Collection of liquids leaching from debris during temporary storage Flushing of oil from debris with water	Direct disposal. Burning. Degradation through land farming or composting for oil mixed with sea weeds or natural sorbents.
	Tar balls	Separation from sand by sieving	Direct disposal Burning

Location for Dug Pond for temporary storage of oily water:

To store the contaminated oily water, temporary dug pond will be excavated for storage of oily water. It is expected that 20 times volume of oil & water mixture will be generated if oil spill happen in the sea. Storage capacity of dug pond of volume 14000 m3 considering spill of level 1 (Tier-1) is required.

Location Identified for Dug Pond behind Maruti Yard (Lat. 22° 45.252'N , Long. 69° 41.093'E) is roposed.



- Size of Dug Pond to be provided : 100 mtr X 100mtr X 1.5mtr
- Total storage capacity (m3) : considering 20 times oily water @ 700 m3 = 14000 m3

Once the contaminated mixture of oil and water is stored, the same will be transferred via tanker to following location. Following are the steps require to be followed.

1. Oil Water Separator: Capacity 25 m3/hr.
2. Effluent Treatment Plant: Capacity 120 KLD
3. Parallely oil recyclers will be approached for the collection and transportation of the oily water.
4. Contaminated Soil / Sediments will be directly sent to the Treatment Storage and Disposal Facility (TSDF) site. List of Oil recyclers and TSDF sites are shown in Annexure – 15
5. Different types of equipment & manpower require for creating dug pond:

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Name of Equipment	**Quantity**	**Primary Responsibility of Equipment & Material**	**Secondary Responsibility**
Excavator	10 Nos.	Marine Dept.	MHS section (Dry Cargo) / Asset Department / Procurement
JCB Machines	10 Nos.	Marine Dept.	ES Civil / Asset Department / Procurement
Material			
HDPE Liners for dug pond	10600 Sq. mtr.	Marine Dept.	Stores & Procurement

In phase wise manner stored oily water will be treated at both the above facility to separate oil from water to the possible extent. Whereas, after recovery of oil from water, water confirming to the effluent discharge limit of oil (< 10 ppm) will be discharged in to sea.

Whereas in case oily water will not capable of treat at OWS & ETP will be dispose through sending it to registered recyclers, for which APSEZL have already done tie up with the registered recyclers as mentioned in **Annexure – 15**.

APSEZL have also done necessary tie up with various institutes/agency/NGO as mentioned in **Annexure – 16** for providing service for rescue & rehabilitation of oil socked birds as well as restoration of mangroves, when oil reaches to the sea shore and mangrove areas during oil spill. Mobile van / vehicle require for rescue of oil socked birds to transfer from affected area to treatment facility center.

4 Equipment

4.1 Marine oil spill response equipment

Detailed in Annexure 3

4.2 Inspection, maintenance and testing

The equipments are being kept in working condition. Routine inspection, maintenance and testing performed as per the stipulated requirements.

4.3 Shoreline equipment, supplies and services

The shoreline clean-up equipment which are essential for the oil removal operations at beaches are as follows:-

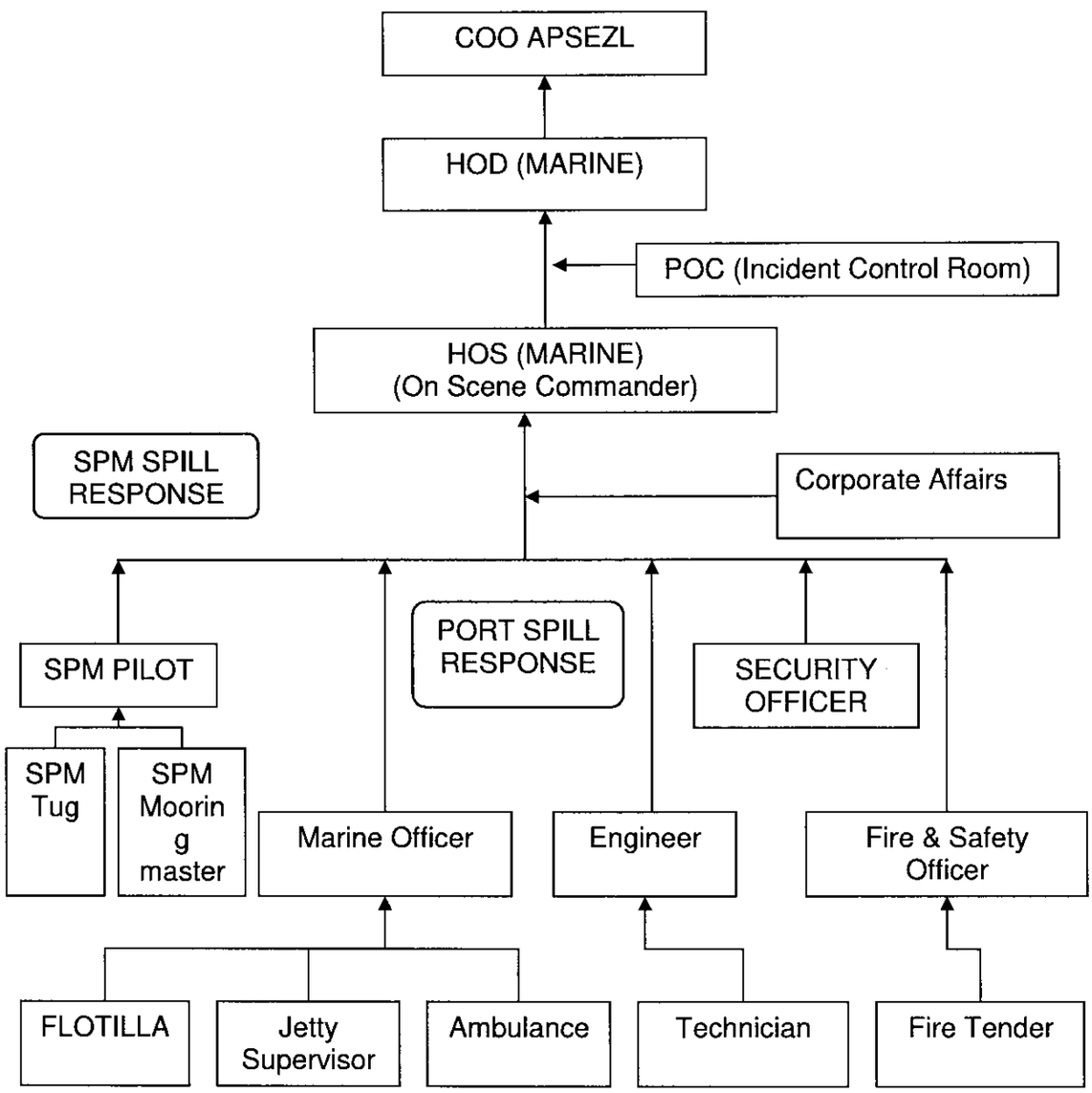
- Protective clothing for everybody (including boots and gloves), spare clothing.
- Cleaning material, rags, soap, detergents, and brushes.
- Equipment to clean clothes, machinery, etc., with jets of hot water.
- Plastic bags (heavy duty) for collecting oily debris.
- Heavy duty plastic sheets for storage areas especially for the lining of temporary storage pits.
- Spades, shovels, scrapers, buckets, rakes
- Ropes and lines
- Anchors, buoys
- Lamps and portable generators
- Whistles
- First Aid material.

5 Management

5.1 Crisis manager and financial authorities

The COO of APSEZL is the final authority of the oil spill response in case of a Tier 1 scenario. He is responsible for raising the level of the response if required and summoning additional help. The authority of all financial decisions rest with him.

5.2 Incident organization chart



5.3 Manpower availability (on-site, on call)

In an event of incident Kandla Port Trust, Gujarat Maritime Board, Gulf of Kutch Ports, District and Regional plans are deemed to have been implemented. Adani Ports and Special Economic Zone Limited (APSEZL) manpower and resources will be put at the disposal and will be deployed as required, provided APSEZL is the polluter and spill is within the Port Limits.

In the event of APSEZL not being the polluter and any event outside the port limit of Adani Port, APSEZL equipment will be subject to mutual assistance plan and it will be the responsibility of the above forum.

5.4 Availability of additional manpower

Similarly in the event of APSEZL being the polluter, additional manpower and supplies can be requested from the resources which are part of this forum.

A numbers of private parties have their labor force working round the clock in the port and on call these can be available.

5.5 Advisors and experts – spill response, wildlife and marine environment

APSEZL, being the nodal agency in this LOS-DCP, will function as the main agency. In the event of the emergency getting raised to higher tier, i.e. in case the incidence becomes a national disaster, the help and advice of Indian Coast Guard will be taken.

5.6 Training / safety schedules and drill / exercise programme

Training of all APSEZL staff who may get involved in implementing this plan is acknowledged. In house and external facilities (of ICG) are used periodically to impart training as per matrix below. Marine Manager has been appointed as training coordinator and custodian of oil pollution equipment. He shall organize training, drills and inspection of equipment as per the plan in force.

Training Module	Duration	Frequency	Participants	Remarks
IMO Model Course	2-5 days	Once	Key persons	By Maritime Training Institute
Oil Spill	1-5 days	Once every 5 years	Key persons	Coast Guard
Oil spill equipment	1-5 days	Once every Year	Managers	In house
Oil spillManagement course	1 day	Once every year	Managers & junior staff	In house for in-depth knowledge
Notification exercise	1-2 hours	6 months	Operational staff	Check systems & communication
Table top	2-6 hours	12 months	Managers	Interactive discussions
Incident	6-8 hours	12 months with others	All	Mock drill

Number of IMO Level-1 and IMO Level-2 qualified staff available with Adani Ports and SEZ Ltd, Mundra:
IMO Level-1 - 30
IMO Level-2 - 03

6 Communications

6.1 Incident control room facilities
Detailed in Annexure 3

6.2 Field communication equipment
Detailed in Annexure 3

6.3 Reports, manuals, maps, charts and incident logs
A copy of the relevant manual is kept with HOD – Marine. Maps/ Charts of APSEZL are kept in Marine Control Tower and attached in Annexures

Action and operations

7 Initial procedures

7.1 Notification of oil spill to concerned authorities

The emergency (due to spill) should be initiated by the first person noticing it by activating the fire alarm from the nearest call-point or by contacting the fire control room immediately on the internal telephone or through mobile phone or through VHF Channel.

The SPM Pilot or On Scene Commander will report the spill to the Marine Control Room.

7.2 Preliminary estimate of response tier

The first few minutes after the incident / accident are invariably the most critical period in prevention of escalation. Therefore the person available at or near the incident site (and often responsible for carrying out that particular activity) on round the clock basis play a vital role in an emergency. The SPM Pilot or On Scene Commander will report the spill to the control room along with his estimate of the response tier.

7.3 Notifying key team members and authorities

Statutory First Information Report (FIR - given in annexure 1) is to be communicated by fastest means possible to President, GMB port and CG at Porbandar followed by full Pollution Report (POLREP – given in annexure 2). The report is to be updated, should the oil spill not be contained and likely to increase to Tier 2

7.4 Manning Control Room

Auxiliary control center is located at Port Operation Centre. Escalation of emergency if any is monitored here. Statutory reporting procedures of FIR and POLREP of developing situation and action taken are also sent from this center. The detail of the contacts to whom the information is to be given is placed at Annexure 4.

7.5 Collecting information (oil type, sea / wind forecasts, aerial surveillance, beach reports)

Marine Manager has the responsibility of arranging the collection of the relevant information which will help in mitigating the emergency

7.6 Estimating fate of slick (24, 48, 72 hours)

Considering the prevalent tidal stream, wind and weather conditions, section 8.3 is to be used in estimating the fate of the slick

7.7 Identifying resources immediately at risk, informing parties

Depending on the quantity of fluid spilled and the prevalent wind & weather conditions, the resources / facilities immediately at risk have to be identified by the On scene commander and the concerned parties informed.

8 Operations planning

8.1 Assembling full response team

On being appraised of the spill, the duty marine officer will inform the marine manager, who will, in turn initiate the assembly of the complete response team which essentially involves relaying information to all relevant personnel, parties and authorities and informing them of the initial response requirements.

8.2 Identifying immediate response priorities

Depending on the initial estimated response tier and the prevalent weather conditions, the marine manager, in consultation with the on scene SPM pilot / marine officer will identify the immediate resources at risk and the response priorities.

8.3 Mobilizing immediate response

The Manager - Marine will initiate the mobilization procedure of the spill equipment, resources and personnel depending on the scale of emergency at hand.

8.4 Media briefing

No other person is authorized to communicate with any external party by any means whatsoever unless expressly permitted by the HOD – Marine or COO, APSEZL.

8.5 Planning medium-term operations (24, 48 and 72 hour)

The HOD – Marine will plan the subsequent action to be taken in response to the tier 1 spill after the initial response is well under way and its consequences / effectiveness are duly evaluated.

8.6 Deciding to escalate response to higher tier

After carefully assessing the scenario and appraising the efficiency of the initial response in the prevalent conditions, the HOD – Marine will decide whether or not to escalate the response.

8.7 Mobilizing or placing on standby resources required

It is recommended that in case of a doubt (as the exact estimate of the quantity of oil spilled is quite difficult and the boundaries between the tiers will inevitably be blurred) it is important to be prepared to involve the next higher tier from the earliest moments. It is easier to stand down an alerted system than to try to escalate a response by calling up unprepared reserves at a late stage.

8.8 Establishing field command post communications

Communications between the Emergency Response Center/ Marine Control room and marine personnel during the response to any oil spillage will be primarily by VHF marine band radio on Channel 73 or 77

Communications between the Marine Control Room and other vessels will be established on VHF radio Channel 16 and will thereafter be conducted on Channel 73 / 77.

Use of cellular telephones will be minimized.

Communications between the Emergency Response Center/ Marine Control Room and external authorities and organizations will be undertaken by telephone and facsimile.

9 Control of operations

9.1 Establishing a Management team with experts and advisors

Detailed in Annexure **4**

9.2 Updating information (sea, wind, weather forecasts, aerial surveillance, beach reports)

The Marine Control Room is well equipped in assimilating data on weather and its forecasts. In case of a Tier 1 response, aerial surveillance and beach reports are not deemed to be essential

9.3 Reviewing and planning operations

Ongoing response and its influence in mitigating the situation will have to be constantly under review in order to contain the spill at the earliest.

9.4 Obtaining additional equipment, supplies, manpower

While deciding not to elevate the tier of the response the HOD- marine may still request additional resources from nearby port facilities which are essentially members of the common forum and are obliged to assist.

9.5 Preparing daily incident log and management reports

A complete report will be submitted by the Marine Manager to the HOD (Marine) every morning (in case the response extends to more than 1 day).
Format for the above report in Annexure 9

9.6 Preparing operations accounting and financial reports

The Port's accounting department will assess the expenditure incurred in the ongoing operation and submit a report to the President's office.

9.7 Preparing releases for public and press conferences

The COO's office, HOD – Marine and the Corporate communications cell will formulate the requisite press releases from time to time and hold press conferences.

9.8 Briefing local and government officials

The COO's office, HOD – Marine and the Corporate communications cell will formulate the requisite reports to brief local and government officials..

10 Termination of operations

10.1 Deciding final and optimal levels of beach clean-up

If at all a distant beach is affected, the COO APSEZL office will decide the optimal levels of cleanup in consultation with the conservator of the port – Gujarat Maritime Board Port Officer.

10.2 Standing down equipment, cleaning, maintaining, replacing

Considering the natural disintegration of the residual oil on water after the cleanup of the bulk amount, The HOD – Marine will decide when to stand down the response. The resources which have been used will have to be re-instated to the original condition by elaborate cleanup or replacement.

10.3 Preparing formal detailed report

The COO's office, HOD – Marine and the Corporate communications cell will formulate the requisite reports to brief local and government officials and media.

10.4 Reviewing plans and procedures from lessons learnt

A complete spill response report will be produced by the Marine manager providing comprehensive and all-inclusive details of the circumstances leading to the spill, initial response and consequent affect of the same, subsequent follow up, effect of prevailing weather, adverse situations, safety issues, difficulties faced and lessons learnt.
Requisite changes will be affected to this plan on basis of such report.

Such a report will also be prepared by the marine manager after each drill or training session and requisite modification(s) incorporated to the plan in order to enhance the overall efficacy of the same.

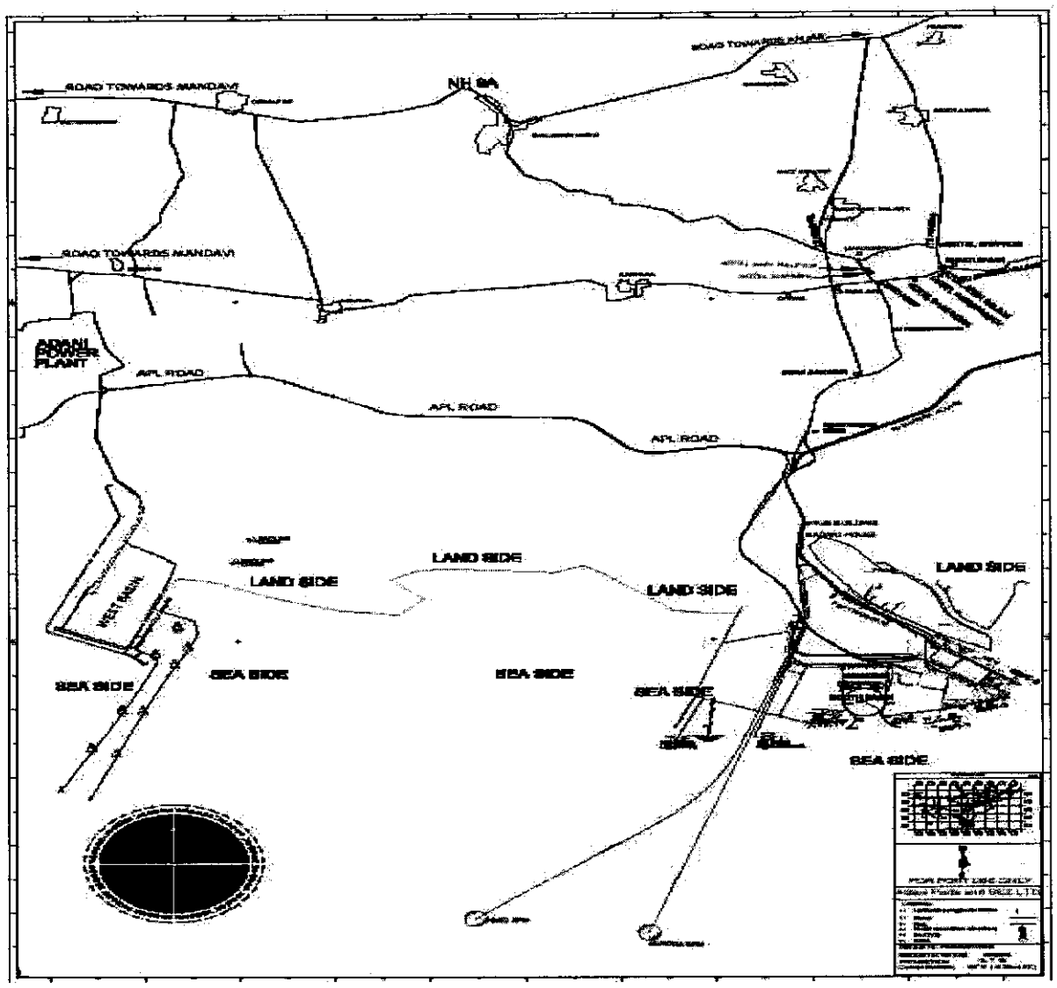
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MUNDRA
OIL SPILL CONTINGENCY RESPONSE PLAN

Data Directory

Maps / Charts

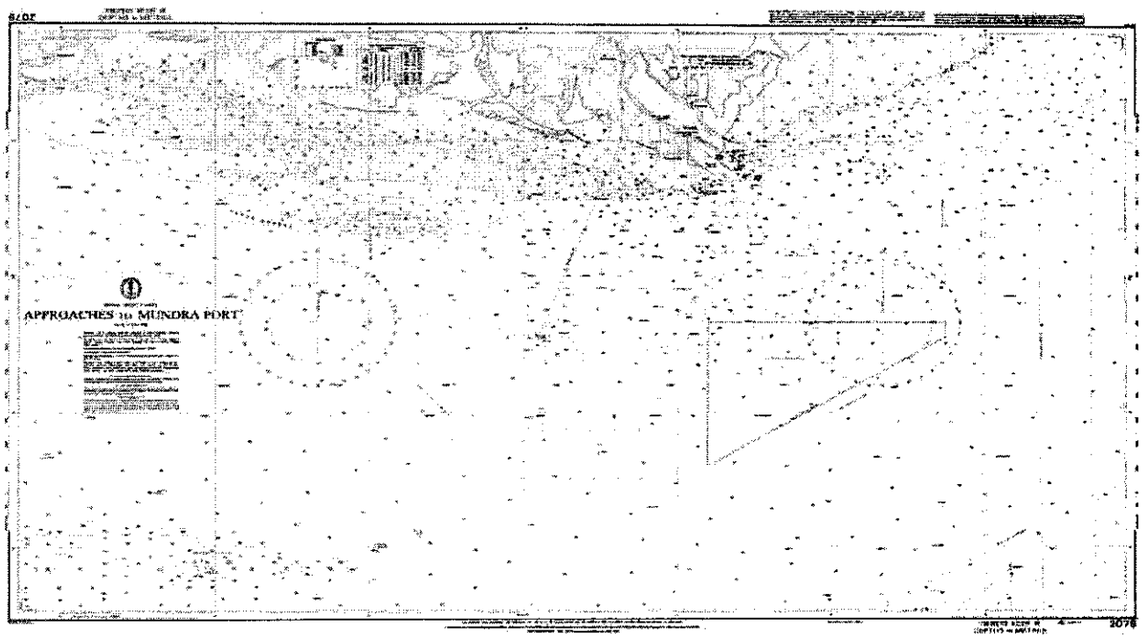
1. Coastal facilities, access roads, hotels etc.

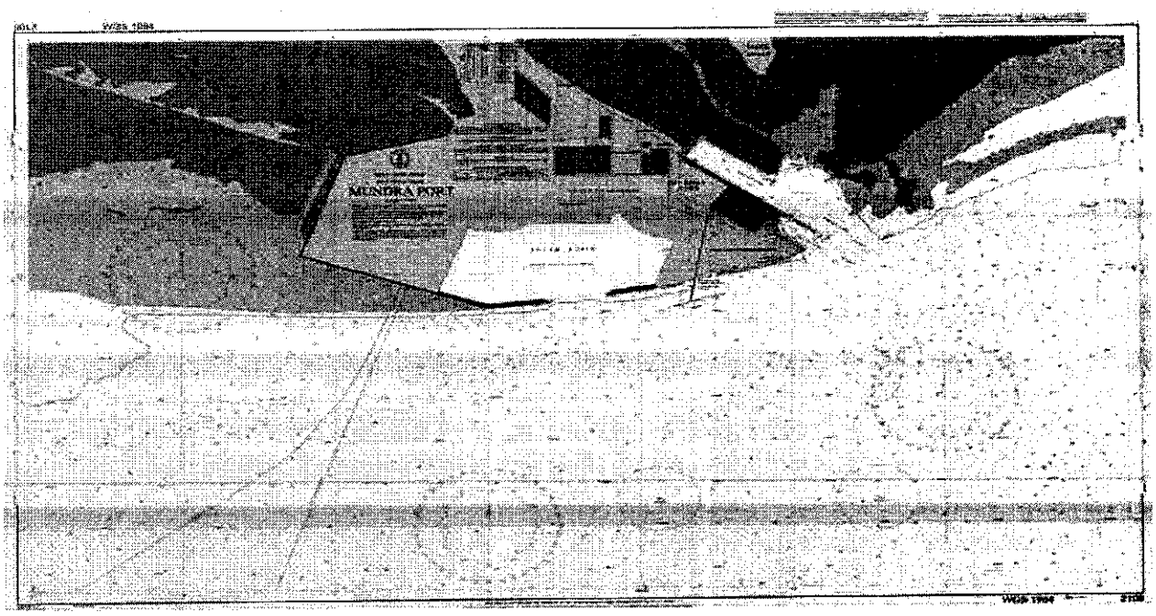


Telephones: Detailed in Annexure **4**

2. Coastal charts, currents, tidal information (ranges and streams), prevailing winds

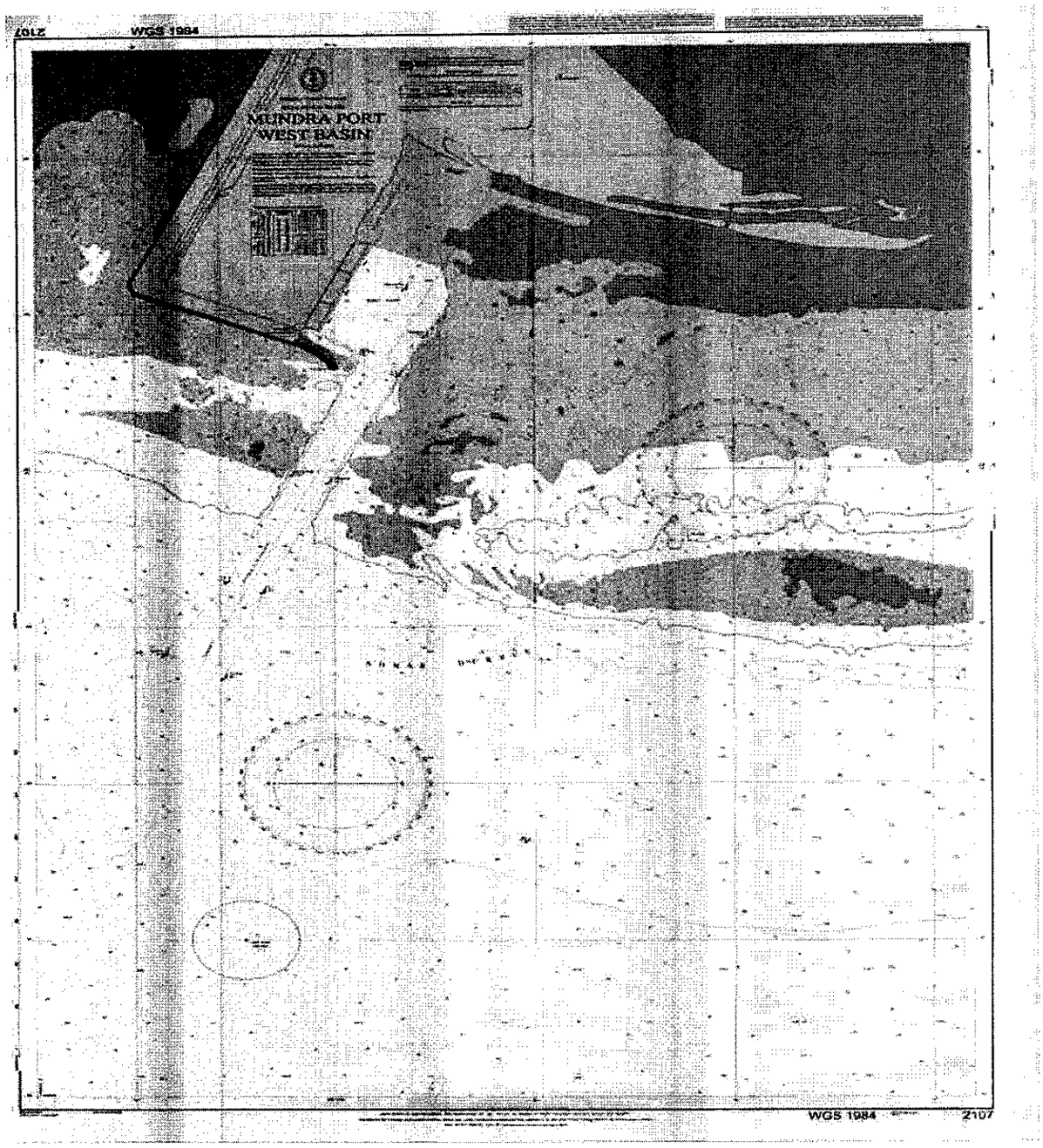
Currents, tidal information (ranges and streams) : Detailed in Annexure- II, Annexure- III and Annexure- IV (Volume 2) of Oil Spill Risk Assessment





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OIL SPILL CONTINGENCY RESPONSE PLAN



3. Risk locations and probable fate of oil

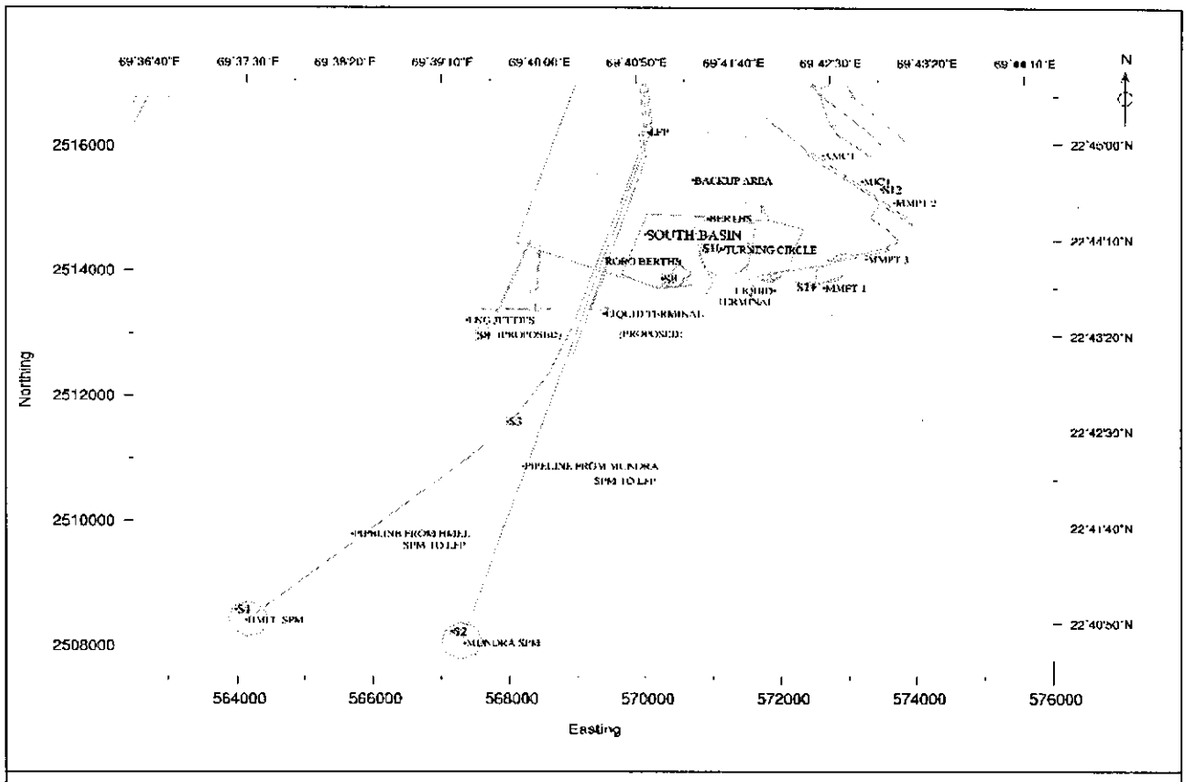


Fig.1: General layout of the Mundra port facilities of APSEZL showing the location of Spill Points for SPMs, South Basin berths, LNG jetty and existing berths

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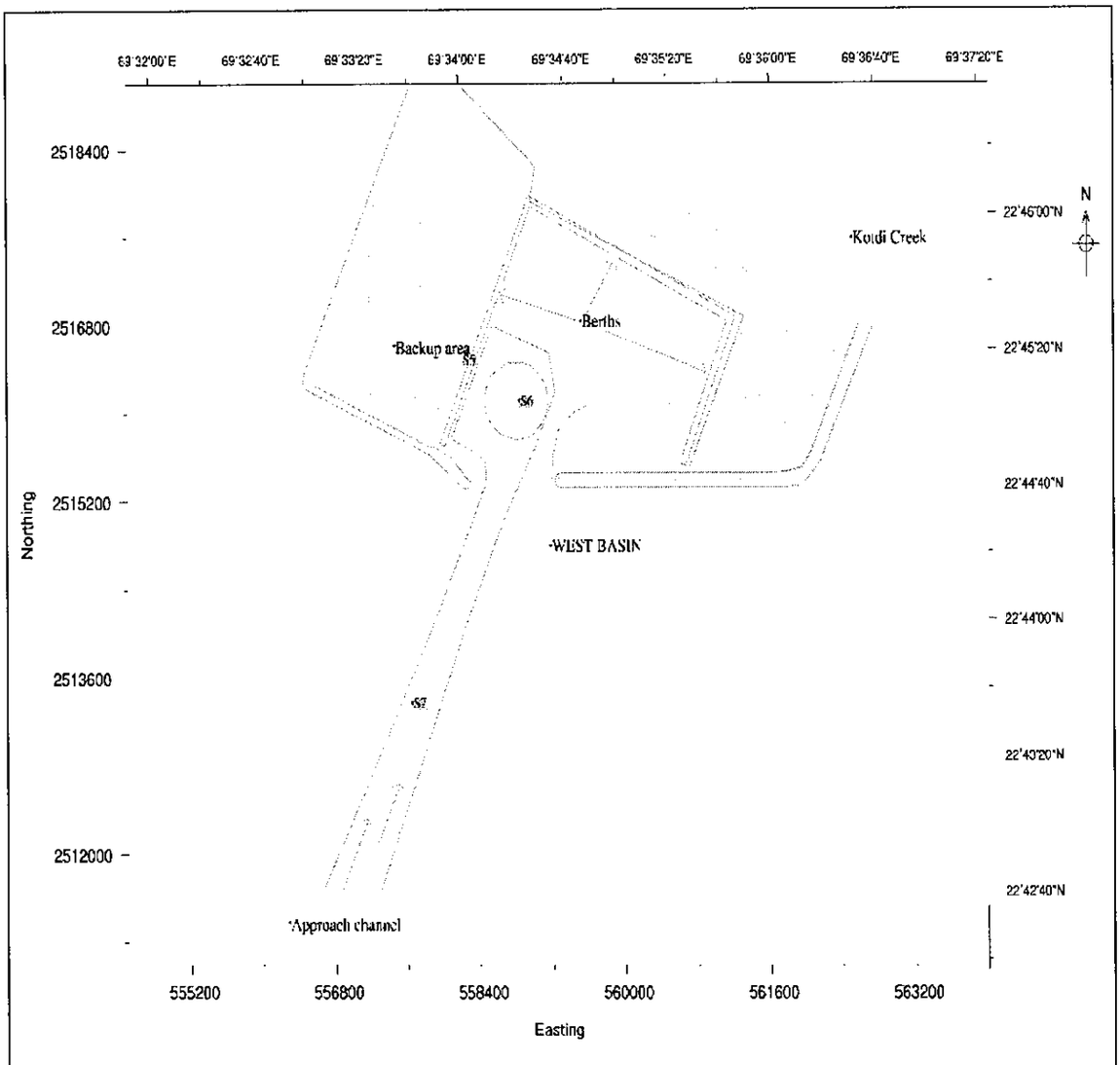


Fig.2: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for West Basin

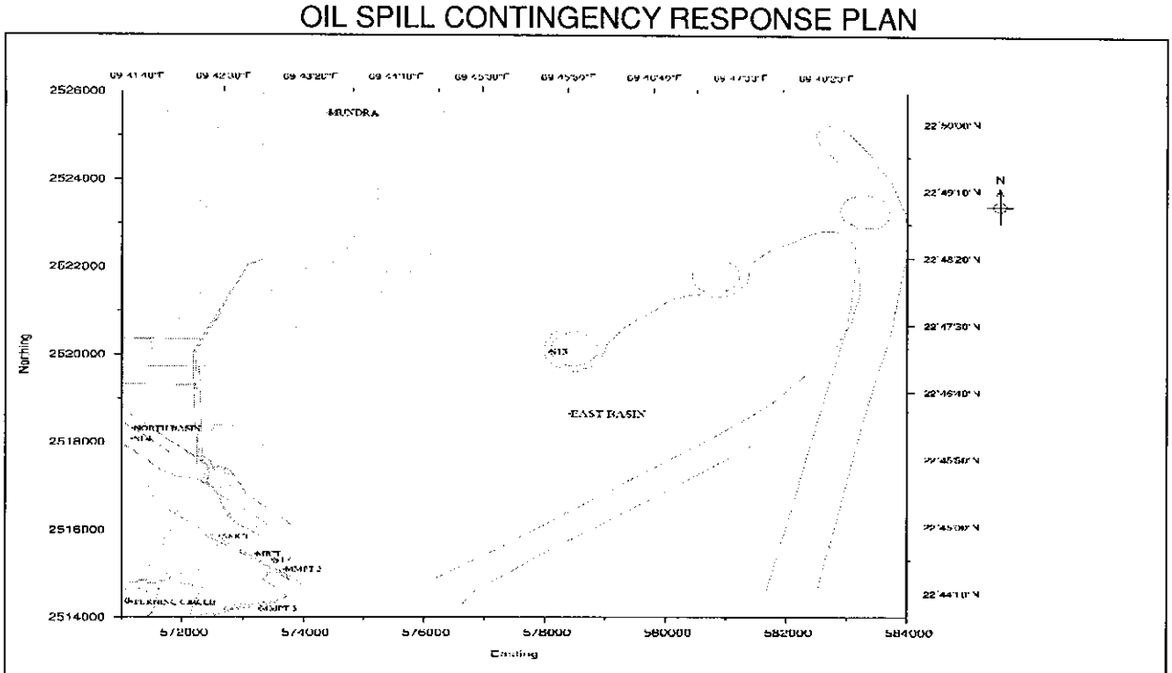
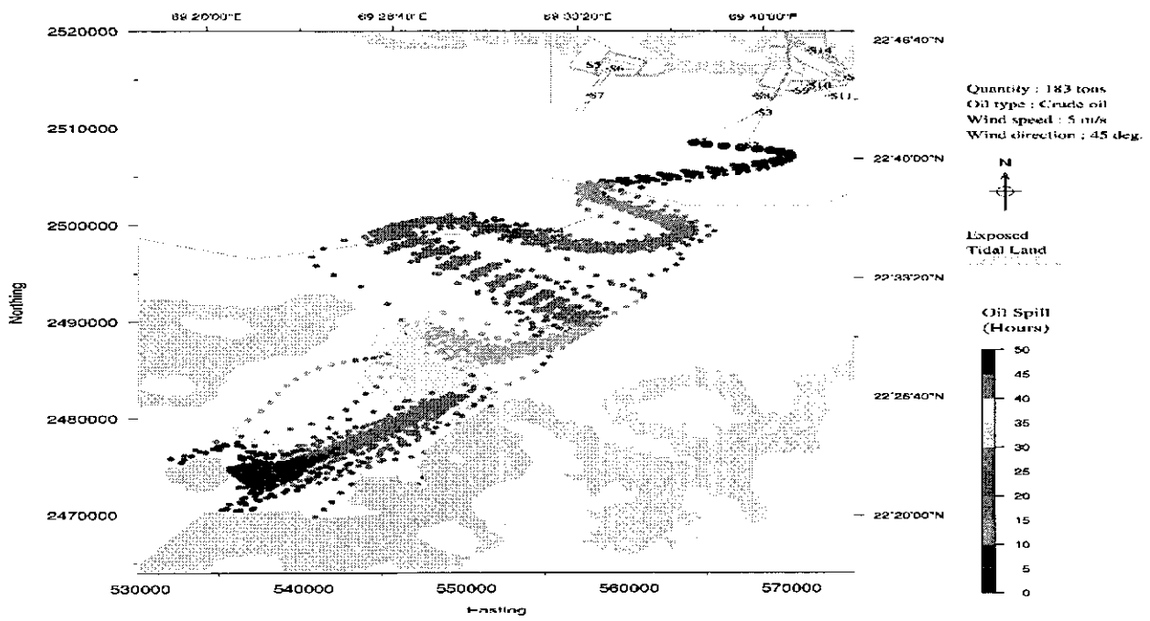
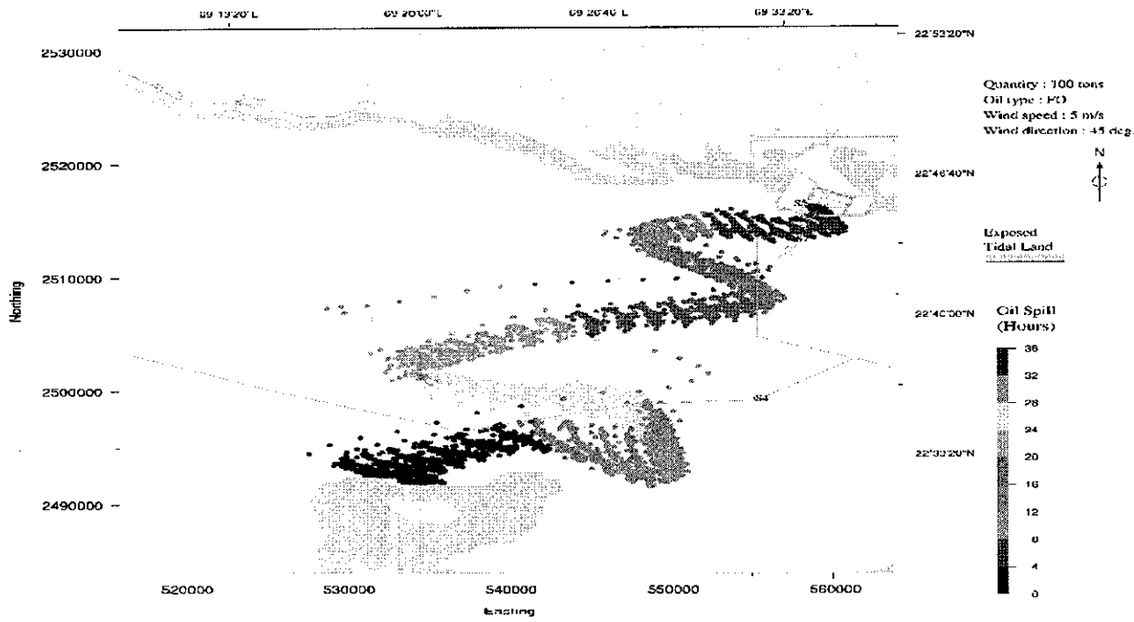


Fig.3: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for North Basin & East Basin



Oil Spill trajectory due to instantaneous crude oil leakage of 700 t (due to collision) at spill point S1 (HMEL SPM) after 50 hours during flood condition of the neap tide

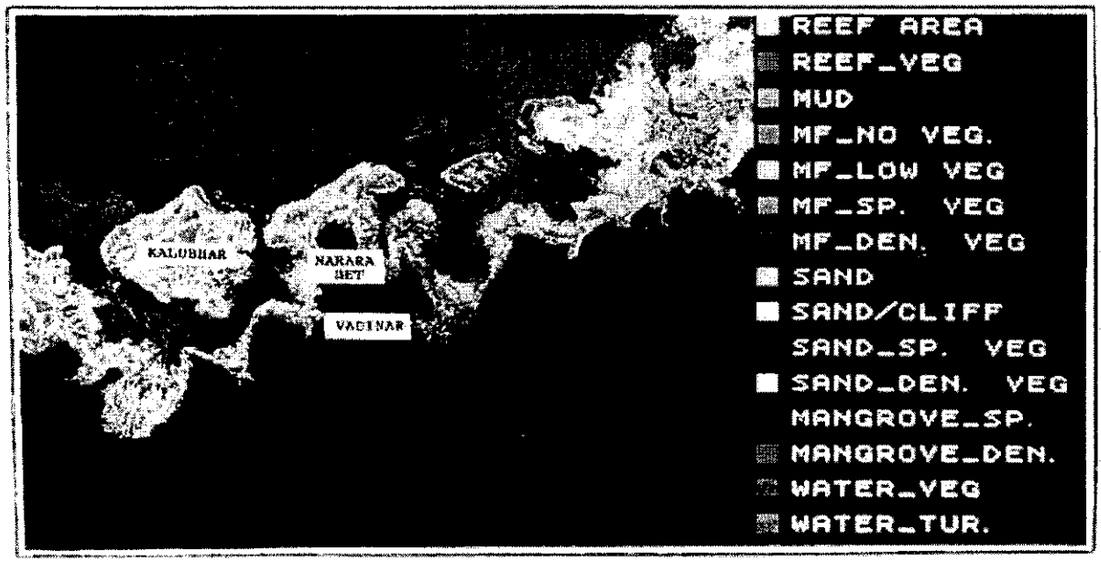
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Oil Spill trajectory due to instantaneous FO leakage of 700 t (due to hull failure/ fire / explosion) at typical berth location in the West Basin

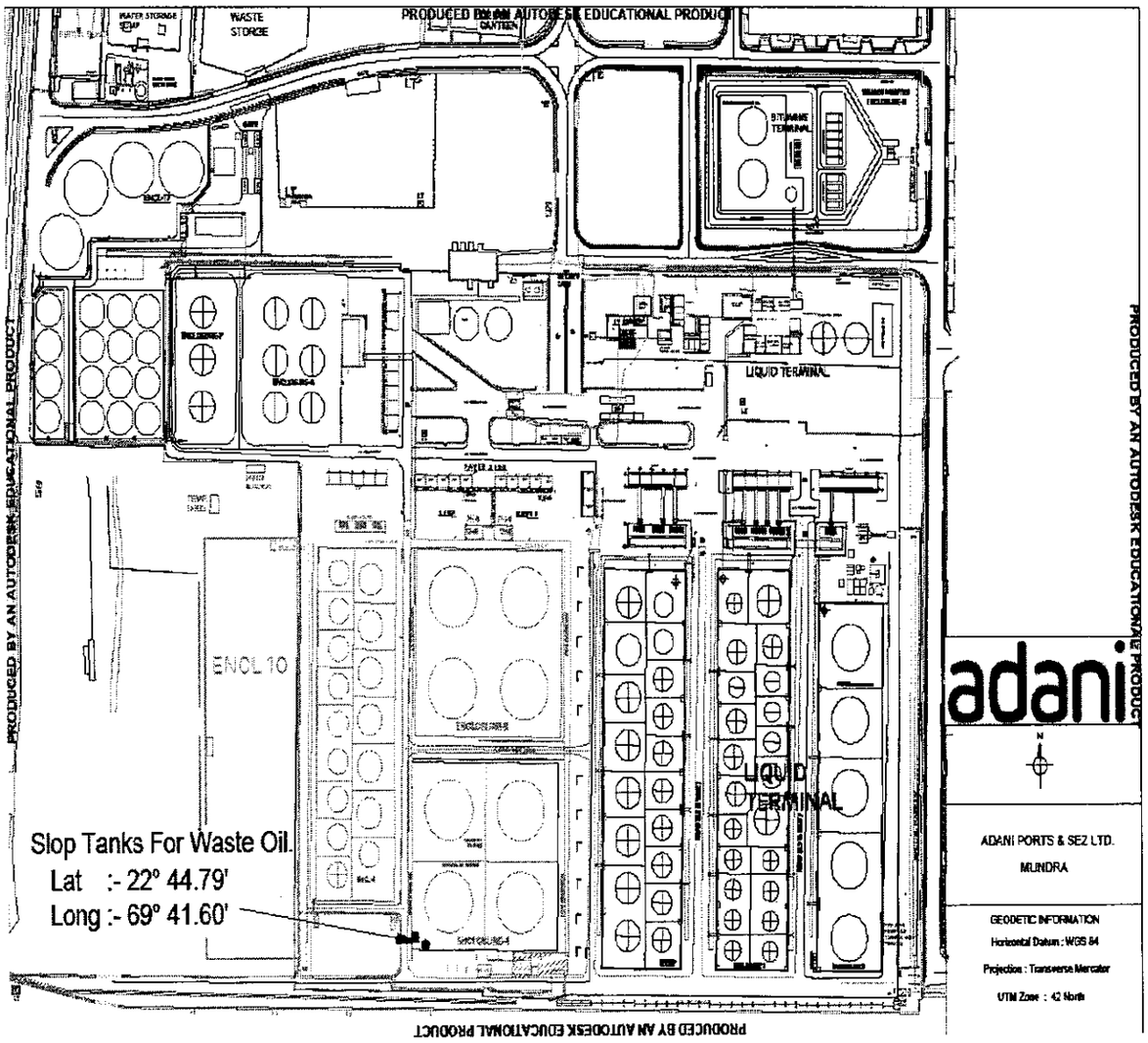
For Risk locations and probable fate of oil refer Annexure- V (Volume 2) of Oil Spill Risk Assessment.

Shoreline resources for priority protection



Oil and Waste Storage / Disposal sites

Oil and Waste storage / Disposal tank No. 46, 109 and 110 are available within Liquid Tank farm.



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Sensitivity Maps/ Atlas

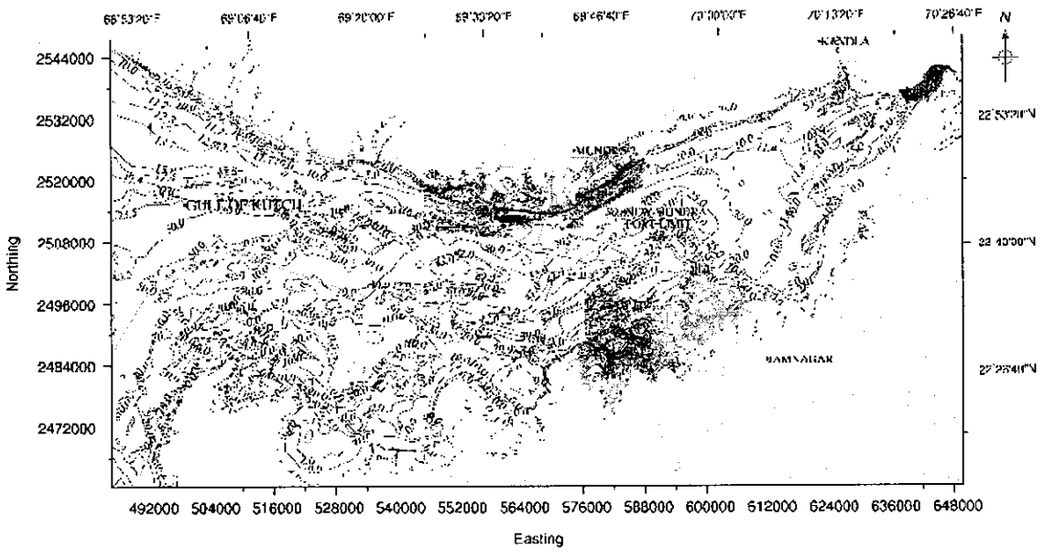


Fig.A1.1 Terrain features of study domain.

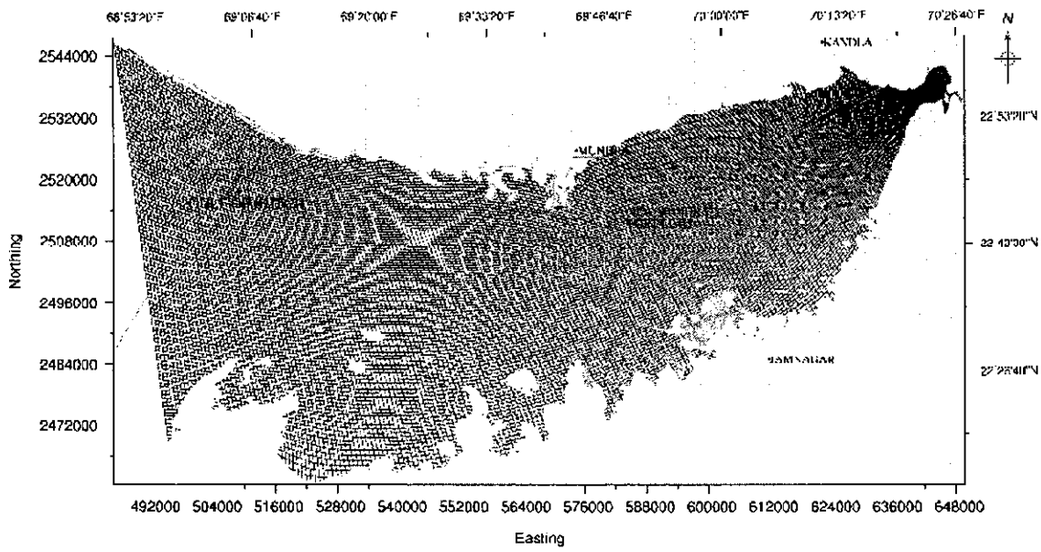


Fig.A1.2 Computational grid

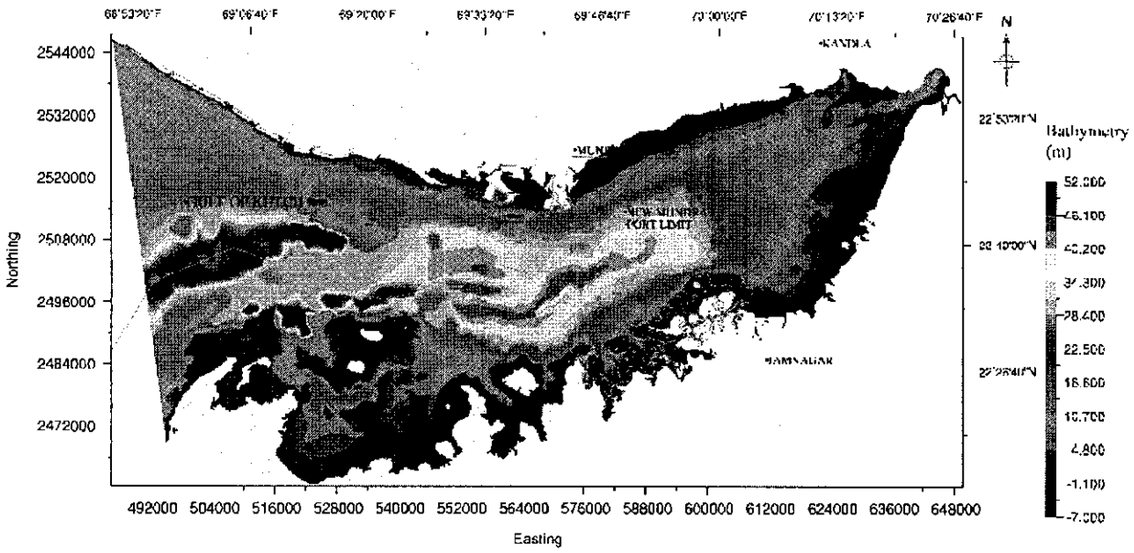


Fig.A1.3 Interpolated depth contours

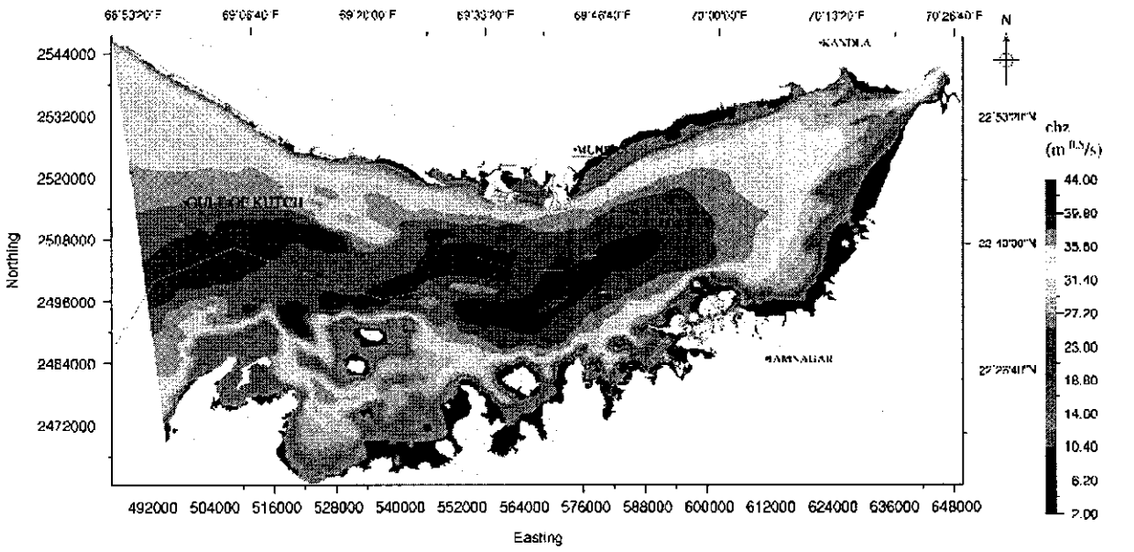


Fig.A1.4 Chezy's coefficient

Lists

1. **Primary Oil spill Equipment:** booms, skimmers, spray equipment, dispersant, absorbents, oil storage, Radio communications etc.

   Detailed in Annexure **3**

2. **Auxiliary Equipment:** Tugs and work boats, aircraft, vacuum trucks, tanks and barges, loaders and graders, plastic bags, tools, protective clothing, communication equipment etc.

   Detailed in Annexure **3**

3. **Support Equipment:** Aircraft, communications, catering, housing, transport, field sanitation and shelter etc. (Availability, contact, cost and conditions)

   Not applicable

4. **Sources of Manpower:** Contractors, local authorities, caterers, security firms (Availability, numbers, skills, contact, cost and conditions)

   Refer Para 5.3

5. **Experts and Advisors:** Environment, safety, auditing (Availability, contact, cost and conditions)

   Detailed in Annexure **4**

6. **Local and National Government contacts:** Name, rank and responsibility, address, telephone, fax, telex.

   Detailed in Annexure **4**

Data

1. **Specification of Oils commonly traded**

At the liquid berth, the representative products that would be handled are petroleum products like FO/ HSD / SKO / MS / CBFS / CPO / Naphtha etc. Vessels calling at the port will be having FO and HSD for their propulsion requirements.. The products like MS, Naphtha etc are oils of non – persistent nature; they tend to evaporate fast and will not stay long on the surface of the sea waters. Hence spill studies have been carried out for FO and HSD spills at the berths.

At the SPMs, Crude oil unloading takes place.

Physical and Chemical Properties of products handled at the SPMs, Berths and of the propulsion fuels of the ships / tankers

Data on the properties for the hydrocarbons / products handled at the jetty is required for quantitative hazard identification and consequence calculations. The properties of the FO and HSD, the petroleum hydrocarbons likely to be spilled due to the operations at the jetty are given in Table-3.1.

Table-3.1: Properties of Crude Oil, FO and Diesel

Sl. No	Chemical	Boiling Range (° C)	Specific Heat of Liquid (J/Kg ° K)	Heat of Evaporation (x 10^5 J/Kg)	Heat of Combustion (x 10^5 J/Kg)
1	Crude Oil	IBP - 700+	2385	3.4	425
2	HSD	200 - 350	2889	4.65	448
3	Fuel Oil	180 - 450	2500	3.4	452

The following characteristics of oil are used for modelling study:

(a) Crude Oil
Sp. Gr = 0.82 to 0.88
Surface Tension =3.0 e-03
Molar Volume =0.002
Viscosity: 275 CST at 37.8 deg C
Wax content: 12 – 19 %
Pour point of untreated crude: 30 deg C
Pour point of treated crude: 18 deg C

(b) FO
Sp. Gr = 0.92
Boiling point = > 260^0 C
Vapor pressure = < 0.1 psia at 21^0 C

(c) HSD
Sp. Gr = 0.86
Pour point = 6^0 C - 18^0 C
Vapor pressure = 2.12 to 26 mm Hg at 21^0 C

2. Wind and weather

Meteorological and Oceanographic Conditions

The met-ocean conditions have been previously ascertained at several stages in the course of various studies conducted in past in respect of Mundra port projects. Flow modeling for the Mundra port location has been covered in the model developed by Environ, India, who have developed the model for whole of Gulf as relevant to Mundra region. It has been observed during model studies that flow regime does not have significant changes due to the proposed developments. The following are the main hydo-meteorological parameters for planning and designing of the marine facilities described below.

Rainfall and Temperature

The Kutch is a semi-arid region with weak and erratic rainfall confined largely to June-October period. With a few rainfall days, the climate is hot and humid from April till October and pleasant during brief winter from December to February. Although the monthly mean maximum temperature recorded is 37°C during 2005, it occasionally exceeds 40°C. Rainfall alone forms the ultimate source of freshwater resource to the region. The average rainfall at Mundra is about 400 mm/year.

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Cyclones

Cyclonic disturbances strike North-Gujarat, particularly the Kachchh and Saurashtra regions, periodically. These disturbances generally originate over the Arabian Sea and sometimes the Bay of Bengal. Generally during June, the storms are confined to the area North of 15°N and East of 65°E. In August, the initial stages, they move along the northwest course and show a large latitudinal scatter. West of 80°E, the tracks tend to curve towards North. During October the direction of movement of a storm is to the West in the Arabian Sea. However, East of 70E some of the storms move North-Northwest and later recurves North East to strike Gujarat-North Mekran coast.

Wind

There are strong winds at times at Mundra Port. The month wise wind rose diagrams for the year 2012 and for the months of January and February of the year 2013 are given below. In the period lasting over months March to May the wind direction is generally SWW (225° - 250°) and velocity varies from 20 to 25 Knots. From June through August, the wind direction is predominantly SW and velocity varies from 25 to 30 Knots with short gusts going up to 35 to 40 Knots. Towards end of September and through October wind direction changes to NE with velocities ranging from 7 to 10 Knots. Direction remaining same the velocity varies 10 knots to 25 Knots in the period November to January. February is the calm period when wind direction is Southerly with velocity in the range of 7 Knots. Stormy weather may generate winds having velocity up to 100 Knots which should be taken as the worst case scenario for design of tall structures and heavy duty cranes.

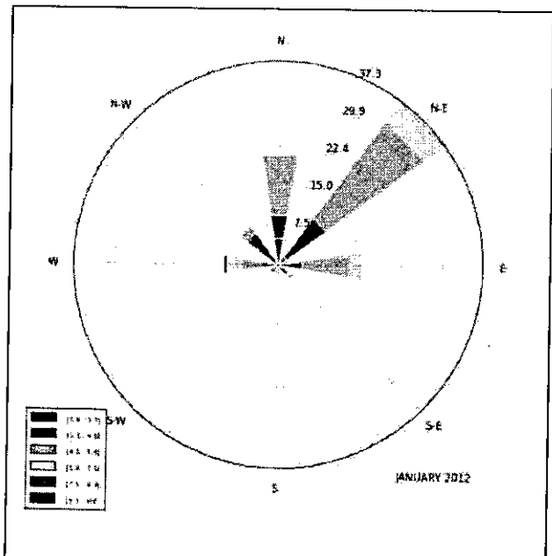


Fig.1.5 January 2012 winds

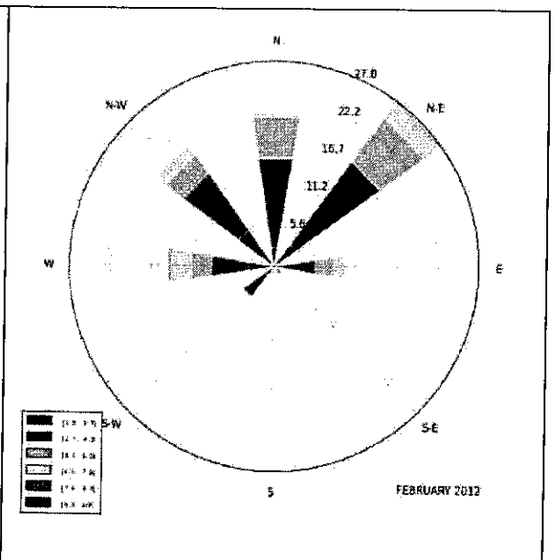


Fig.1.6 February 2012 winds

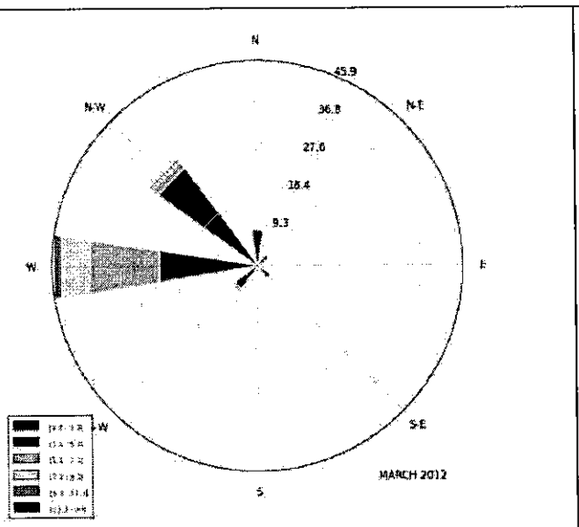


Fig.1.7 March 2012 winds

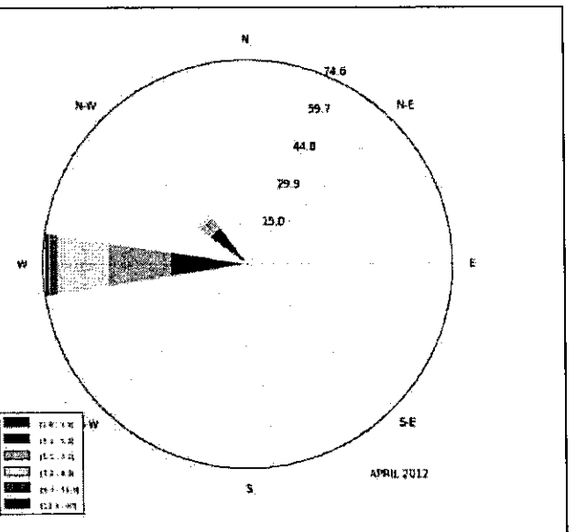


Fig.1.8 April 2012 winds

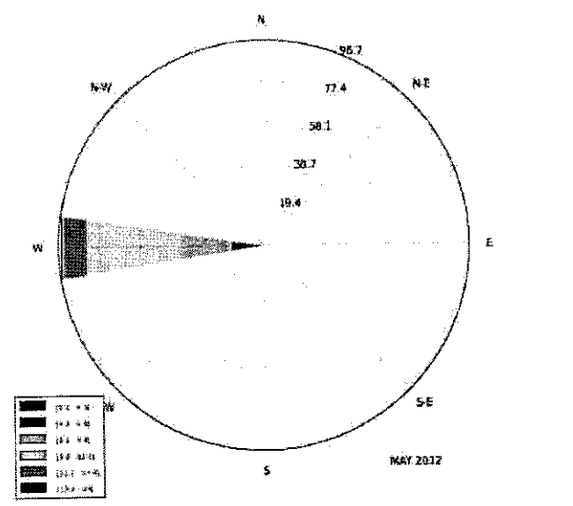


Fig.1.9 May 2012 winds

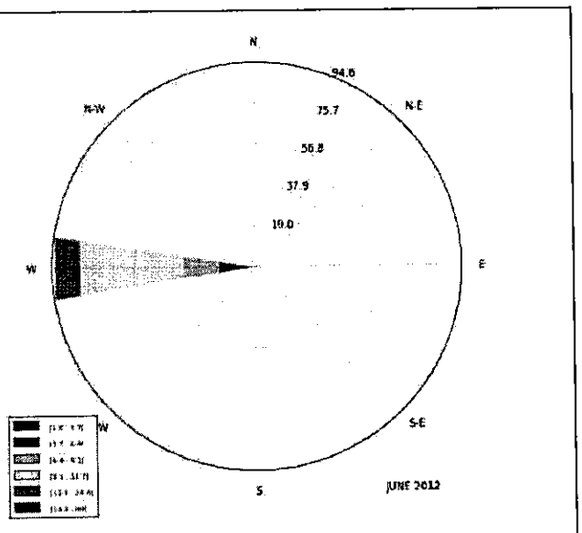


Fig.1.10 June 2012 winds

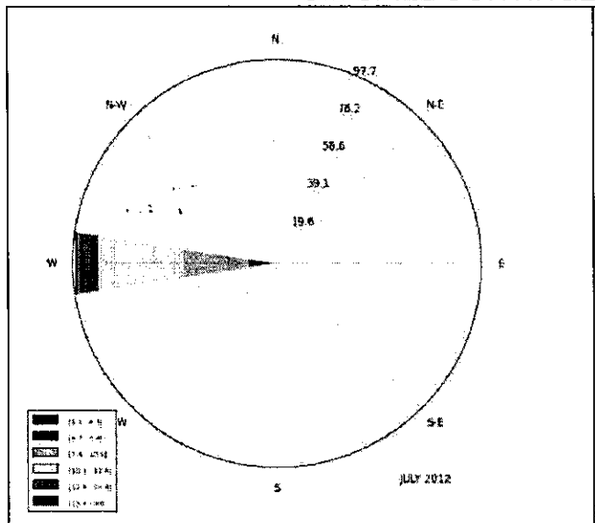


Fig.1.11 July 2012 winds

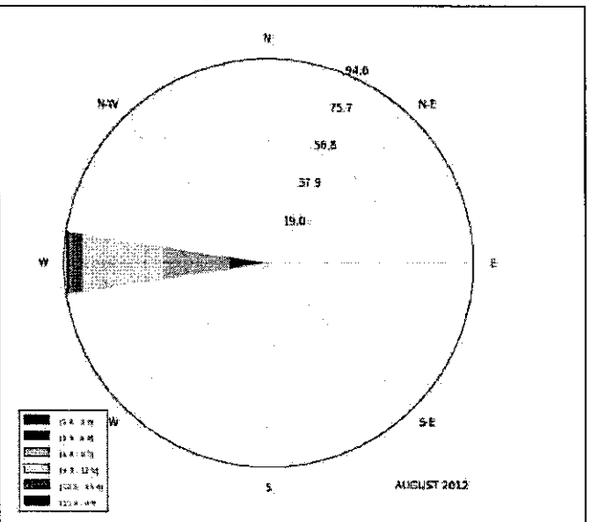


Fig.1.12 August 2012 winds

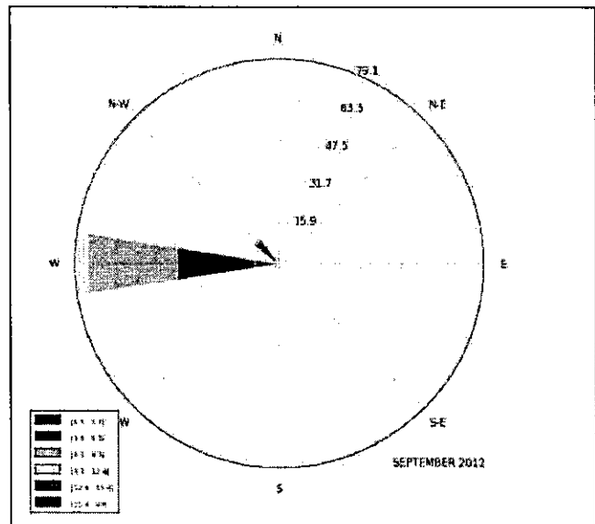


Fig.1.13 September 2012 winds

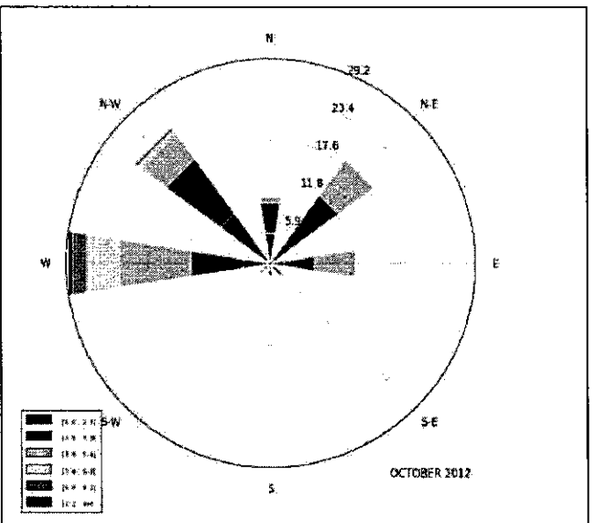


Fig.1.14 October 2012 winds

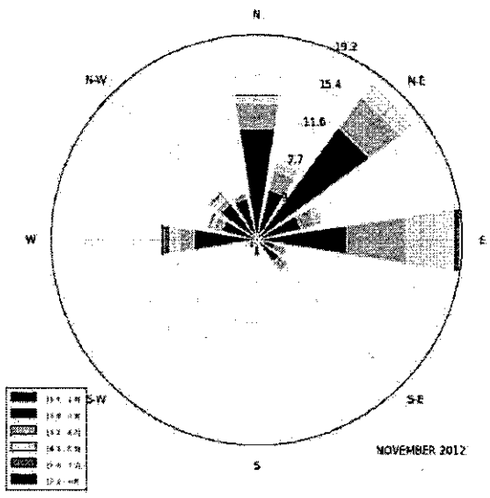


Fig.1.15 November 2012 winds

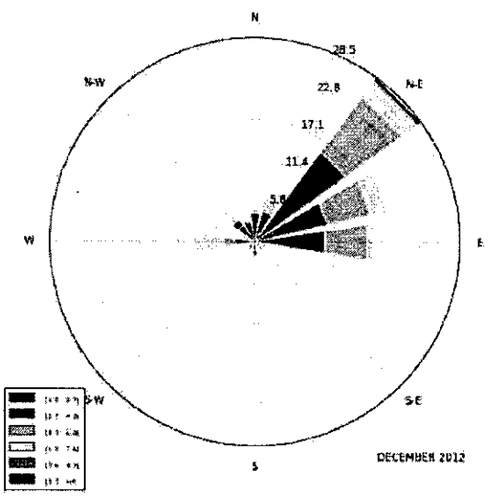


Fig.1.16 December 2012 winds

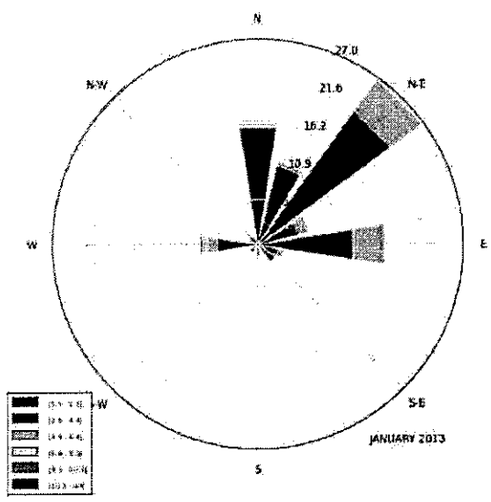


Fig.1.17 January 2013 winds

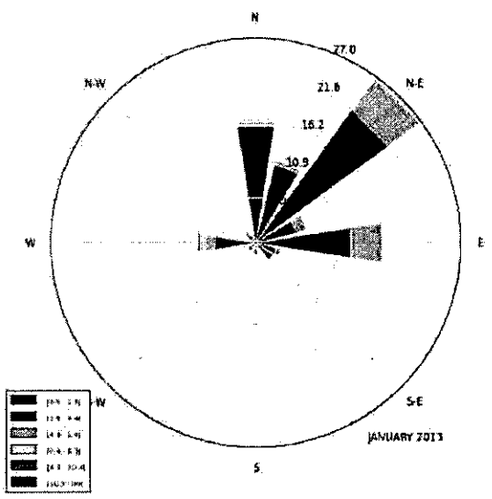


Fig.1.18 February 2013 winds
(Readings till Feb 18,2013)

Tides

The tidal planes were assessed in 1998 and are as shown in Table below.
The Highest Astronomical Tide (HAT) is estimated to be about +6.4 m above chart datum (CD), and the Lowest Astronomical Tide (LAT) to be at 0.0 m CD.

Tide	Height (m) above CD
Mean High Water Springs	5.8
Mean High Water Neaps	4.6
Mean Low Water Neaps	2.1
Mean Low Water Springs	1.0

Currents

Currents in the approaches to the port are dominated by the tidal flows, with predictable variations over diurnal, monthly and annual time scales. Currents in this part of the Gulf flow parallel to the natural sea-bed contours. Currents can be relatively strong, with speeds in excess of 3.0 Knots reported at sometimes of the year. The Admiralty Chart shows currents off Navinal point to be 3.0 Knots East & West bound. It is observed that the currents are usually aligned with the bed contours and are stronger in deeper waters off the coast. The impact of future development over the existing coast-line can be determined by the change in current speed resulting from the proposed developments.

Waves

In past HR Wallingford (HRW) has studied the wave climate considering wave energy from locally generated waves and swell propagating in to the Gulf of Kutch from the Arabian Sea. The results of the study carried out by HRW are presented in the Table below.

Design Waves at Mundra

Direction Sector (°N)	Return Period (years)	Inshore Direction (°N)	Hs (m)	T2 (sec)
210	1	222	1.2	5.0
	5	222	1.4	5.3
	20	221	1.6	5.8
	100	221	1.8	6.1
240	1	226	1.5	5.4
	5	226	1.7	5.8
	20	225	1.8	6.1
	100	225	2.0	6.5
270	1	239	1.4	5.5
	5	236	1.7	6.3
	20	236	1.8	6.7
	100	235	2.0	7.4
300	1	240	0.8	5.2
	5	240	0.9	5.6
	20	239	1.0	6.2
	100	238	1.2	6.7

Atmospheric stability is an important factor for predicting the dispersion characteristics of gases/vapours into the surrounding environment. Change in atmospheric stability is a direct consequence of the vertical

temperature structure. The stability effects are mathematically represented through Pasqual parameters. The following stability classification is employed:

Stability Class	Atmospheric Condition
A	Very Unstable
B	Unstable
C	Slightly Unstable
D	Neutral
E	Stable
F	Very Stable

Condition of atmospheric stability is estimated by a suitable method that uses dispersion parameters viz., vertical temperature gradient, profile of the winds and roughness factor. The roughness factor for the Mundra area is small since it mainly comprises of plain land.

The following meteorological information has been taken in the calculations for the Mundra area (GMB-2010):

Average ambient temperature : 30°C
Average wind speed : Wind data for the whole year 2012 is available and is used
Stability condition : F (Very Stable)

3 Information sources

This plan is prepared in accordance with:

a) Marine Environmental Impact Assessment of SPMs, COTs and connecting pipelines of APSEZL at Mundra dated February 2001, prepared by National Institute of Oceanography, Mumbai.
b) Report on Risk assessment study and On-site disaster management Plan for SPMs, COTs and connecting Pipelines of Adani Ports and Special Economic Zone Limited, by TATA AIG Risk Management Services Limited, dated February 2001.
c) HAZOP study report of SPM Terminal pipeline project by Intec Engineering, dated 26/02/2004.
d) IPIECA guide to Contingency planning for oil spills on water.
e) Oil spill risk assessment and contingency plan study done by M/s Environ Software Pvt. Ltd. (Copy enclosed)

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.
MUNDRA
OIL SPILL CONTINGENCY RESPONSE PLAN

ANNEXURES

INITIAL OIL SPILL REPORT		**ANNEXURE 1**
Particulars of person, office reporting		
Tel No.		
Date & time of incident		
Spill location		
Likely cause of spill		Witness
Initial response action		By
Any other information		

This FIR is to be sent to Marine Manager by fastest means of communication possible. It is an offence not to report oil pollution incident.

This FIR is to be followed by company's incident report also.

Following POLREP report to the Government through nearest CG information will also be required:

Identity of informant	
Time of FIR	
Source of spill	
Cause of spill	
Type of spill	
Colour code information (from CG)	
Radius of slick	
Tail	
Volume	
Quantity	
Weather	
Tide / current	
Density	
Layer thickness	
Air / Sea temp.	
Predicted slick movement	
Size of spill classification (Tier 1, 2 or 3)	

POLREP **ANNEXURE 2**

In case of an oil spill, APSEZ will provide information to Commandant Coast Guard District 1 Porbandar COMDIS 1 and Coast Guard Station Mundra in the following format:

SN.	Parameter	Data
1.	Identity of the informant	
2.	Time of information receipt	
3.	Source of Spill	
4.	Cause of Spill	
5.	Type of oil	
6.	Colour code information	
7.	Configuration	
8.	Radius	
9.	Tail	
10.	Volume	
11.	Quantity	
12.	Weathered or Fresh	
13.	Density	
14.	Viscosity	
15.	Wind	
16.	Wave Height	
17.	Current	
18.	Layer Thickness	
19.	Ambient air temperature	
20.	Ambient sea temperature	
21.	Predicted slick movement	
22.	Confirm Classification of spill size	

Additional Information :

LIST OF RESOURCES AVAILABLE — ANNEXURE 3

Tugs Available for Oil Spill Containment

Name of Tug	Type	BHP	OSD	AFFF	Capacity (cubm/Hr)	BP
Dolphin No. 3	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 4	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 7	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 10	ASD	3000 X 2	3000 ltr	-	-	70
Dolphin No. 11	ASD (DSV)	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 14	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 15	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 16	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 17	ASD	3000 X 2	3000 ltr	-	-	70
Dolphin No. 18	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Khushboo	Fixed screw	401 X 2	-	-	-	10

Dolphin No. 3, 4, 7, 10, 11, 14, 15, 16, 17 & 18 are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required. Dolphin No.3, 4, 7, 11, 14, 15, 16, 17 & 18 are fitted with a fire curtain and remote controlled fire monitors.

All above eleven Tugs have class notation as Harbour Tugs and are certified to work within the Harbour limits only.
Reception Facility : 12" pipe line, connected to a slop tank at chemical tank farm.

Dolphin 11 has fire fighting system of 1200 m3/hr along with 20 ton lifting "A" frame and diving support facility.

Location of Oil Spill Equipment: The Oil Spill Equipments are stored in SPM Store.

Resources / Equipment Available with APSEZL, Mundra

Item	Quantity
Canadyne Fence Boom (Reel model 7296/8496 with Power Pack, Towing bridles and Tow lines - 235 meter	1 no
Power pack with boom reel with hydraulic hoses	2 nos.
Power pack - 20 KV with boom reel with hydraulic hoses	2 nos.
Lamor Side Collector system (Recovery Capacity 123 m³/ hr) (Side collector LSC-3C/2300(01C02-P536). Oil transfer pump OT A 50 with oil transfer hose set	2 nos. 2 sets
Lamor Minimax 12 m³ skimmer	2 sets
Power pack for skimmers with hydraulic hoses	4 nos.
Power pack - 20 KV for skimmers with hydraulic hoses	1 no.
Floating tank (25 m³)	1 nos.
Foot pumps for floating tank	6 nos
Oil Spill Dispersants	5000 ltr
Portable dispersant storage tank: 1000 ltr capacity	1 no.
Portable pumps	2 nos.
Two – way hydraulic maneuvering panel	2 nos
Oil Containment Boom-Length 2000 metres, Height -1500 mm, Draft-900mm, Free Board-600mm	2000 mtr
Current Buster Boom-Fasflo -75 (for response in fast current)	2 Nos
Skimmer-KOMARA 15 Duplex Skimmer System with floating IMP 6 Pump.	4 Nos
12.5T Flexible Floating Storage Tank (PUA).	3 Nos
Diesel Driven Transfer Pump for Flex Barge	2 Nos
Site Hose Kit for the transfer Pump for the Flex Barge	2 Nos
3" & 2"Hose Adaptor for Transfer Pump and Hose	2 Nos
Shoreline Cleanup Equipment	
Mini Vac System	5 Nos
OSD Applicator- Oil Dispersant Spry Unit(20 Ltr) for use on Beach and Inter Tidal Zones	2 Nos
Startank with Capacity 10000 liter($10m^3$)	2 Nos
Sorbent Boom Pack(12.5cm x4 M)	500 mtr
Sorbent pad	2000 Nos

Facilities in the Marine Control room:

1. Tidal stream gauge: This can accurately read the prevalent rate of flow and direction of current.
2. Tide gauge: For accurately calculating the height of tide at any given time.
3. Wind gauge: For direction and speed of wind.
4. VHF sets (fixed and portable) with complete range of marine frequencies to be used for field operations.

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LIST OF TELEPHONE NUMBERS OF EXPERT ADVISORS **ANNEXURE 4**

List of Important Telephone Numbers of Govt. Officials and other neighboring Organisations (Expert and Advisors) related to Spill Combating Plan

SN.	Company	Name and Designation	Telephone Numbers
1.	APSEZL, Mundra	Chief Operating Officer Head Marine Pollution Response Officer Port Control	02838-6272602838-255727 02838-255727 02838-255761 / 289170 (Fax) 02838-255739
2.	Kandla Port Trust	Chairman Dy. Conservator Harbor Master Signal Station	02836-233001 / 234601 02836-223585 / 220235 02836-270201 02836-270194 / 549
3	Indian Oil Corporation, Mundra	CM (Ops) Manager (Ops) Control Room	02838- 222194 02838- 222197 02838- 224444
4	Indian Oil Corporation, Vadinar	DGM (Ops) Manager Tech Services Port Control	02833-256527 02833-256464 02833-256555
5	Reliance Petroleum Ltd Jamnagar	Marine Chief Senior Port Captain Port Control	0288-4013607 0288-4013750 0288-4012600 / 4012610
6	The Commanding Officer Indian Coast Guard Station, Mundra	ICGS, Mundra Station Ops Officer	02838 - 271402 & 03 (Tel) 02838 – 271404 (Fax)
7	The Commander Coast Guard Region (North West), Gandhinagar	COMCG (NW) Regional Ops & Plans Officer	079-23243241 (Tel) 079-23243283 (Fax)
8	The Commander No.1 Coast Guard District (Guj), Porbandar	COMDIS-1 District Ops & Plans Officer	0286-2214422 (Tel) 0286-2210559 (Fax)
9	The Commander Coast Guard Region (West) Mumbai	COMCG (W) Regional Ops & Plans Officer	022-24376133 (Tel) 022-24333727 (Fax)
10	The Officer-in-Charge Coast Guard Pollution Response Team (West), Mumbai	PRT (W) Officer-in-Charge	022-23722438 (Tel) 022-23728867 (Fax)
11	Gujarat Maritime Board	Vice Chairman & CEO Chief Nautical Officer	079-23238346 / 23238363 079-23234716

12	Ministry of Environment Govt. of Gujarat	Director (Environment)	079-23252154 / 23251062 079-23252156 (Fax)
13	Gujarat Pollution Control Board	Environmental Engineer	079-232 22756 079-232 22784 (Fax)

List Of Important Telephone Numbers Of Adani Group Personnel

S.No.	Description / contact person / designation	Telephone Nos.	
		Landline	Mobile
01	Capt. Anubhav Jain, Head – Marine & PFSO, APSEZL	02838 - 255727	91 9925223674
02	Mr.Cherian Abraham, Dy. PFSO - (AICTPL)	91-2838 - 255733	9189800 48850
03	Capt. Kumar Paritosh, Dy. PFSO, ACMTPL	02838 – 255733	91 9879104839
04	Mr. Hari Govindan V , Dy.PFSO, MICT	91-2838 - 285072	91 9879104805
05	Marine control, APSEZL	02838 – 255333 / 255761	91 9825228673
06	Port Operation center, APSEZL	02838 –255762	91 9825000949
07	Port security Control, APSEZL	02838 – 289322	91 9825000933
08	Head - Security, APSEZL	02838 – 289947	91 90999 99262
09	Head - Health, safety & Environment, APSEZL	02838 - 255777	91 7574894383
10	Head - Fire Dept. APSEZL	02838 – 255857	91 7069083035
11	Occupational Health Centre	02838 - 255710	91 8980015070

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.
MUNDRA
OIL SPILL CONTINGENCY RESPONSE PLAN

	Marine Officer/ SPM Mooring master	**ANNEXURE 5**
Responsibilities	• Observe or receive report of oil or chemical spill incident • Initiate measures to prevent/ reduce further spillage • Maintain communication with other all vessels	
Step	**Actions**	**Additional Information**
Alert	(Marine Manager / On Scene Commander / SPM Pilot Tugs and other support/ response craft	*VHF Channel 73 / 77*
Initial Actions	Stop all cargo operations Ensure all safety precautions taken/observed Verify incident details Advise all relevant information to (Marine Manager / On Scene Commander / or SPM Pilot Initiate personal log Place tugs/other response craft on stand-by	*Liaise with Terminal Shift Engineer*
Further Actions	Brief (Marine Manager / On Scene Commander / SPM Pilot as necessary Mobilize response equipment/ personnel as directed by (Marine Manager / On Scene Commander / Maintain personal log of communications and events Act as instructed by (Marine Manager / On Scene Commander / SPM Pilot	
Final Actions	Submit personal log to HOD – Marine Attend debrief	

	MARINE MANAGER / On Scene Commander **ANNEXURE 6**	
Responsibilities	• Initially assess situation • Verify classification • Verify fate of spill • Verify resources immediately at risk, inform parties • Provide accurate situation reports to Radio Room/ HOD – Marine • Collect evidence and/ or statements • Liaise with HOD-Health, Safety, Environment & Fire • Liaise with incident vessel regarding status of oil spill (if applicable)	
Step	**Actions**	**Additional Information**
Alert	HOD – Marine	
Initial Actions	Proceed to incident location, assume role of On-Scene Coordinator Ensure all safety precautions have been taken Initiate response / Investigate cause/ source of spill Communicate all information to HOD – Marine Ensure samples of spilled oil taken Initiate personal log Take photographic evidence Collect evidence and take statements	*Stopped or ongoing*
Further Actions	Ensure resources are being deployed as required Provide co-ordination at-sea response Provide detailed situation reports to HOD- Marine Liaise with -Health, Safety Environment & Fire Department.	
Final Actions	Submit personal log to HOD – Marine Attend debrief	

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.
MUNDRA
OIL SPILL CONTINGENCY RESPONSE PLAN

	SPM Pilot	ANNEXURE 7
Responsibilities	• Initially assess situation • Verify classification • Provide accurate situation reports to Radio Room/ OSC • Collect evidence and/ or statements • Liaise with incident vessel regarding status of oil spill (if applicable)	
Step	**Actions**	**Additional Information**
Alert	☐ Marine Control Room ☐ OSC ☐ Tugs and other support / response crafts	*VHF Channel 73 / 77*
Initial Actions	Assume role of On-Scene Coordinator Investigate cause/ source of spill Communicate all information to Marine Control Room Ensure samples of spilled oil taken Initiate personal log Take photographic evidence Collect evidence and take statements	*Stopped or ongoing*
Further Actions	Ensure resources are being deployed as required Provide co-ordination of the at-sea response Provide detailed situation reports to HOD – Marine	
Final Actions	Submit personal log to HOD – Marine Attend debrief	

	HOD – Marine	ANNEXURE 8
Responsibilities	• Confirm/ amend initial classification • Manage the APSEZL response • Authorize expenditure after consultation with COO APSEZL • Brief COO, APSEZL • Liaise with Coast Guard • Approve press statements for release	

Step	Actions	Additional Information
Alert	Coast Guard External organizations	
Initial Actions	Verify/ amend spill classification Ensure all safety precaution have been taken Confirm external organizations have been alerted Convene Emergency Response Team Predict slick movement Liaise with vessel Agents/ Owners as appropriate	
Further Actions	Chair the Emergency Response Team meetings Constantly review the strategy being employed and advise of changes where necessary Approve all expenditure commitments Brief President APSEZ Agree press statements with Corporate Relations Chief Confirm formal samples have been taken Advise Coast Guard if oil migrates outside of Local Area	
Final Actions **Final Actions (contd.)**	Terminate the clean-up Collate personal logs. Prepare the incident report. Hold full de-brief involving all members. Amend contingency plan as required. General Report to President	

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.
MUNDRA
OIL SPILL CONTINGENCY RESPONSE PLAN

OIL SPILL PROGRESS REPORT	ANNEXURE 9
Incident Name:	
Updated by:	
Date:	**Time (local):**
Summary of Incident Response Operations:	
Summary of Incident Response Resource Utilization:	
Number of Aircraft:	Number of Vessels:
Dispersant Used: Liters	Length of Booms in Use: m
Number of Recovery Devices:	Number of Storage Devices:
Sorbent Used: kg	Bio-remediation Used: kg
Number of Personnel:	Number of Vehicles:
Specialist Equipment:	
Oil Spill Balance Sheet:	
Total amount of oil spilled:	Tons
Total amount of oil recovered:	Tons
Outstanding amount of spilled oil:	Tons
Mass balance:	
Estimated Natural Weathering:	Tons
Mechanically agitated:	Tons
Chemically dispersed:	Tons
Skimmer recovered:	Tons
Sorbent recovered:	Tons
Manually recovered:	Tons
Bio-remediated:	Tons
Other:	Tons

Emergency Response Log	ANNEXURE 10
Page Number:	**Date:**
Name:	**Position:**
Contact Number	**Signature:**

Time	Activity Completed:

Control Room Officer **HOD – Marine**

Classification of Oil

ANNEXURE 11

Group 1 oils

A: °API > 45 (Specific gravity < 0.8)
B: Pour point °C
C: Viscosity @ 10–20°C: less than 3 CSt
D: % boiling below 200°C: greater than 50%
E: % boiling above 370°C: between 20 and 0%

	A	B	C	D	E
Anegard	59	-28	2 @ 10°C	58	14
Arabian Super Light	55	-39	2 @ 20°C		
Condensate	48	-18	2 @ 20°C	51	18
Cutlew	47	-13	2 @ 20°C	57	17
F3 Condensate	54	<-48	1 @ 10°C	81	0
Gippsland	57	-11	1.5 @ 20°C	63	8
Hidra	52	-42	2.5 @ 10°C	68	11
Terengganu condensate	73	-16	0.5 @ 20°C	95	0
Wollybutt	49	-51	2 @ 20°C	55	4
Gasoline	58		0.5 @ 15°C	100	0
Kerosene	45	-65	1 @ 15°C	50	0
Naptha	55		0.5 @ 15°C	100	0

Group 2 oils

A: °API 35–45 (Specific gravity 0.8–0.85)
B: Pour point °C
C: Viscosity @ 10–20°C: between 4 Cst and semi-sol
D: % boiling below 200°C: between 20 and 50%
E: % boiling above 370°C: between 15 and 50%

Low pour point <0°C

	A	B	C	D
Arabian Extra Light	38	-30	3 @ 15°C	26
Azeri	37	-3	8 @ 20°C	29
Brent	38	-3	7 @ 10°C	37
Dreugen	40	-15	4 @ 20°C	37
Dukhan	41	-49	9 @ 15°C	36
Liverpool Bay	45	-21	4 @ 20°C	42
Sokol (Sakhalin)	37	-27	4 @ 20°C	45
Rio Negro	35	-5	23 @ 10°C	29
Umm Shaif	37	-24	10 @ 10°C	34
Zakum	40	-24	6@ 10°C	36
Marine Gas oil (MGO)	37	-3	5 @ 15°C	

High pour point >5°C

Arzna	36	19	Semi-solid	25
Bonito	38	18	32 @ 15°C	25
Bintulu	37	19	Semi-solid	24
Escravos	34	10	9 @ 15°C	35
Suez	38	24	Semi-solid	24
Statfjord	40	6	7 @ 10°C	38

Group 3 oils

A: °API 17.5–35 (Specific gravity 0.85–0.95)
B: Pour point °C
C: Viscosity @ 10–20°C: between 8 CSt and semi-solid
D: % boiling below 200°C: between 10 and 35%
E: % boiling above 370°C: between 30 and 65%

Low pour point <0°C

	A	B	C	D	E
Alaska North Slope	28	-18	32 @ 15°C	32	41
Arabian Heavy	28	-40	55 @ 15°C	21	56
Arabian Medium	30	-21	25 @ 15°C	22	51
Arabian Light	33	-40	14 @ 15°C	25	45
Basrah Light	35	-11	25 @ 15°C	28	50
Iranian Heavy	31	-36	25 @ 15°C	24	48
Iranian Light	34	-33	15 @ 15°C	26	48
Oseberg	28	-37	80 @ 15°C	23	55
Shell	33	-12	18 @ 10°C	32	38
Thunder Horse	32	-27	10 @ 10°C	32	39
Tia Juana Light	32	-42	500 @ 15°C	34	45
Troll	35	-8	14 @ 20°C	24	35
IFO 180	18–22	10–30	1,500–3,000 @ 15°C		

High pour point >5°C

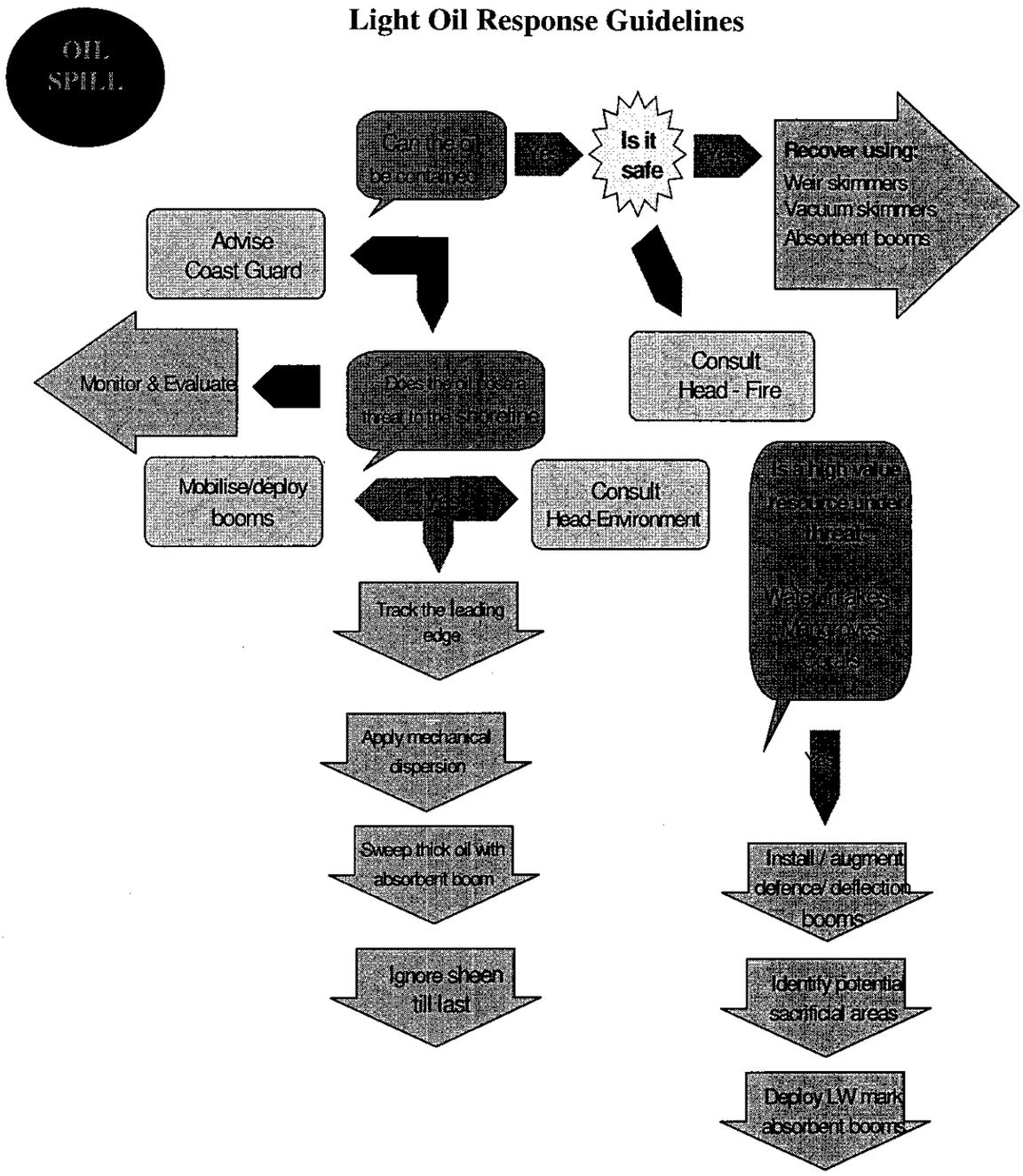
Cabinda	33	12	Semi-solid	18	56
Cano	30	21	Semi-solid	23	46
Gamba	31	23	Semi-solid	11	54
Murchison	36	9	20 @ 15°C	21	53
Minas	35	18	Semi-solid	15	58

Group 4 oils

A: °API <17.5 (Specific gravity >0.95) or
B: Pour point >30°C
C: Viscosity @ 10–20°C: between 1500 CSt and semi-solid
D: % boiling below 200°C: less than 25%
E: % boiling above 370°C: greater than 30%

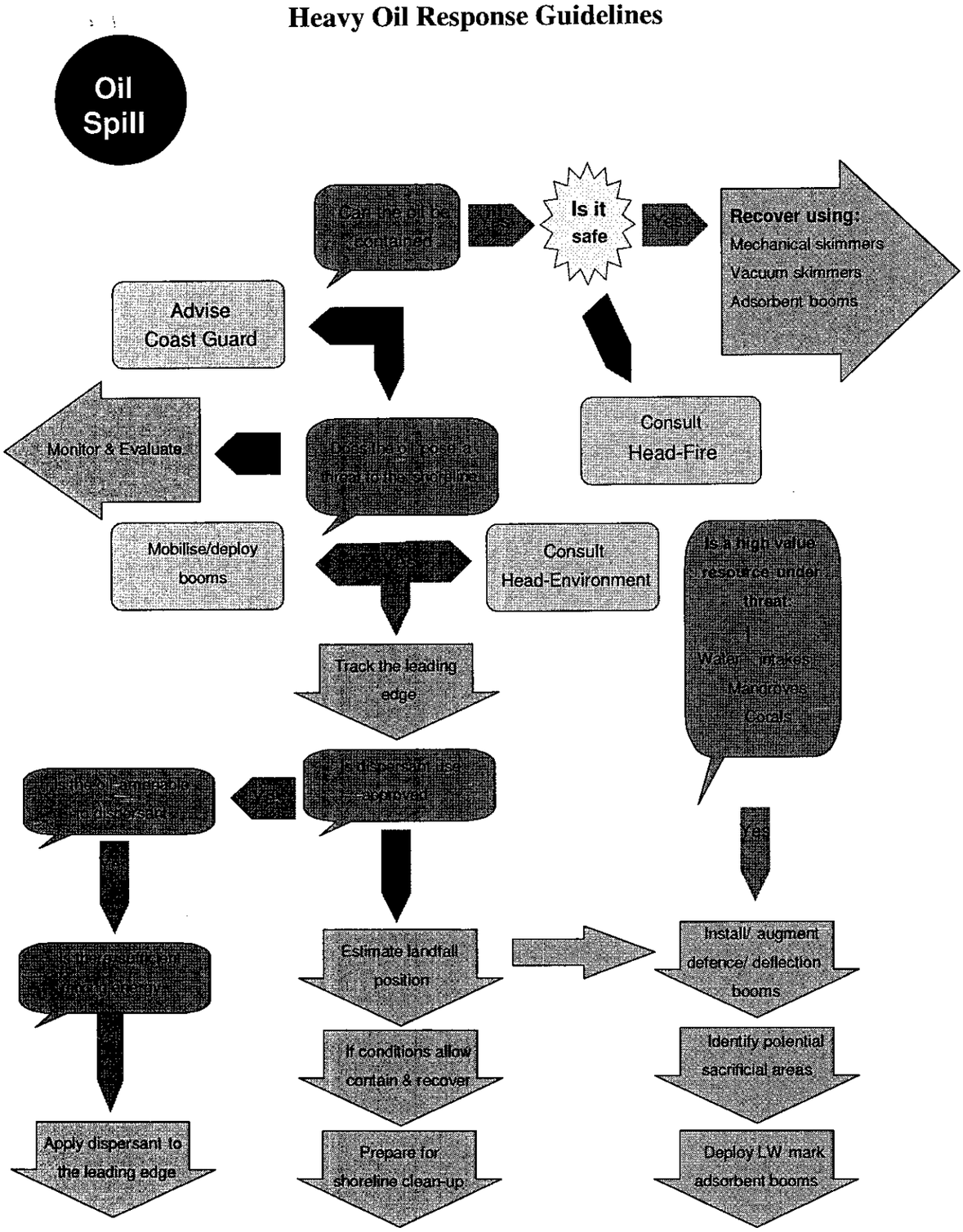
	A	B	C	D	E
Bachaquero 17	16	-28	5,000 @ 15°C	10	60
Boscan	10	15	Semi-solid	4	80
Cinta	13	43	Semi-solid	10	54
Handil	13	35	Semi-solid	23	33
Merey	17	-21	7,000 @ 15°C	7	70
Nile Blend	34	31	Semi-solid	11	59
Pilon	14	-3	Semi-solid	2	92
Shengli	24	21	Semi-solid	9	70
Taching	31	35	Semi-solid	12	49
Tia Juana Pesado	12	-1	Semi-solid	3	78
Widuri	33	46	Semi-solid	7	70
IFO 380	11–15	10–30	5,000–30,000 @ 15°C		

Light Oil Response Guidelines



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Heavy Oil Response Guidelines



Site Specific Health and Safety Plan *Assessment Form*					ANNEXURE 13
1. APPLIES TO SITE :					
2. DATE :		**3. TIME :**		**4. INCIDENT :**	
5. PRODUCT(S) :				(Attach MSDS)	
6. Site Characterization					
6a. Area	☐ Open water	☐ Inshore water	☐ River / Creek	☐ Salt marsh	☐ Mudflats
	☐ Shoreline	☐ Sand	☐ Shingle	☐ Intake Channel	
6b. Use	☐ Commercial	☐ Industrial	☐ Public	☐ Government	☐ Recreational
	☐ Residential	☐ Other			

7. Site Hazards			
	☐ Boat safety	☐ Fire, explosion, in-situ burn	☐ Slips, trips and falls
	☐ Chemical hazards	☐ Heat stress	☐ Steam and hot water
	☐ Drum handling	☐ Helicopter operations	☐ Tides
	☐ Equipment operations	☐ Lifting	☐ Trenches, excavations
	☐ Electrical hazards	☐ Motor vehicles	☐ Visibility
	☐ Fatigue	☐ Noise	☐ Weather
	☐ Others	☐ Overhead/buried utilities	☐ Work near water
	☐	☐ Pumps and hoses	

8. Air Monitoring									
	☐ O_2		☐ LEL		☐ Benzene		☐ H_2S	☐ Other	

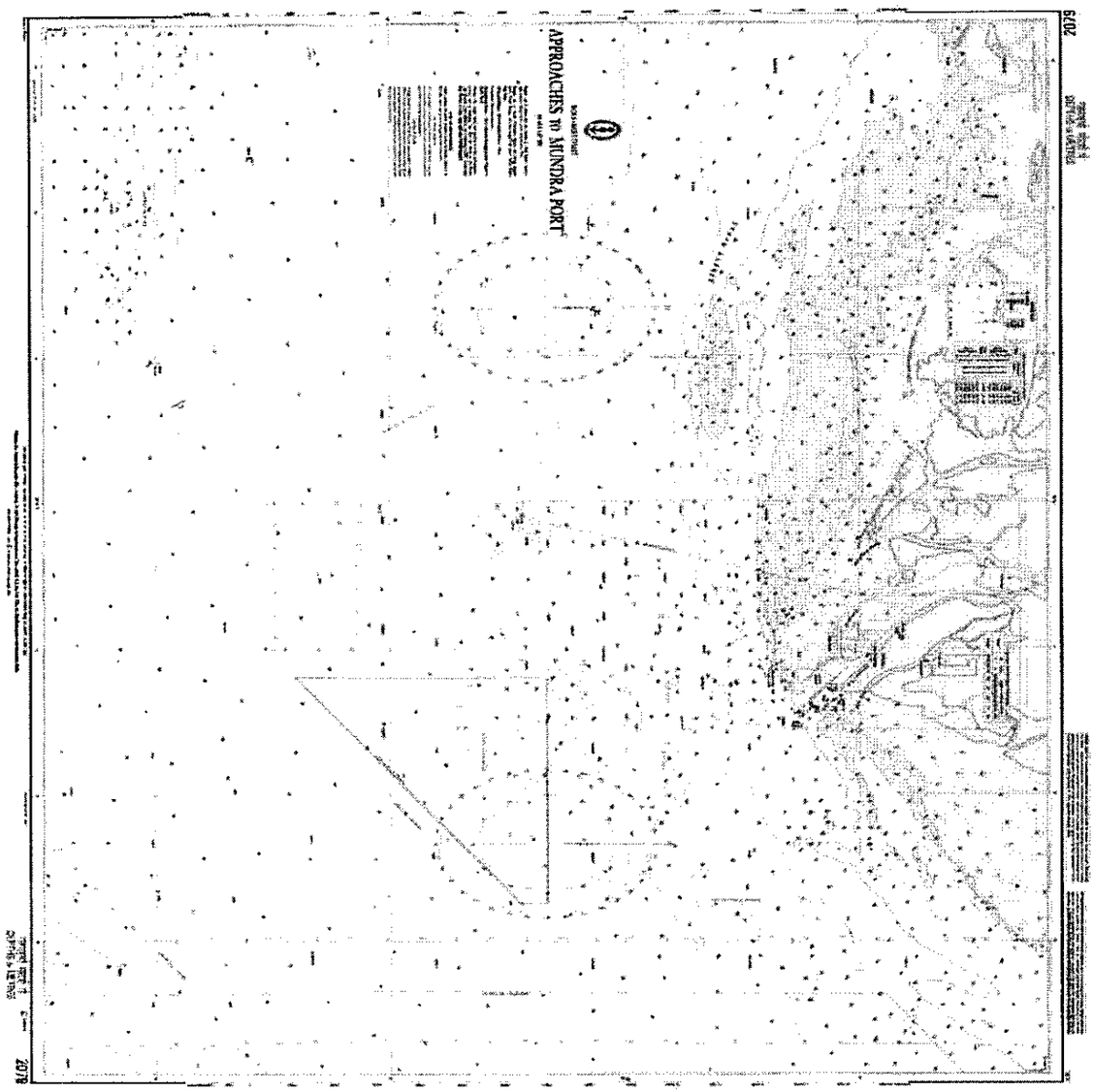
9. Personal Protective Equipment			
☐ Foot Protection		☐ Coveralls	
☐ Head Protection		☐ Impervious suits	
☐ Eye Protection		☐ Personal Floatation	
☐ Ear Protection		☐ Respirators	
☐ Hand Protection		☐ Other	

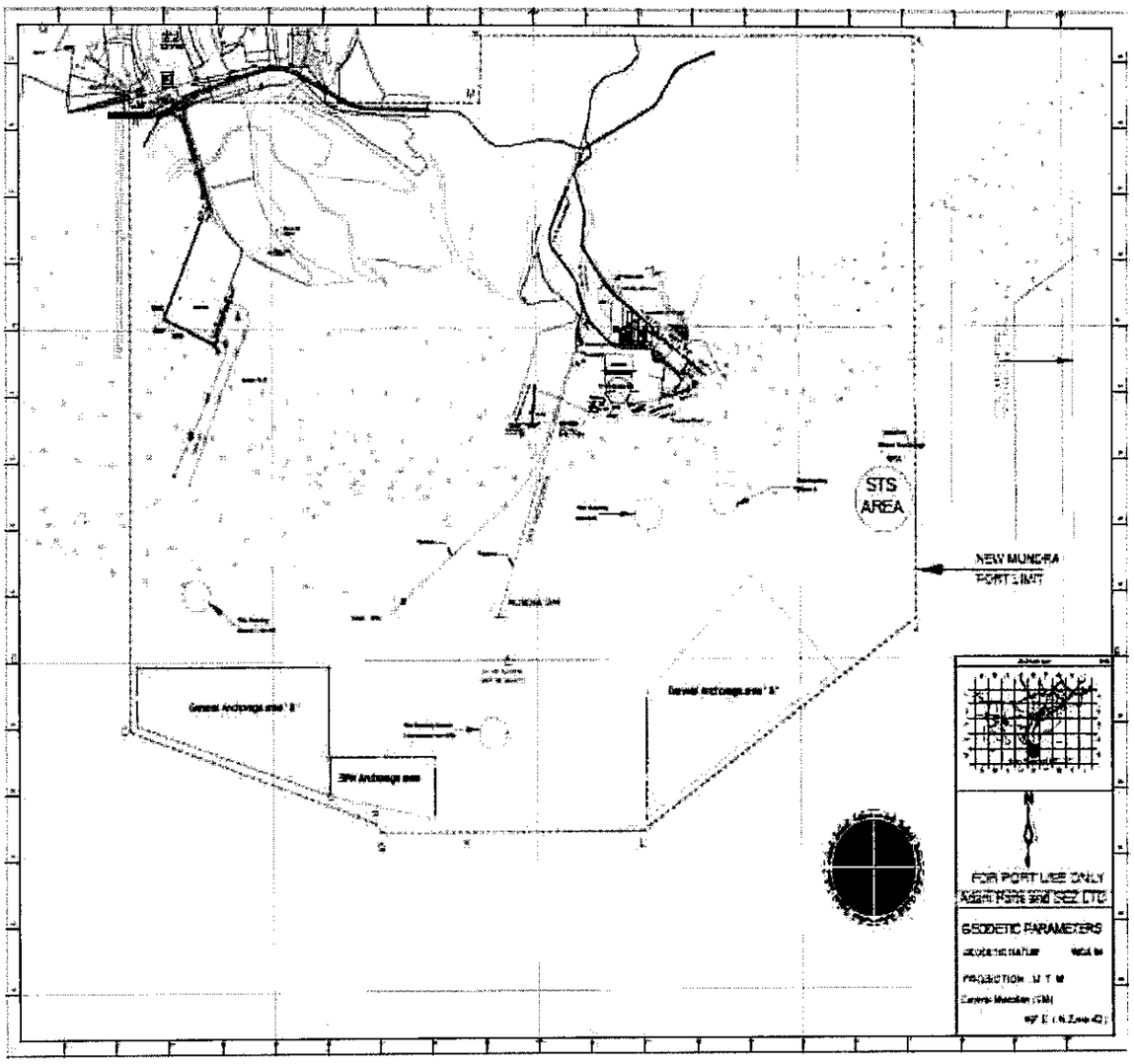
10. Site Facilities		
☐ Sanitation	☐ First Aid	☐ Decontamination

11. Contact details :		
☐ Doctor	Phone	
☐ Hospital	Phone	
☐ Fire	Phone	
☐ Police	Phone	
☐ Other	Phone	

12. Date Plan Completed	
13. Plan Completed by	

Indian Chart 2079	ANNEXURE 14




STS
AREA
NEW MUNDRA
PORT LIMIT
N
FOR PORT USE ONLY
Adani Ports and SEZ LTD
GEODETIC PARAMETERS

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.
MUNDRA
OIL SPILL CONTINGENCY RESPONSE PLAN

List of recycler approved by state of Gujarat	ANNEXURE 15

LIST OF APPROVED VENDOR FOR COLLECTION & DISPOSAL OF OIL SPILL WASTE WATER AND OILY SOIL

Sr No.	Name of the party & Contact Detail	Date of Issue of Passbook alongwith validity	Capacity
1	M/s Jawrawala Petroleum, Plot No: 200/33, B/H Kashiram Textile Mill, Narol, Ahmedabad – 382405 Contact Detail - (079) - 25358099 (M) +91 9824045726	18/09/2012 to 17/09/2017	1. 4800 KLPA - Used Oil 2. 9000 KLPA – Waste Oil
2	M/s Reliance Barrel Supply co., 200/34, B/H-Kashiram Mill, Narol, Ahmedabad-382405 Contact Detail - (079) - 25356629 (M) +91 9824090021	03/09/2014 to 02/09/2019	1. 8280 KLA - Used Oil 2. 9000 KLA – Waste Oil
3	M/s Western India Petrochem Industry, Plot No-50, 51, GIDC Estate, Village Gozaria, Dist-Mehsana. Contact Detail - Tel:+91- 278- 420941 Fax:+91- 278- 429503	25/07/2014 to 24/07/2019	1. 3660 KLPA – Used oil 2. 11100 KLPA – waste oil
4	M/s Saurashtra Enviro Projects Pvt. Ltd.(SEPPL) 3rd Floor,K.G.Chambers, Udhana Darwaja, Ring Road, Surat, Gujarat, India-395002 Contact Detail - +91 261 2351248	TSDF Site	3,95,000 MT (Landfilling) + 7.50 Million Kcal/Hr. (Incineration)
5	M/s Bharuch Enviro Infrastructure Ltd, Ankleshwar Contact Detail - Phone 91-2646-253135 Fax 91-2646-222849	TSDF Site	23,00,000 MT (Landfilling) + 120 MT/Day (Incineration)
6	M/s Nandesari Environment Control Ltd. Nandesari, Vadodara, Contact Detail – Phone 265 – 2840818 Fax 265 – 2841017	TSDF Site	3,00,000 MT (Landfilling) + 700 Kg/Hr. (Incineration)

LIST OF AGENCY FOR SUPPORT & GUIDANCE FOR RESCUE & REHABILITATION OF OILED BIRD & MANGROVES MANAGEMENT DURING OIL SPILL	ANNEXURE 16

Sr No.	Name of the party & Contact Detail	Contact Person	Contact Detail	Activity
1	Gujarat Institute of Desert Ecology P.O Box No. #83, Opp. Changleshwar Temple, Mundra Road Bhuj - 370001 Gujarat – India.	Dr. Thivakaran	EMAIL: desert_ecology@yahoo.com FAX: 02832-235027 02832-235025	Restoration of Mangroves
2	Kalapoornasuri Karunadham Karunadham Hospital, At – Shedata, Bhuj, Kucth		(M) 9925020776	Rescue of oil socked birds / animals and medical treatment facility
3	Anchorwala Ahinshadham Bhagwan Mahavir Pashu Raksha Kendra, Pragpar, Mundra, Kutch.		Phone (02838) 22352	Rescue of oil socked birds / animals and medical treatment facility
4	**ASHA Foundation** C/182, Ashoknagar, Opposite ISRO Satellite, Ahmedabad – 380015, Gujrat, India.	Lalubhai	Phone: 09824037521 ,09879877281 Email: ashahmedabad@yahoo.co.in Website: www.ashafoundationindia.org	Rescue of oil socked birds / animals and medical treatment facility

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Terms, definitions and abbreviations used in this plan

APSEZL	Adani Ports and Special Economic Zone Ltd.
COO	Chief Operating Officer
DGM	Deputy General Manager
DGS	Directorate General of Shipping
ENGR.	Engineer
ESD	Emergency Shut Down
FIR	First Information Report
FO	Furnace Oil
GMB	Gujarat Maritime Board
GPCB	Gujarat Pollution Control Board
HOD	Head Of Department
HQ	Head Quarters
HSD	High Speed Diesel
ICG	Indian Coast Guard
IMO	International Maritime Organization
IPMS	Integrated Port Management System
KPT	Kandla Port Trust
LWS	Low Water State
MCLS	Maximum Credible loss scenario
MMD	Mercantile Maritime Deptt.
MOEF	Ministry of Environment & Forest
MSDS	Material Safety Data Sheets
NOS DCP	National Oil Spill Disaster Contingency Plan
OSC	On Scene Commander
PLEM	Pipe line end manifold
POLREP	Pollution Report
PPE	Personal Protective Equipment
PR	Public Relations Officer
R/O	Radio Officer
SKO	Super Kerosene Oil

Certificate of Endorsement

(To be certified personally by an officer not below the post of Deputy Conservator of a port facility or the Installation Manager of an oil installation, or offshore installation, or equivalent legally responsible authority)

I hereby certify that:

1 The oil spill contingency plan for the facility under my charge has been prepared with due regard to the relevant international best practices, international conventions, and domestic legislation.

2. The nature and size of the possible threat including the worst case scenario, and the resources consequently at risk have been realistically assessed bearing in mind the probable movement of any oil spill and clearly stated.

3. The priorities for protection have been agreed, taking into account the viability of the various protection and clean-up options and clearly spelt out.

4. The strategy for protecting and cleaning the various areas have been agreed and clearly explained.

5. The necessary organization has been outlined, the responsibilities of all those involved have been clearly stated, and all those who have a task to perform are aware of what is expected of them.

6. The levels of equipment, materials and manpower are sufficient to deal with the anticipated size of spill. If not, back-up resources been identified and, where necessary, mechanisms for obtaining their release and entry to the country have been established.

7. Temporary storage sites and final disposal routes for collected oil and debris have been identified.

8. The alerting and initial evaluation procedures are fully explained as well as arrangement for continual review of the progress and effectiveness of the clean-up operation.

9. The arrangements for ensuring effective communication between shore, sea and air have been described.

10. All aspects of plan have been tested and nothing significant found lacking.

11. The plan is compatible with plans for adjacent areas and other activities.

12. The above is true to the best of my knowledge and belief.

13. I undertake to keep the plan updated at all times and keep the Indian Coast Guard informed of any changes through submission of a fresh certificate of endorsement.

Seal: Capt. Anubhav Jain
AGM - Marine & PFSO
Adani Ports & SEZ Ltd.
Mundra - Kutch - Gujarat

Signature:

Name: Capt. Anubhav Jain

Designation: Head - Marine

Organisation: Adani Ports and SEZ Ltd, Mundra

Place: Mundra

Date: 01 Oct 2018

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Appendix E5 to NOS DCP 2015

(Para 4.5 refers)

Contingency Planning Compliance Checklist

Name of the Port/ Oil Handling Agency	Adani Ports and SEZ Limited, Mundra

	DESCRIPTION	Complied Yes/No	Remarks
Risk Assessment			
1.	Whether the facility produces / handles / uses / imports / stores any type of petroleum product.	Yes	**(Ref. OSCRP 2.2)**
2.	Whether risk assessment is done	Yes	**(Ref. OSCRP 2.0)**
3.	Who did the risk assessment	Yes	Environ Software (P) Ltd. & APSEZ
4.	Whether maximum volume of oil spill that can occur in the worst case scenario is considered.	Yes	**(Ref. OSCRP 2.4)**
5.	Whether relative measures of the probability and consequences of various oil spills including worst case scenario are taken into account.	Yes	**(Ref. OSCRP 2.4)**
6.	Whether all types of spills possible in the facility are considered including grounding, collision, fire, explosion, Rupture of hoses.	Yes	**(Ref. OSCRP 2.3 & 2.4)**
7	Please specify the list of oils considered for risk assessment	Yes	**(Ref. OSCRP 2.2)**
8	Whether the vulnerable areas are estimated by considering maximum loss scenario and weather condition	Yes	**(Ref OSCRP 2.1 Computational Scenarios)**
9	Whether impacts on the vulnerable areas are made after considering the marine protected areas ,population ,fishermen ,saltpans ,mangroves ,corals, and other resources within that area	Yes	**(Ref. OSCRP 2.6)**
10	Whether measures for reduction of identified high risk are included by reducing the consequences through spill mitigation measures	Yes	**(Ref. OSCRP 1.4, 2.3, 2.6, 3 & 5)**
11	Whether steps have been considered to reduce risks to the exposed population by increasing safe distances by acquiring property around the facility ,if possible	NA	All facilities developed within SEZ keeping safe distances from the exposed population.
12	Whether risk levels are established for each month after considering the probability with tide and current and consequences of each such spill	Yes	**(Ref. OSCRP 2.1 computational scenarios & 2.3)**
13	Whether prevention and mitigation measures are included in the plan	YES	**(Ref. OSCRP 4.0, 7.0, 8.0 & 9.0)**
14	Whether the spill may affect the shoreline.(length of the shoreline with coordinated)	Yes	**Ref. OSCRP 2.3 & 2.6)**
15	Whether time taken the oil spill to reach ashore in each quantity of spill in various month are mentioned in the plan	Yes	**(Ref. OSCRP 2.3)**
16	Whether sensitivity mapping has been carried out	Yes	**(Ref. OSCRP 2.5)**
17	Does the sensitivity mapping clearly identify the vulnerable areas along with MPAs, corals fishermen community, saltpans, mangroves and other socio-economic elements in the area	Yes	**(Ref. OSCRP 2.5 & 2.6)**

18	Do the sensitivity maps indicate area to be protected on priority	Yes	**(Ref. OSCRP 2.6)**
19	Does the maps indicate boom deployment locations	NA	Booms not deployed permanently
20	Whether any marine protected area will be affected	YES	**(Ref. OSCRP 2.5 & 2.6)**
21	Whether total number of fishermen likely to affected is mentioned in the plan	Yes	**(Ref. OSCRP 2.6)**
22	Whether any saltpan in the area is going to be affected	Yes	**(Ref. OSCRP 2.6)**
23	Whether any mangroves in the area will be affected by a spill	Yes	**(Ref. OSCRP 2.6)**
Preparedness			
24	whether any containment equipment is available	Yes	**(Ref. OSCRP Annex 3)**
25	Whether any recovery equipment is available	Yes	**(Ref. OSCRP Annex 3)**
26	Whether the facility is having any temporary storage capacity	Yes	**(Ref. OSCRP Annex 3)**
27	Whether location of the oil spill response equipment is mentioned in the plan	Yes	Has been included in Annex 3
28	Whether suitable vessels available for deploying the boom skimmer etc.	Yes	**(Ref. OSCRP Annex 3)**
29	Whether OSD held with facility	Yes	**(Ref. OSCRP Annex 3)**
30	Whether the OSD held with the facility is approved for use in Indian waters	Yes	
31	Whether the facility has MoU with other operator for tier -1 preparedness	Yes	**(Ref. OSCRP 1.4)**
32	Whether the list of oil spill response equipment available with each agency in deliberation	Yes	MoU document
33	Whether the facility has any MoU with private OSRO	NA	Port itself is equipped to deal with oil spill emergencies
34	Whether the procedure for evoking the mutual aid is clearly described in the plan	Yes	**(Ref. OSCRP 1.4)**
35	Whether additional manpower is available	Yes	**(Ref. OSCRP 5.4)**
36	Whether list of approved recyclers is mentioned in the plan	Yes	List of recycler approved by state of Gujarat is included in Annexure 15.
37	Whether NEBA (net environmental Benefit Analysis) has been undertaken	Yes	Before commissioning of any new project, various environmental aspects with their positive or adverse impact is considered under EIA Environment Impact Assessment stage.
38	**Whether the areas from priority protection have identify in the plan**	YES	**(Ref. OSCRP 2.5 & 2.6)**
39	Whether relevant authorities and stakeholder were consulted for NEBA and during the areas for property protection	Yes	Before commissioning of any new project Environment Impact Assessment & Public consultation is carried out, in which relevant authorities & stakeholders

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			were consulted.
40	Whether district administration has been appraised of the risk impact of oil spills?	Yes	District Level Disaster Management Plan is prepared and regularly updated at district level by District Collector of Kutchh. Under DMP Oil spillage contingency is identified as risk. During preparation & updating of disaster management plan, District Level Authority organises & compiles information from various industries of kutchh. APSEZL is regularly participating in the same & providing necessary information to district level administration.
Action Plan			
41	Whether the plan outlines procedure for reporting of oil spill to coast guard	Yes	**(Ref. OSCRP 7.3)**
42	Whether the oil spill response action is clearly mentioned	Yes	**(Ref .OSCRP 3.1 to 3.6)**
43	Whether the action plan include all duties to be attended in connection with an oil spill	Yes	**(Ref. OSCRP 3.4)**
44	Whether the action plan includes key personnel by their name and designation viz. C/C, S/C	Yes	**Ref. OSCRP Annexure-4**
45	Whether alternate coverage is planned to take care of the absence of a particular person [in cases where action plan is developed basic names]	Yes	**(Ref. OSCRP 5)**
46	Whether the plan includes assignment of all key coordinators viz.the communication controller ,safety coordinator ,Emergency management team, Administration and communication coordinator and safety coordinator	Yes	**(Ref. OSCRP 3.4)**
47	Whether contact directory containing numbers of key response and management personnel is intimated in the plan	Yes	Ref. OSCRP Annexture-4
48	Whether approved recyclers are identified for processing recovered oil and oily debris	Yes	List of approved recycler of Gujarat state is included in annexure 15. Membership of common disposal facility for disposal of oily debris is also attached annexure 16.
49	Whether the shoreline likely to be affected is identified	Yes	**(Ref. OSCRP 2.5 & 2.6)**
50	Whether final report on the incident is submitted to CGHQ as per NOS-DCP 2014	NA	**No incident**
51	Whether the spill incident and its consequences	NA	**No incident**

	are informed to fishermen and other NGOs for environment protection through media		
	Training and exercises		
52	Whether mock fire /emergency response drills are specified in the plan	Yes	**(Ref. OSCRP 5.6)**
53	Whether the mock drills cover all types of probable oil spill	Yes	
54	Whether the plan mentions list of trained manpower	Yes	**(Ref. OSCRP 5.6)**
55	Whether record for periodic mock drill are maintained in a well-defined format	Yes	
56	Whether the plan updated according to the finding in mock-drills and exercises	Yes	
	DESCRIPTION		
57	What is the frequency of updation /review of contingency plan?	Yes	As Per NOSDCP 2015
58	Periodicity of joint exercises with mutual aid partner	Yes	
59	Frequency of mock-drills for practice	Yes	**(Ref. OSCRP 5.6)**
60	Whether the records for periodic mock drills are maintained in a well-defined format	Yes	**(Ref. OSCRP 5.6)**
61	Whether the plan is updated according to the finding of mock-drills and exercises	Yes	
62	Frequency of updation /review of contingency plan	Yes	As Per NOSDCP 2015

I, hereby ,declare that the all information appended above and true and correct to my knowledge of belier

Capt. Anubhav Jain
AGM - Marine & PFSO
Adani Ports & SEZ Ltd.
Mundra - Kutch - Guiarat

Date: 01 Oct 2018 Chief conservator /Installation manager

VERIFIED

Date: (District commander ICG)
or his representative

Date: (Regional commander ICG)
or his representative

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ANNEXURE – 7

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MOCK DRILL REPORT

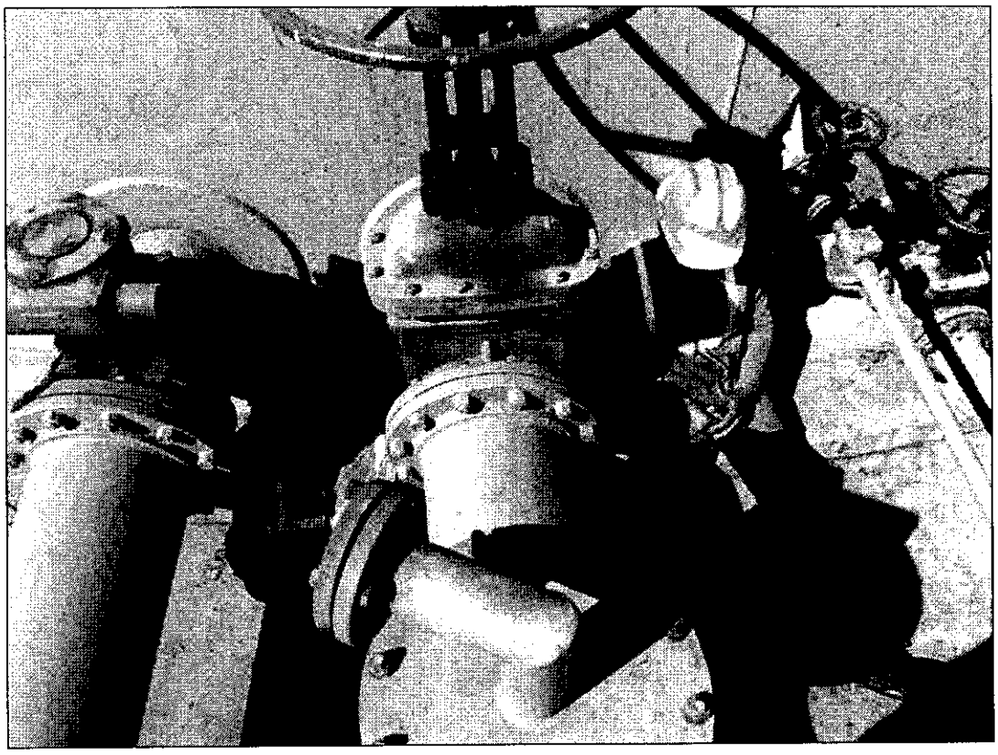
Date	:	25.01.2019
Time	:	11:45 AM
Location	:	Liquid Terminal – Enclosure-09 (Tank No. 117)
Type/Text of the Scenario	:	MTBE (Methyl Tert-Butyl Ether) leakage from the body valve of T – 117, catches fire and two person found unconscious due to inhalation

INTRODUCTION:

Loading in charge Mr. Jayesh Parmar observed leakage of MTBE and found that two people were unconscious at near body valve of T – 117 and simultaneously observed that fire has taken place in the area. He immediately informed Liquid Control In charge Mr. Vikas Dhole for ascertaining the situation.

Immediately POC, Fire and OHC were informed. POC subsequently intimated the same through message/ call to concern departments.

LOCATION (WITH PHOTOGRAPH):



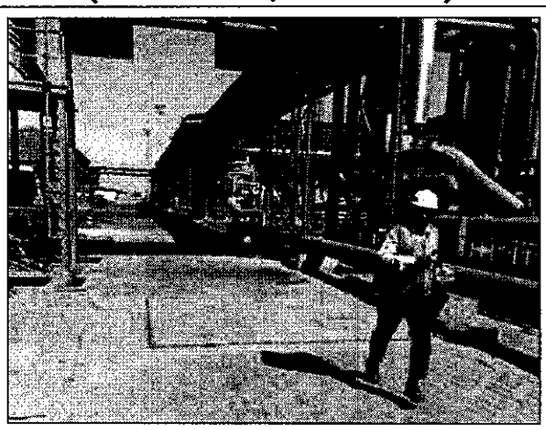
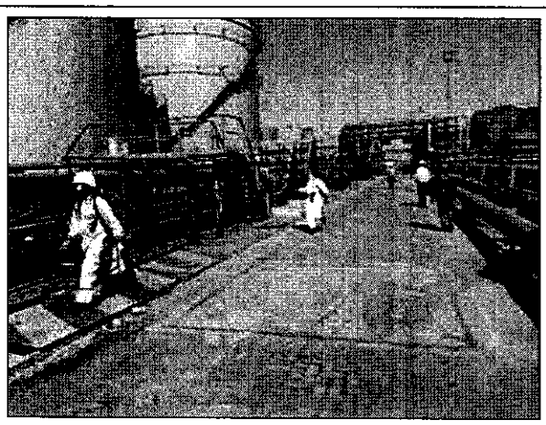
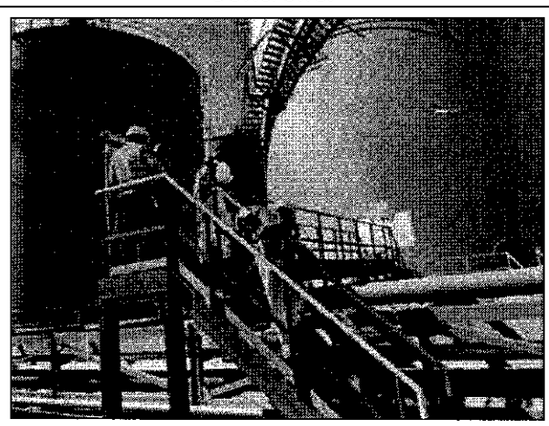
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MOCK DRILL REPORT

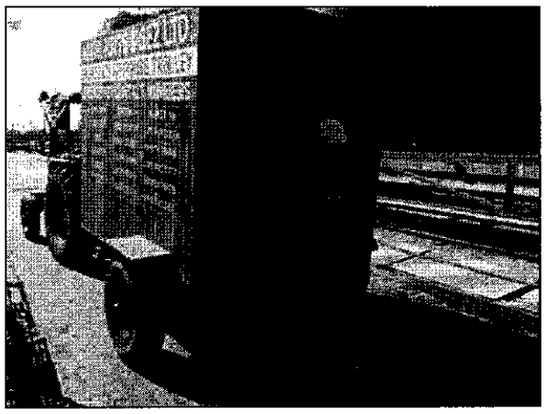
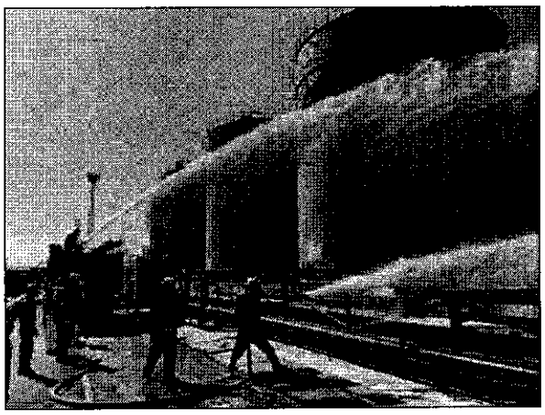
SEQUENCE OF EVENTS WITH PHOTOGRAPHS:

	
Incident Spot : Inside Liquid Terminal (Enclosure-09, Tank no. 117)	**First Responder informed to Incident Controller**
	
Incident Controller reached at site	**Emergency Declared by Incident Controller**
	
Fire team reached at site	**Fire team rescued the victim**

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Ambulance reached at site	Security team reached at site
	
Emergency Spill kit mobilised at site	Maintenance staff reached at site
	
Fire Fighting by Fire Team	People Evacuated from the Liquid Terminal

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MOCK DRILL REPORT

	
Observer – Manan Bhatt & K R Rao	Headcounting at Assembly point (Near Driver Canteen)
	
Briefing at Assembly Point by LT - HOS (Near Driver Canteen)	Briefing at Assembly point by LT - HOD (Near Driver Canteen)
	
Briefing at Assembly point by Fire, Safety & Security	De-Briefing Meeting

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MOCK DRILL REPORT

RESPONSE TIME:

#	Description		Exact Time
1.	First responder informed to Incident Controller	:	11:45 AM
2.	Incident controller comes on site	:	11:46 AM
3.	Declaration of Emergency	:	11:46 AM
4.	Security team reaching time at incident point	:	11:51 AM
5.	Fire Tender reaching time at incident Point	:	11:53 AM
6.	Ambulance reaching time at incident Point	:	11:54 AM
7.	Departure of Ambulance with patient	:	11:57 AM
8.	Ambulance reached at OHC	:	12:01 PM
9.	First person at Assembly Point	:	--
10.	Last person at Assembly Point	:	--
11.	Maintenance/ Rescue Arrangement at site	:	11:56 AM
12.	Corporate Affairs team reaching on site	:	NA
13.	Liaoning officer reached at site	:	--
14.	Audibility of the scenario on PA system	:	--
15.	Termination of Emergency	:	12:15 PM

Note: For more than one assembly point, please mention details for point 10 & 11.

COMMUNICATION & ACTIONS:

Action By	Information To / Action By	Remarks
First Responder	Information given to incident controller about situation / scenario.	
Site Incident Controller	Assess the site and declare emergency.	
Concern Department/ Area In-charge	Inform to POC, Security, Fire, Medical, Safety etc.	
Engineering Services	LT Maintenance team reached the site and assess the leakage from the body valve with coordination of incident controller. ES – E & I team reached at site and acted as per instruction of incident controller.	
Corporate Affairs	NA	
HR/ Admin	HR Team reached at the site and ensured head count along with Security Personnel. Admin team reached at assembly point to ensure proper evacuation of workforce upon instruction of incident controller.	
Safety	Discuss to mitigate catastrophic effects with incident controller and	

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	ask for any add or services required like PPE's, Ambulance etc.	
OHC	Ensure the type of chemical exposure with incident controller and mobilize ambulance at OHC for further treatment.	
Security Control Room	Evacuated the workforce from the terminal and carried out check with the patrolling vehicle.	
Fire Control Room Inform	Immediately rescued the unconscious persons from the incident spot and handed over to ambulance. Immediate started the fire fighting from fixed firefighting system with coordination of incident controller.	

COMMUNICATION TO MUTUAL AID GROUP
(IF REQUIRED, AS AND WHEN MUTUAL AID IS CALLED) – Not Required.

To	By Whom/ Media	Standard	Performance
IOCL		2 min. after receiving information to Emergency Control Room	
HPCL			
JINDAL SAW			
ADANI POWER			
CGPL			
HMEL			

RESPONSE TIME PERFORMANCE OF ACTION

Agency	Standard Time	Performance	Rating (Max. 9/ Block) +VE Marks	-VE Marks
Ambulance	1-2 Min	2 Min	9	
Safety	4-5 Min	4 Min	9	
Fire Services	4-5 Min	3 Min	9	

A. PERFORMANCE OF OHS & F SERVICES & RESCUE SERVICES

Performance	Performance	Rating (Max. 3 per Block) +VE Marks	-VE Marks
Turn out/ response time of Fire Team	Fire team reached at site within benchmark of response time.	3	
Turn out/ response time of OHC Team	OHC team reached at site within benchmark	3	

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MOCK DRILL REPORT

	of response time.		
Turn out/ response time of Safety Team and in coordination with incident controller mobilisation of personnel and resources.	Response time of Safety team is within benchmark and well coordinate with incident controller for mobilisation of personnel, resources, PPE's etc.	3	
Firefighting at the site	Rescued the affected person immediately with the staff available in the terminal. Started firefighting for controlling the fire with co – ordination of incident controller.	3	
Medical attention at the site	Reported to incident Controller and immediately unconscious persons shifted to OHC for the treatment.	3	
Rescue of person	Immediately rescue of casualties by fire team by using SCBA set.	3	

B. PERFORMANCE OF MAINTENANCE DEPARTMENT

Performance	Performance	Rating (Max. 3 per Block) +VE Marks	-VE Marks
Power shut down/ cut off	As per guided by incident controller immediate power shut off by E & I Team.	3	
Immediate arrangements at the site	All arrangement were mobilised	3	
Mobilizing of personnel and resources	Maintenance team reached at site with tool kit and appropriate PPEs.	3	
Maintenance activities being carried out at the site	As per guided by incident controller, leak controlled by maintenance team with help of tool kit.	2	1

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MOCK DRILL REPORT

	One staff was observed without proper PPEs		
Clearing debris	NA	3	
Other arrangement at required to meet emergency	Provided as required by incident controller and support team.	3	

C. PERFORMANCE OF SECURITY SERVICES

Performance	Performance Rating	Rating (Max. 3 per Block) +VE Marks	-VE Marks
Turnout of Security	Security team reached within time and barricade the area reported to incident controller for further update.	3	
Performance of security guards	Gates were opened for easy evacuation of workforce. Turnstile was not freed/ by-passed for speedy evacuation of workforce	2	1
Security officer's command & control	Security officers restrict the entry of unauthorized persons / also ensure that vehicles do not enter the gate.	3	
Area cordoned off	Immediate barricade the area for restrict to entry at scene by security team as guided by incident controller.	3	
Prevent unwanted/ unauthorized entry into this area	Security officers restrict the entry of unauthorized persons / also ensure that vehicles do not enter the gate also co-ordinate properly with incident controller.	3	
Closer of gates	Vehicle and man movement entry gates closed by security	3	

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MOCK DRILL REPORT

	guard		
Providing security coverage at main gate and directing concern person to the site	Round of the terminal with announcement was taken to ascertain that all the workforces have safely moved to assembly point.	3	

D. PERFORMANCE OF OPERATION/ CONCERN DEPARTMENT

Performance	Performance Rating	Rating (Max. 3 per Block) +VE Marks	-VE Marks
Immediately pass the communication message through VHF / other available media to subordinates & emergency response team.	Communication / Information on emergency conveyed to all concern. Communication to emergency services at the site by incident controller was found lacking to some extent specially with fire services	1	2
Stopping of operation / like critical operations first & on priority basis	All operations stopped by incident controller.	3	
Emergency response of particular department at site	Response time of concern department found adequate. Fire extinguisher was immediately used at the site by LT Team and all the emergency services response time was good.	3	
Support for evacuation of people at site and head count along with HR/ Admin	Evacuation done by operation & security team and head count was done by HR team in coordination with Liquid and Security team. Admin team was also available at the site for providing required	3	

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MOCK DRILL REPORT

	support.		
Availability and response of emergency kit / equipment / Other.	Emergency kit was immediately mobilized at the incident spot	3	
Audibility of the scenario on PA System by Persons	Security vehicle PA system is audible during evacuation of people.	3	

Good Observations:

1. Fire extinguisher was immediately used by Liquid Terminal staff for extinguishing the fire at initial stage
2. Causalities were immediately rescued by fire team with use of SCBA set.
3. MSDS was referred during the emergency handling by incident controller.
4. Spill kit was mobilised at the incident spot to control/ contain the spillage of cargo.
5. Communication / Information on emergency conveyed to all concern by POC & incident controller.
6. Use of spark proof tools along with PP tool box was observed by maintenance team.
7. PA system was used for evacuation of people by security system.
8. Response of emergency agencies was satisfactory (i.e. OHC, Fire, Security, OHS, Environment, etc.)
9. HR & Admin team reached on time and performed the duty of head count and providing required resources.

Observer – I & II: Mr. Manan Bhatt & Mr. K R Rao

1. Emergency siren was blown after 2 mins from the declaring of emergency. Person at the control room was not aware of the procedure to blow the siren.
2. Communication of incident controller with the emergency services at the site was lacking to some extent.
3. Person with proper PPE's should only be available at site (one maintenance staff was found at location without mask).
4. Punching gate/ turnstile gate were not made free for easy exit of workforce (in & out gate were opened).
5. Suggestion – There should be proper approach at main gate entrance for easy mobilization/ movement of emergency vehicle.

Overall rating

Marks from above 96 - Excellent

Marks from 90 to 95 - Very Good

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MOCK DRILL REPORT

Marks below 90 - Needs Improvement

VOTE OF THANKS:

Mr. Anand Marathe, Mr. Manan Bhatt, Mr. Rakesh Chaturvedi & Mr. K R Rao thanked all the staff involved in the drill. Mr. K R Rao also thanked OHS, Fire, OHC, Security and Maintenance team for their immediate response.

SUPPORTING STAFF:

Drill Organized By	:	Mr. Bhushan Bhatt and Mr. Rana Bambhaniya
Drill Guided By	:	Mr. K R Rao
Exercise Performance Assessor	:	Mr. Manan Bhatt and Mr. K R Rao
Site Incident Controller	:	Mr. Haresh Patel
Report prepared By	:	Mr. Manan Bhatt

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MOCK DRILL REPORT

COMPLIANCE REPORT FOR MOCK DRILL

Plant/ Facilities : Liquid Terminal
Date of Mock Drill : 25.01.2019

#	Recommendations	Action Taken/ Date	Date of Completion
1	• **Emergency siren was blown after 2 mins from the declaring of emergency. Person at the control room was not aware of the procedure to blow the siren.** • **Communication of incident controller with the emergency services at the site was lacking to some extent.** • **Person with proper PPE's should only be available at site (one maintenance staff was found at location without mask).** Training/ refresher training to be arranged covering all the personal involved in an emergency (i.e. LT, ES – LT, Security, etc.).	LT/ OHS	
2	**Punching gate/ turnstile gate were not made free for easy exit of workforce (in & out gate were opened).** As per the normal practice in an emergency all the gates should be made free to avoid any untoward incident during evacuation.	Security	
3	**Suggestion – There should be proper approach at main gate entrance for easy mobilization/ movement of emergency vehicle** Approach road need to be made clear from any obstacles so that emergency services can reach on time and also to avoid any untoward incident	LT/ ES	

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MOCK DRILL REPORT

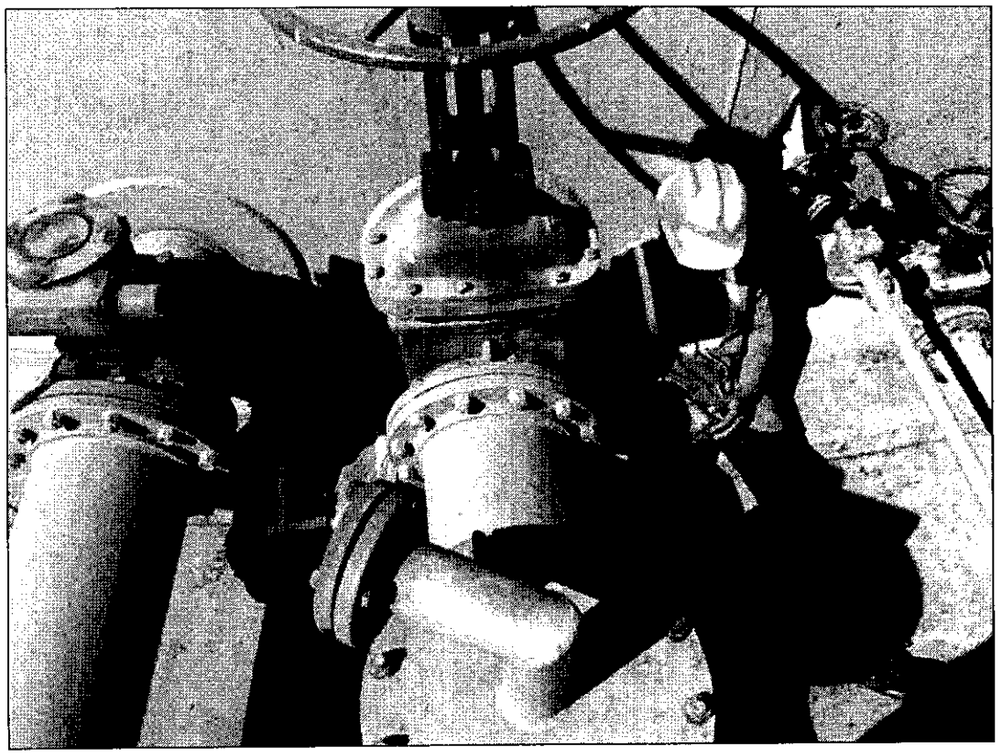
Date	:	25.01.2019
Time	:	11:45 AM
Location	:	Liquid Terminal – Enclosure-09 (Tank No. 117)
Type/Text of the Scenario	:	MTBE (Methyl Tert-Butyl Ether) leakage from the body valve of T – 117, catches fire and two person found unconscious due to inhalation

INTRODUCTION:

Loading in charge Mr. Jayesh Parmar observed leakage of MTBE and found that two people were unconscious at near body valve of T – 117 and simultaneously observed that fire has taken place in the area. He immediately informed Liquid Control In charge Mr. Vikas Dhole for ascertaining the situation.

Immediately POC, Fire and OHC were informed. POC subsequently intimated the same through message/ call to concern departments.

LOCATION (WITH PHOTOGRAPH):



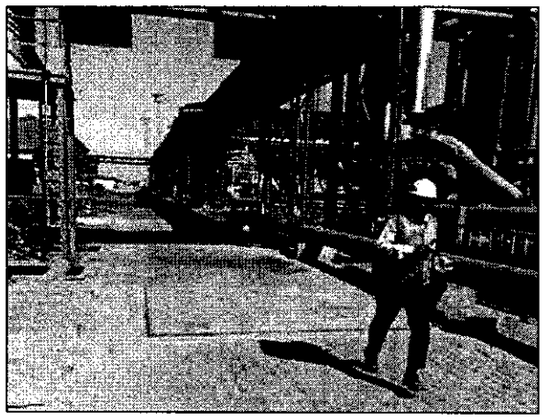
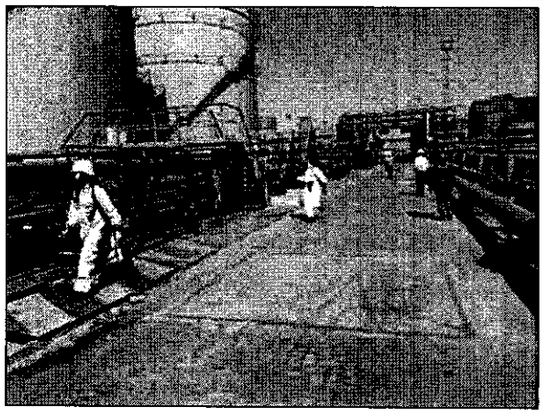
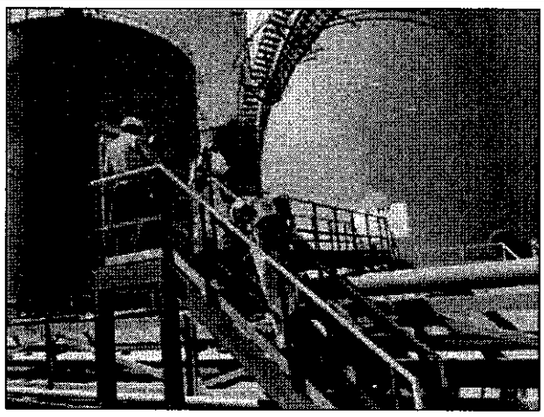
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MOCK DRILL REPORT

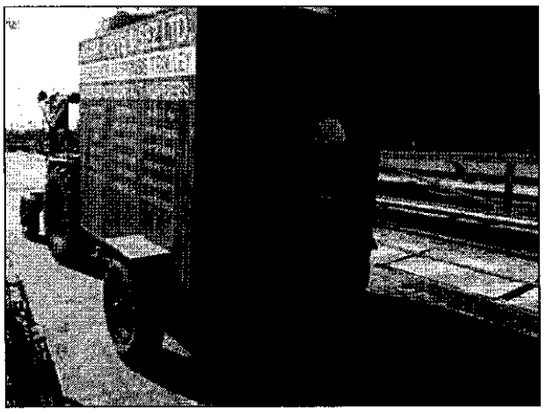
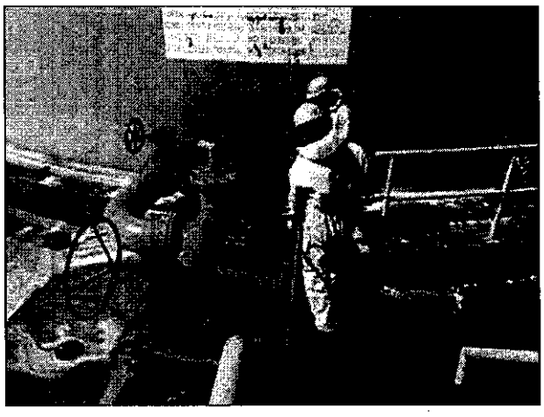
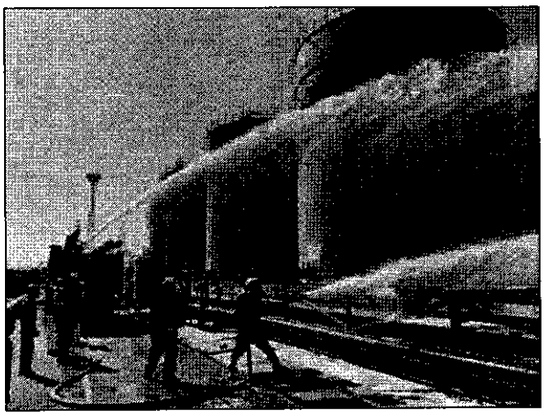
SEQUENCE OF EVENTS WITH PHOTOGRAPHS:

	
Incident Spot : Inside Liquid Terminal (Enclosure-09, Tank no. 117)	**First Responder informed to Incident Controller**
	
Incident Controller reached at site	**Emergency Declared by Incident Controller**
	
Fire team reached at site	**Fire team rescued the victim**

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MOCK DRILL REPORT

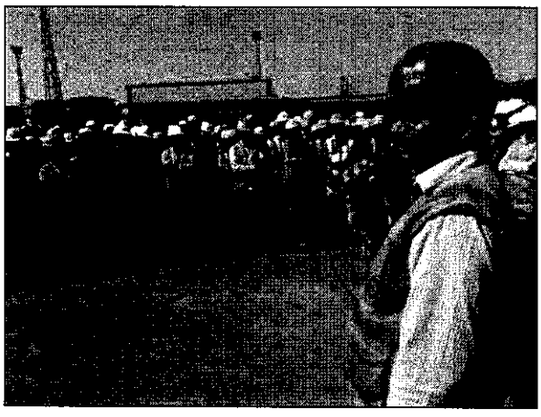
	
Ambulance reached at site	**Security team reached at site**
	
Emergency Spill kit mobilised at site	**Maintenance staff reached at site**
	
Fire Fighting by Fire Team	**People Evacuated from the Liquid Terminal**

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MOCK DRILL REPORT

	
Observer – Manan Bhatt & K R Rao	**Headcounting at Assembly point (Near Driver Canteen)**
	
Briefing at Assembly Point by LT - HOS (Near Driver Canteen)	**Briefing at Assembly point by LT - HOD (Near Driver Canteen)**
	
Briefing at Assembly point by Fire, Safety & Security	**De-Briefing Meeting**

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MOCK DRILL REPORT

RESPONSE TIME:

#	Description		Exact Time
1.	First responder informed to Incident Controller	:	11:45 AM
2.	Incident controller comes on site	:	11:46 AM
3.	Declaration of Emergency	:	11:46 AM
4.	Security team reaching time at incident point	:	11:51 AM
5.	Fire Tender reaching time at incident Point	:	11:53 AM
6.	Ambulance reaching time at incident Point	:	11:54 AM
7.	Departure of Ambulance with patient	:	11:57 AM
8.	Ambulance reached at OHC	:	12:01 PM
9.	First person at Assembly Point	:	--
10.	Last person at Assembly Point	:	--
11.	Maintenance/ Rescue Arrangement at site	:	11:56 AM
12.	Corporate Affairs team reaching on site	:	NA
13.	Liaoning officer reached at site	:	--
14.	Audibility of the scenario on PA system	:	--
15.	Termination of Emergency	:	12:15 PM

Note: For more than one assembly point, please mention details for point 10 & 11.

COMMUNICATION & ACTIONS:

Action By	Information To / Action By	Remarks
First Responder	Information given to incident controller about situation / scenario.	
Site Incident Controller	Assess the site and declare emergency.	
Concern Department/ Area In-charge	Inform to POC, Security, Fire, Medical, Safety etc.	
Engineering Services	LT Maintenance team reached the site and assess the leakage from the body valve with coordination of incident controller. ES – E & I team reached at site and acted as per instruction of incident controller.	
Corporate Affairs	NA	
HR/ Admin	HR Team reached at the site and ensured head count along with Security Personnel. Admin team reached at assembly point to ensure proper evacuation of workforce upon instruction of incident controller.	
Safety	Discuss to mitigate catastrophic effects with incident controller and	

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MOCK DRILL REPORT

	ask for any add or services required like PPE's, Ambulance etc.	
OHC	Ensure the type of chemical exposure with incident controller and mobilize ambulance at OHC for further treatment.	
Security Control Room	Evacuated the workforce from the terminal and carried out check with the patrolling vehicle.	
Fire Control Room Inform	Immediately rescued the unconscious persons from the incident spot and handed over to ambulance. Immediate started the fire fighting from fixed firefighting system with coordination of incident controller.	

COMMUNICATION TO MUTUAL AID GROUP
(IF REQUIRED, AS AND WHEN MUTUAL AID IS CALLED) – Not Required.

To	By Whom/ Media	Standard	Performance
IOCL		2 min. after receiving information to Emergency Control Room	
HPCL			
JINDAL SAW			
ADANI POWER			
CGPL			
HMEL			

RESPONSE TIME PERFORMANCE OF ACTION

Agency	Standard Time	Performance	Rating (Max. 9/ Block) +VE Marks	-VE Marks
Ambulance	1-2 Min	2 Min	9	
Safety	4-5 Min	4 Min	9	
Fire Services	4-5 Min	3 Min	9	

A. <u>PERFORMANCE OF OHS & F SERVICES & RESCUE SERVICES</u>

Performance	Performance	Rating (Max. 3 per Block) +VE Marks	-VE Marks
Turn out/ response time of Fire Team	Fire team reached at site within benchmark of response time.	3	
Turn out/ response time of OHC Team	OHC team reached at site within benchmark	3	

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

	of response time.		
Turn out/ response time of Safety Team and in coordination with incident controller mobilisation of personnel and resources.	Response time of Safety team is within benchmark and well coordinate with incident controller for mobilisation of personnel, resources, PPE's etc.	3	
Firefighting at the site	Rescued the affected person immediately with the staff available in the terminal. Started firefighting for controlling the fire with co – ordination of incident controller.	3	
Medical attention at the site	Reported to incident Controller and immediately unconscious persons shifted to OHC for the treatment.	3	
Rescue of person	Immediately rescue of casualties by fire team by using SCBA set.	3	

B. PERFORMANCE OF MAINTENANCE DEPARTMENT

Performance	Performance	Rating (Max. 3 per Block) +VE Marks	-VE Marks
Power shut down/ cut off	As per guided by incident controller immediate power shut off by E & I Team.	3	
Immediate arrangements at the site	All arrangement were mobilised	3	
Mobilizing of personnel and resources	Maintenance team reached at site with tool kit and appropriate PPEs.	3	
Maintenance activities being carried out at the site	As per guided by incident controller, leak controlled by maintenance team with help of tool kit.	2	1

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MOCK DRILL REPORT

	One staff was observed without proper PPEs		
Clearing debris	NA	3	
Other arrangement at required to meet emergency	Provided as required by incident controller and support team.	3	

C. PERFORMANCE OF SECURITY SERVICES

Performance	Performance Rating	Rating (Max. 3 per Block) +VE Marks	-VE Marks
Turnout of Security	Security team reached within time and barricade the area reported to incident controller for further update.	3	
Performance of security guards	Gates were opened for easy evacuation of workforce. Turnstile was not freed/ by-passed for speedy evacuation of workforce	2	1
Security officer's command & control	Security officers restrict the entry of unauthorized persons / also ensure that vehicles do not enter the gate.	3	
Area cordoned off	Immediate barricade the area for restrict to entry at scene by security team as guided by incident controller.	3	
Prevent unwanted/ unauthorized entry into this area	Security officers restrict the entry of unauthorized persons / also ensure that vehicles do not enter the gate also co-ordinate properly with incident controller.	3	
Closer of gates	Vehicle and man movement entry gates closed by security	3	

	guard		
Providing security coverage at main gate and directing concern person to the site	Round of the terminal with announcement was taken to ascertain that all the workforces have safely moved to assembly point.	3	

D. PERFORMANCE OF OPERATION/ CONCERN DEPARTMENT

Performance	Performance Rating	Rating (Max. 3 per Block) +VE Marks	-VE Marks
Immediately pass the communication message through VHF / other available media to subordinates & emergency response team.	Communication / Information on emergency conveyed to all concern. Communication to emergency services at the site by incident controller was found lacking to some extent specially with fire services	1	2
Stopping of operation / like critical operations first & on priority basis	All operations stopped by incident controller.	3	
Emergency response of particular department at site	Response time of concern department found adequate. Fire extinguisher was immediately used at the site by LT Team and all the emergency services response time was good.	3	
Support for evacuation of people at site and head count along with HR/ Admin	Evacuation done by operation & security team and head count was done by HR team in coordination with Liquid and Security team. Admin team was also available at the site for providing required	3	

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MOCK DRILL REPORT

	support.		
Availability and response of emergency kit / equipment / Other.	Emergency kit was immediately mobilized at the incident spot	3	
Audibility of the scenario on PA System by Persons	Security vehicle PA system is audible during evacuation of people.	3	

Good Observations:

1. Fire extinguisher was immediately used by Liquid Terminal staff for extinguishing the fire at initial stage
2. Causalities were immediately rescued by fire team with use of SCBA set.
3. MSDS was referred during the emergency handling by incident controller.
4. Spill kit was mobilised at the incident spot to control/ contain the spillage of cargo.
5. Communication / Information on emergency conveyed to all concern by POC & incident controller.
6. Use of spark proof tools along with PP tool box was observed by maintenance team.
7. PA system was used for evacuation of people by security system.
8. Response of emergency agencies was satisfactory (i.e. OHC, Fire, Security, OHS, Environment, etc.)
9. HR & Admin team reached on time and performed the duty of head count and providing required resources.

Observer – I & II: Mr. Manan Bhatt & Mr. K R Rao

1. Emergency siren was blown after 2 mins from the declaring of emergency. Person at the control room was not aware of the procedure to blow the siren.
2. Communication of incident controller with the emergency services at the site was lacking to some extent.
3. Person with proper PPE's should only be available at site (one maintenance staff was found at location without mask).
4. Punching gate/ turnstile gate were not made free for easy exit of workforce (in & out gate were opened).
5. Suggestion – There should be proper approach at main gate entrance for easy mobilization/ movement of emergency vehicle.

Overall rating

Marks from above 96 - Excellent

Marks from 90 to 95 - Very Good

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MOCK DRILL REPORT

Marks below 90 - Needs Improvement

VOTE OF THANKS:

Mr. Anand Marathe, Mr. Manan Bhatt, Mr. Rakesh Chaturvedi & Mr. K R Rao thanked all the staff involved in the drill. Mr. K R Rao also thanked OHS, Fire, OHC, Security and Maintenance team for their immediate response.

SUPPORTING STAFF:

Drill Organized By	:	Mr. Bhushan Bhatt and Mr. Rana Bambhaniya
Drill Guided By	:	Mr. K R Rao
Exercise Performance Assessor	:	Mr. Manan Bhatt and Mr. K R Rao
Site Incident Controller	:	Mr. Haresh Patel
Report prepared By	:	Mr. Manan Bhatt

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MOCK DRILL REPORT

COMPLIANCE REPORT FOR MOCK DRILL

Plant/ Facilities : Liquid Terminal
Date of Mock Drill : 25.01.2019

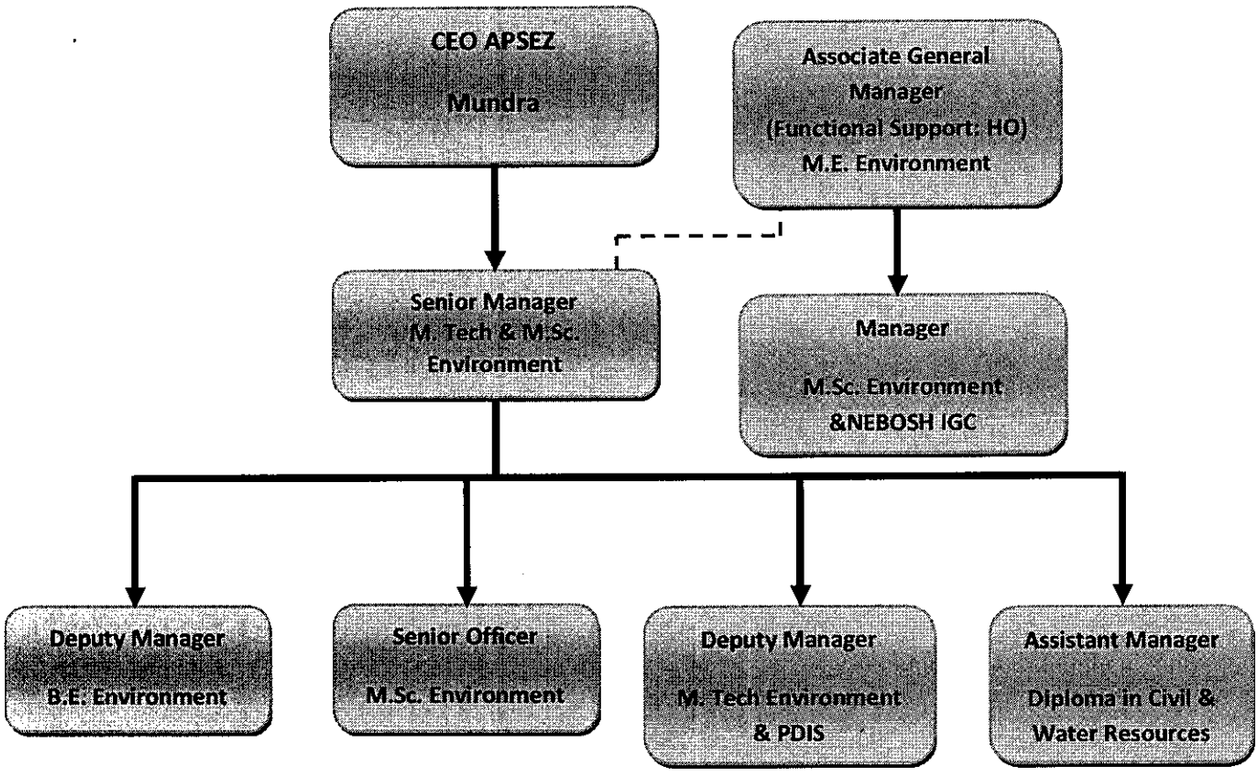
#	Recommendations	Action Taken/ Date	Date of Completion
1	• **Emergency siren was blown after 2 mins from the declaring of emergency. Person at the control room was not aware of the procedure to blow the siren.** • **Communication of incident controller with the emergency services at the site was lacking to some extent.** • **Person with proper PPE's should only be available at site (one maintenance staff was found at location without mask).** Training/ refresher training to be arranged covering all the personal involved in an emergency (i.e. LT, ES – LT, Security, etc.).	LT/ OHS	
2	**Punching gate/ turnstile gate were not made free for easy exit of workforce (in & out gate were opened).** As per the normal practice in an emergency all the gates should be made free to avoid any untoward incident during evacuation.	Security	
3	**Suggestion – There should be proper approach at main gate entrance for easy mobilization/ movement of emergency vehicle** Approach road need to be made clear from any obstacles so that emergency services can reach on time and also to avoid any untoward incident	LT/ ES	

ANNEXURE – 8

42479

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Organogram of Environment Management Cell, APSEZ, Mundra



~~4250~~
4286

3986

ANNEXURE – 9

4281

Cost of Environmental Protection Measures

Sr. No.	Activity	Cost incurred (INR in Lacs)			Budgeted Cost (INR in Lacs)
		2016 – 17	2017 – 18	2018 – 19	2018 – 19
1.	Environmental Study / Audit and Consultancy	36.78	9.0	6.7	30.5
2.	Legal & Statutory Expenses	4.76	5.07	4.42	5.7
3.	Environmental Monitoring Services	27.95	27.02	20.36	36.0
4.	Hazardous / Non Hazardous Waste Management & Disposal	12.52	65.62	95.72	84.8
5.	Environment Days Celebration	6.71	2.85	0.28	10.0
6.	Treatment and Disposal of Bio-Medical Waste	1.27	1.13	1.21	1.56
7.	Mangrove Plantation, Monitoring & Conservation	72.38	60.0	47.0	50.0
8.	Other Horticulture Expenses	555.00	547.0	579.32	579.32
9.	O&M of Sewage Treatment Plant and Effluent Treatment Plant (including STP, ETP of Port & SEZ & Common Effluent Treatment Plant)	61.50	70.02	144.29	153.9
10.	Expenditure of Environment Dept. (Apart from above head)	131.83	102.15	109.28	117.29
	Total	**910.70**	**889.86**	**1008.58**	**1069.07**

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ANNEXURE – 10

4283 o/c

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PCB ID: 17739

APSEZ/EnvCell/2018-19/059

Date: 22.11.2018

Received
Gujarat Pollution Control Board
Regional Office
Kutch (East)
22/11/2018

To,
Regional Officer
Regional Office,
Gujarat Pollution Control Board (East – Kutch),
Sector No. 8, Gandhidham,
Kutch – 370201.

Subject: Submission of compliance to observation/suggestion/instruction made by GPCB officials during inspection.

Reference: GPCB Inspection letter dated 20.11.2018, PCB ID: 17739 (**Annexure – 1**)

Dear Sir,

With reference to the above mentioned subject, APSEZL is submitting the compliance details of your observations as below:

- ✓ **Our Reply against your Observation – 1**: Approx. 200 KL (60 KL/Day) of wastewater will be generated due to washing of 01 tank as & when waste oil storage will be stored within the liquid terminal premises. Entire quantity of wastewater generated from tank washing due to storage / handling of waste oil will be sent to Effluent treatment plant for further treatment. Treated water will be utilized for horticulture purpose within the APSEZ premises.

  We have provided dedicated liquid cargo storage tank within our tank farm, however occasionally it is required to wash the tank to changeover the cargo in case of non-availability of dedicated tank. As per our present CC&A granted, maximum effluent generation quantity @ 90.31 KLD due to tank washing activity is provided. Adequate effluent treatment plant of 120 KLD capacities to treat and handle the total effluent load is in operation.

  Washing of these tanks might be few times in a year due to waste oil handling activity. So whatever quantity of wastewater generated due to this washing activity will be well within the GPCB consented limit.

- ✓ **Our Reply against your Observation – 2**: We will dispose entire quantity of waste oil to the GPCB / CPCB registered recyclers / reprocessors. Details of CPCB / GPCB registered recyclers / reprocessors are attached as **Annexure – 2**.

- ✓ **Our Reply against your Observation – 3**: Till date we have not received any waste oil from ships / vessels, however as per current CC&A , permission to receive and handle slop & its further treatment in oil water separator (25 m3/hr) is available.

Adani Ports and Special Economic Zone Ltd
Adani House,
PO Box No. 1
Mundra, Kutch 370 421
Gujarat, India

Tel +91 2838 25 5000
Fax +91 2838 25 5110
info@adani.com
www.adani.com

✓ **Our Reply against your Observation – 4**: Legal notarized undertaking stating that handling, storage and disposal of waste oil will be done as per Hazardous Waste Rules – 2016 is attached as **Annexure – 3.**

APSEZL is submitting the compliances regularly and hope the above mentioned submission is in line with requirement.

Thanking you,
For, **Adani Ports and Special Economic Zone Ltd.**

Authorised Signatory

Copy to:

Unit Head (Kutch unit)
Gujarat Pollution Control Board,
Paryavaran Bhavan, Sector – 10A,
Gandhinagar – 382010.

Adani Ports and Special Economic Zone Ltd
Adani House,
PO Box No. 1
Mundra, Kutch 370 421
Gujarat, India

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ANNEXURE-1

8285

ગુજરાત પ્રદુષણ નિયંત્રણ બોર્ડ

પ્રાદેશિક કચેરી : કચ્છ (પૂર્વ)

દિનદયાલ પોર્ટ ટ્રસ્ટનું વહીવટ મકાન ફ્લા નં. ૨૧૫, ૨૧૬, ૨જો માળ,
સેક્ટર નં. ૮, ગાંધીધામ-૩૭૦૨૦૧, કચ્છ. ફોન : ૦૨૮૩૬-૨૩૦૮૨૮

પ્રતિ, Adani Ports & Special Economic Zone Ltd.
S.N. 169/1
Mundra, Kutch

તારીખ : 20/11/18

જીપીસીબી આઇડી : 17739

ગુજરાત પ્રદુષણ નિયંત્રણ બોર્ડના અધિકારીઓ દ્વારા આપના એકમની આજરોજ જુદા જુદા પર્યાવરણીય નિયમોને આધિન સ્થળ મુલાકાત લેવામાં આવેલ.આપના એકમના સ્થળ મુલાકાત દરમ્યાન કરેલ અવલોકનો, આપે આપેલ માહિતી / દસ્તાવેજો અને પર્યાવરણીય નિયમોની જોગવાઇ આધીન, આપને નીચે મુજબ સુચનાઓ આપવામાં આવે છે જેની પૂર્તતા/સ્પષ્ટતા અંગેનો અહેવાલ (કોમ્પલાયન્સ રીપોર્ટ) આ આદેશ મળ્યાની તારીખથી કામકાજના દિવસ-3 માં લેખીત/એક્ષજીએન/ઇલેક્ટ્રોનિક માધ્યમ મારફતે બોર્ડની વડી કચેરી ગુજરાત પ્રદુષણ નિયંત્રણ બોર્ડ, પર્યાવરણ ભવન, સેક્ટર ૧૦-એ, ગાંધીનગર-૩૮૨૦૧૦ ને આ કચેરીની જાણ હેઠળ અચૂક મોકલી આવવો.

(1) Waste ના storage/Handling ના washing or બગીચામાં તથા storage tank માં વપરાતા Cement ના ડાઘા માટે ના બગાડ, ફોરકોર, માર્ગ ની સાફ સફાઈ કરવી.

(2) મોર્ટર માટે રેતી/કોંક્રીટ માટે Receive થતા waste ના પ્રમાણ માર્ગ અને થતા ઘટાડા અંગે તા. 29-2-22 સુધીમાં સાફ સફાઈ કરવી. (capacity વધારવા)

(3) રેતી/કોંક્રીટ માટે વેસ્ટ બેગીંગ કરીને ફરીથી ઉપયોગ કરવો નો નવા Handling, storage અને Disposal સાફ સફાઈ કરવી.

(4) Waste oil ના Handling, storage અને disposal Hazardous waste Rules 2016 ની જોગવાઈ મુજબ કરવા અંગે ની Notarized undertaking કરી આપવું.

એકમના પ્રતિનિધિનું નામ અને હોદ્દો

Chirag Rajput
Dy Manager

R/R Vinda
ASE

R. H. Jirani
SO

ANNEXURE – 2

DETAILS OF REGISTERED RECYCLER / REPROCESSOR

Sr. No.	Name & Address of the Unit	Permitted Capacity (MTA/KLA)
1	Mundra Oil Pvt. Ltd, SUR NO-141,Paiki,Mundra,SEZ, Ta- Mundra. Dist- Kutch	27000
2	Allcid organic Industries Ltd., Plot no: 208, Hanuman Henduva, opp. Gujcomasol, Nr. Khari River, Highway, Post: Palavasana, Mehsana-2	18000
3	Western India Petrochem Industry, Plot No-50, 51, GIDC Estate, Village Gozaria, Dist-Mehsana.	11100
4	Deepak Petrochem Ltd., 56/2, rameshwar road, vill. Vasenti, nr. Baska, tal. Halol, panchmahal - 389350	50400
5	Jawrawala Petroleum, Plot No:200/33, B/H Kashiram Textile Mill, Narol, Ahmedabad - 382405	9000
6	Hindustan Oils Industries, Shed No.282, A-I, Sec-III, Kandla SEZ, Gandhidham-370210, Dist-Kutch	12000
7	Concept Petrochem, S.No. 249A, Plot No: 41/A, Vasna Iyava, Vill. Sanand, Dist. Ahmdabad	12000
8	Shine Petrochem, Survey No.21, Vill: Jakshi-382150, Ta: Viramgam, Dist: Ahmedabad	12000
9	R. V. Biocoal, Survey No.205/P, National Highway – 8B, Alakh Hotel, Vill – Gomta, Ta – Gondal, Dist: Rajkot-360311	26250
10	Kutch Petrochem P. Ltd., Plot No.12-14 & 23-25, Survey No,105/1, Vill: Padana, Ta: Gandhidham, Dist: Kutch	10800

Adani Ports and Special Economic Zone Ltd
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Registered Office: Adani House, Nr Mithakhali Circle, Navrangpura, Ahmedabad 380 009, Gujarat, India

ANNEXURE-5

AXIS BANK LTD,
ADANI PORT, MUNDRA-370421.

GUJISOS/AUTH/AV/101/2006

भारत 59043 SPECIAL ADHESIVE 9287
169961 NOV 22 2018
11:55
Rs.0000100/- PB5257
INDIA STAMP DUTY GUJARAT

Purchaser's Name Chirag Rupat
Address Mundra
Name P. C. SHAH
Area : Dist. Kutch
Reg. No. : NTR/175/R
Expiry Date 25/5/2021
Licence No. GJ/Kutch/AV/101/2006/5211
One Hundred Only

NOTARY Name P. C. SHAH Area : Dist. Kutch Reg. No. : NTR/175/R Expiry Date 25/5/2021 GOVT. OF GUJARAT (INDIA)

NOTARIAL Name NOTARIAL P. C. SHAH Area : Dist. Kutch Reg. No. : NTR/175/R Expiry Date 25/5/2021 GOVT. OF GUJARAT (INDIA) NOTARIAL NOTARIAL



LEGAL UNDERTAKING

I, Sumit Paliwal age 44 years, Sr. Manager – Environment Cell, Adani Ports and Special Economic Zone Limited at Plot No. 169/P, Navinal Island, Mundra, Ta: Mundra, Dist: Kutch do hereby undertake as under:

APSEZL has applied for CC&A-Amendment for handling, storage and disposal of Waste Oil (Slop Oil, Used Oil, Oil Tank Cleaning Water, Oily Water, etc.) from Ships / Vessels @ 0.18 MMTPA capacities.

Waste Oil will be handled, stored and disposed as per the provision of Hazardous & Other Solid Waste (Management & Transboundary) Rules 2016.

Due to proposed activity, there will be no increase in water consumption as well as wastewater generation and it will be well within the GPCB consented limit.

That is stated herein above is true to the best of my knowledge and the same I believe to be true.

Signed / Sworn
Before Me.

Date: 22.11.2018
AQBPP 1937A
Place: Mundra, Kutch

Sumit Paliwal
(Sr. Manager – Environment Cell, APSEZ, Mundra)

NOTARY Name P. C. SHAH Area : Dist. Kutch Reg. No. : NTR/175/R Expiry Date 25/5/2021 GOVT. OF GUJARAT (INDIA)

P. C. SHAH
NOTARY (KUTCH)
JAYSUKH NIWAS,
BUNDER ROAD, MUNDRA
KUTCH (GUJARAT)

NR 1063/2018

EAC OBSERVATION:

The reply to TOR point No (4) is not proper.

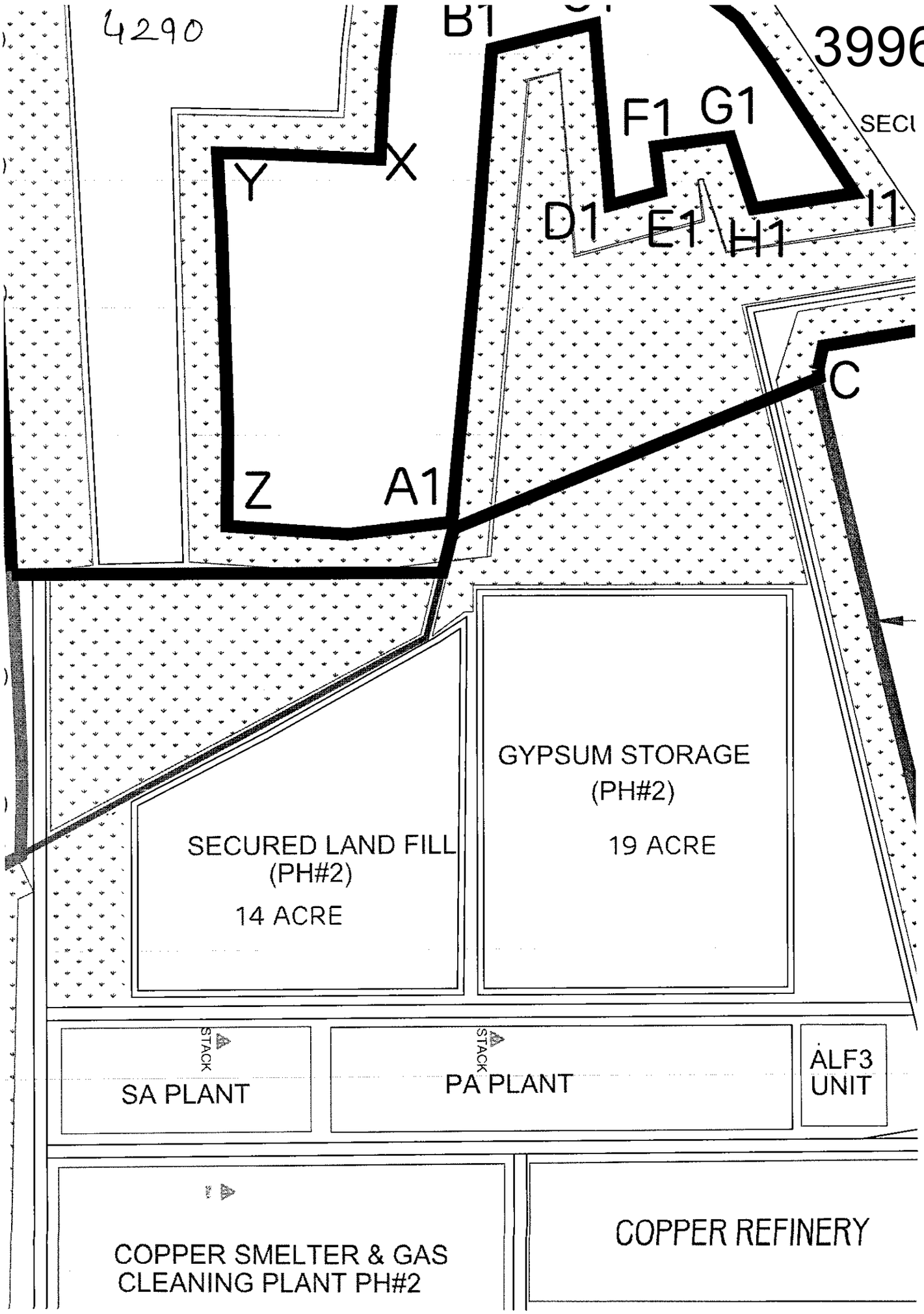
REPLY:

Description	Compliance
i) Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.	Complied. EIA Chapter-2, Section 2.1.2, Page C2-3
ii) A Topo- sheet of the study area of radius of 10 km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)	Complied. EIA Chapter-1, Figure 1.2.
iii) Co-ordinates (Lat-long) of all four corners of the site.	Drawing along with all boundary corners is attached as **Annexure-29(a) of ADS Reply.**
iv) Google map-Earth downloaded of the project site.	Complied. EIA Chapter-1, Figure 1.3.
v) Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.	Layout of APSEZ indicating existing industries and proposed copper unit is attached as **Annexure-29(a) of ADS Reply**. Details of the proposed copper refinery unit indicating storage area, plant area, greenbelt area, utilities etc. is attached as **Annexure-29(b) of ADS Reply.**
vi) Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.	Complied. EIA Chapter-1, Figure 1.4(A) and 1.4 (B), pages C1-9 and C1-10.
vii) A list of major industries with name and type within study area (10 km radius) shall be incorporated. Land use details of the study area	Complied. • 4620 MW TPP of Adani Power (Mundra)Limited • 4000 MW TPP of Coastal Gujarat Power Limited (CGPL). • Land use of the study area is provided in Chapter-3, Section-3.3 of EIA Report.
viii) Geological features and Geo-hydrological status of the study area shall be included.	Geo-hydrological study has been conducted and is attached as **Annexure- 18 of ADS Reply.**
ix) Details of Drainage of the project up to 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (Mega green field projects).	Complied.
x) Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of	Total project area for the proposed Copper Refinery is 256.58 Ha. APSEZ is in possession of 154.19 Ha land and

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the land.	is already notified as SEZ via Gazette Notification of MINISTRY OF COMMERCE AND INDUSTRY dated 21st September 2016. The balance land of 102.39 Ha for proposed Copper Refinery Project is part of Forest Clearance (FC) proposal no- F. No. 8-04/2016-FC for diversion of 1576.81 Ha of forest land applied by M/s APSEZ. This FC proposal has been accorded stage-1 "In-principle" approval vide letter dated 16th November 2018, under Section-2 of the Forest (Conservation) Act, 1980 in favour of APSEZL for the development of Special Economic Zone (SEZ) and Industrial Park. Forest Clearance (FC) Stage-I, dated 16th November 2019.
xi) R&R details in respect of land in line with state Government policy.	No R&R involved in proposed Project.


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B1
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F1
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Y
D1
E1
H1
I1
C
Z
A1
GYPSUM STORAGE
(PH#2)
19 ACRE
SECURED LAND FILL
(PH#2)
14 ACRE
STACK
SA PLANT
STACK
PA PLANT
ALF3
UNIT
COPPER SMELTER & GAS
CLEANING PLANT PH#2
COPPER REFINERY

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PROPOSED EAST PORT
AIRSTRIP
AIRPORT
SHEKHADIYA
BARAI
MUNDRA
GATE
HOSPITAL
SCHOOL
AMUNDRA TOWNSHIP
MIRZA CORNER
NANA KAPAYA POCKET (DTA)
ADANI WILLMAR
CHEMICAL CLUSTER
CETP
WTP
MITAP
IOCL
OLD PORT
PORT GATE
BOCHA
LAND
ADANI HOUSE
LIGHT HOUSE
PORT USER BUILDING
R&D YARD
FTWZ
HPCL
HMEL
CFS
G.I.D.C.
MAIN GATE
SEZ
DHRUB
LABOUR COLONY
ZARPARA
ZERO POINT
NANAKAPAYA
SHANTIVAN COLONY
SCHOOL
MICT COLONY
60m Road
BARADI MA
HILL

EAC OBSERVATION:

The data retrieved from the LULC studies shall be utilized for the prediction of impacts and mitigation measures.

REPLY:

Based on the remote sensing satellite imageries data, land use/ land cover maps have been prepared for the 10 km radius study area for analyzing the land use pattern of the study area. IRS Resourcesat-2 of 5 m resolution (L4FMX) multispectral satellite data of 21st January/14th February 2016 was used for the mapping and interpretation. The land use pattern of the study area indicates that 37.41% of the study area is under agricultural land followed by water bodies of about 22.63%. Percentage of built-up area and forest land is about 5.08% and 2.02% respectively. Waste lands and wetlands in about 13.58% and 10.80% of the study area. Reclaimed land, salt pans and sandy area is about 8.48% of study area. The details of land use studies are presented in Section-3.3 of Chapter-3 in the Final EIA Report.

WATER QUALITY & SOLID WASTE DISPOSAL IMPACT ON LAND USE/LAND COVER

The water system is highly integrated and is designed for Zero Liquid Discharge (ZLD). The total water requirement for the project is about 35,496 KLD (35.5 MLD). 32,267 KLD (32.27 MLD) would be sourced from desalination plant of APSEZ Limited and supply through M/s. Mundra Utility Private Limited (MUPL). Balance will be met from recycled water. No ground water is proposed to abstract for the project usage. However, a ground water level monitoring system shall be established by installing 5 piezometers within the plant premises and monitoring water levels at a monthly interval.

Wastewater in the proposed project will be generated from plant facilities, plant operations, cooling system and landfill areas. Sewage generated from plant domestic facilities will be treated in STP and used for horticulture and plantation, toilets etc. Wastewater/ reject water generated from plant operations and landfill will be treated in ETPs and will be recycled for plant operations.

Kotdi creek towards south of project site and Boradi Mata creek towards southeast of project site are the major creeks in the study area. Arabian Sea, the Gulf of Kachchh is in the southern part occupying 18% of the study area. Danesri Nadi, a seasonal stream passes through western part of the project site. Danesri Nadi originates from north of study area (3.80 km from study area) and has a catchment area of 3.75 sq km from railway line near project site. There are no other drainage courses in the project site. Danesri Nadi along the project boundary will not be disturbed and maintained with necessary bank stabilization will be done with compaction/stone pitching and raising the bund up to 2.0 m. The Danesri Nadi conservation plan will include a 50 m corridor from HFL along the stream course for green belt development and another 50 m along the green belt where any storage is coming (total of 100 m from HFL along the stream course near the storage areas) as presented in plant layout hereunder. No effluent will be discharged into this stream from the plant. Storm water from plant operations, storage areas, landfill and other pollution prone areas shall be separated and diverted to ETP for treatment and reused for plantation and other non-potable uses. The quality will

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be monitored periodically to ensure contaminant free storm water only reaches Danesri Nadi.

Hazardous cake, ETP waste sludge, scrubber cake, spent catalyst and spent resins (from DM, RO & Refinery) will be stabilized and stored in secured land fill of 13.35 ha as per guidelines of MoEF&CC/ CPCB/ GPCB. Further, an area of 18.62 ha and 20.63 ha are identified for the intermediate/emergency storage of copper slag and phosphogypsum. Provision would be made to reclaim the disposed copper slag and phosphogypsum from gypsum pond at a later stage for various utilization ventures. The used oil, oil sludge, nickel sludge and arsenic bearing sludge (As-Cu precipitate) will be given to authorized recycler. The detailed Geology and Hydrogeology report is enclosed as **Annexure-18**.

Mitigation Measures:

- No ground water will be used in this project.
- No surface water will be used in this project and only desalinated water will be used.
- No effluent will be discharged outside the plant premises and plant will operate on Zero Liquid Discharge (ZLD).
- Storm water from plant operations, storage areas, landfill and other pollution prone areas will be separated and diverted to ETP for treatment and reused for plantation and other non-potable uses.
- Maximum recycling of treated wastewater into process;
- Utilization of treated domestic wastewater in greenbelt development and dust suppression;
- Stabilized arsenic bearing sludge, scrubber cake, spent catalyst and spent resins (from DM, RO & Refinery) will be stored in secured land fill as per guidelines of CPCB.
- SLF with double HDPE Liner of 2 mm thick and gypsum storage with single HDPE liner of 1.5 mm thickness will be constructed.
- Ground water level monitoring system will be established by installing 5 piezometers within the plant premises for monitoring water levels at a monthly interval.

AIR QUALITY IMPACT ON LAND USE/LAND COVER

Flash Smelting technology was considered for modelling studies of proposed project. The maximum predicted incremental GLC's for pollutants such as PM_{10} 0.99 $\mu g/m^3$, $PM_{2.5}$ 0.37 $\mu g/m^3$, SO_2 4.2 $\mu g/m^3$, NO_2 0.13 $\mu g/m^3$, HF 0.03 $\mu g/m^3$ and Hg <0.005 $\mu g/m^3$ in 2.2 km in NE direction were determined for FSF technology. However, in the cases, the resultant ambient air quality values are observed to be well within the NAAQS 2009 considering the worst-case scenario (representing winter season).

Hence, it can be concluded that there will not have any major adverse impact on surrounding agriculture, forest land, nearest settlements and other type of lands due to the proposed copper refinery plant. Further, the proposed mitigation measures will bring down these concentrations making the activity more environment friendly. The air quality modelling isopleths are superimposed on LULC map for the prediction of impacts and mitigation measures are enclosed **Annexure-31**.

RESULTANT CUMULATIVE GROUND LEVEL CONCENTRATIONS (24 HOURLY)

Pollutants	Maximum Incremental Levels ($\mu g/m^3$)	Distance (km)	Direction	Existing Land use
PM_{10}	0.99	2.2	NE	Land with Shrub
$PM_{2.5}$	0.37	2.2	NE	
SO_2	4.2	2.2	NE	
NO_2	0.13	2.2	NE	
HF	0.03	2.2	NE	
Hg	0.005	2.2	NE	

RESULTANT CUMULATIVE GROUND LEVEL CONCENTRATIONS (DAY & NIGHT)

Pollutants	Day Time			Night Time		
	GLC ($\mu g/m^3$)	Distance & Direction	Existing Land use	GLC ($\mu g/m^3$)	Distance & Direction	Existing Land use
PM_{10}	0.53	2.8 km & N	Land with Shrub	2.10	1.4 km & SSW	Land with Shrub
$PM_{2.5}$	0.17	2.8 km & N		0.71	1.4 km & SSW	
SO_2	3.81	2.8 km & N		8.51	1.4 km & SSW	
NO_2	0.10	2.8 km & N		0.28	1.4 km & SSW	
HF	0.02	2.8 km & N		0.06	1.4 km & SSW	
Hg	0.003	2.8 km & N		0.006	1.4 km & SSW	

Mitigation measures during Construction Stage:

- Enforce deployment of good condition vehicles with speed restrictions inside the project boundary;
- Deploy mobile water tankers to moist the vehicle movement paths to suppress dust; and
- Enforce no use of firewood for cooking and also no open air burning of any kind of wastes

Mitigation measures during Operation Stage for Fugitive emissions:

- Tube and closed *conveyor* will be provided at raw material handling area;
- High efficiency collecting hood system for fugitive emissions from originating source such as tapping port of smelting furnaces, transfer ladles, furnace openings etc.
- Hood system at converter to capture secondary gases while transferring.
- Minimum 15 m wide greenbelt with native species will be maintained all around the plant boundary. Total of greenbelt & green cover will be 89.84 ha (~35%) within in the Plant boundary.

a) Abatement Technologies:

- **Sulphur Dioxide (SO_2):** High efficiency collection and scrubbing system with lime and caustic;
- **Fluorine (F):** High efficiency collection and scrubbing system with water to produce hydro fluro silicic acid, which will be input to aluminum fluoride plant;

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- **Particulate Matter:** Wet scrubbers, cyclones, electrostatic precipitators, bag filters, vacuum trucks, road vacuum sweepers, etc.; based on the application; and
- The final gaseous emissions from the copper refinery project would be well within the permissible limits as prescribed by GPCB/CPCB/MoEF&CC.

Environmental Setting with regards to Water Bodies

a) Kotdi creek towards south of project site and Boradi Mata creek towards southeast of project site are the major creeks in the study area.
b) Arabian Sea, the Gulf of Kachchh is in the southern part occupying 18% of the study area.
c) Danesri Nadi, a seasonal stream passes through western part of the project site.
d) Danesri Nadi originates from north of study area (3.80 km from study area) and has a catchment area of 3.75 sq km from railway line near project site.
e) There are no other drainage courses in the project site.
f) The project site as such is having less drainage density and hence the potential impact is minimal, however mitigation measures will be implemented.

Mitigation Measures:

1) No ground water will be used in this project.
2) No surface water will be used in this project and only desalinated water will be used.
3) No effluent will be discharged outside the plant premises and plant will operate on Zero Liquid Discharge (ZLD).
4) Storm water from plant operations, storage areas, landfill and other pollution prone areas will be separated and diverted to ETP for treatment and reused for plantation and other non-potable uses.
5) Maximum recycling of treated wastewater into process;
6) Utilization of treated domestic wastewater in greenbelt development and dust suppression;
7) Stabilized arsenic bearing sludge, scrubber cake, spent catalyst and spent resins (from DM, RO & Refinery) will be stored in secured land fill as per guidelines of CPCB.
8) SLF with double HDPE Liner of 2 mm thick and gypsum storage with single HDPE liner of 1.5 mm thickness will be constructed.
9) Ground water level monitoring system will be established by installing 5 piezometers within the plant premises for monitoring water levels at a monthly interval.

EAC OBSERVATION:

The Air Quality modelling studies shall be re-worked out including the mercury and keeping the mixing height in view.

REPLY:

Mercury (Hg) in ambient air was monitored during the period of month of January and February 2019 at eight locations within the 10 km radius study area.

For the mercury sampling, IS: 5182-Part-23 has been followed. The collected sample has been extracted by microwave extraction (Method IO-3.1) method. The extract has been analysed by the ICP MS having least count of 5.0 ng/m^3

The Hg content in the ambient air found to be <5.0 ng/m^3 which was monitored during the period of month of January and February 2019. The dispersion modelling using AERMOD requires hourly meteorological data.

RESULTANT GLC's – WORST CASE SCENARIO

Expressed in µg/m^3

Parameter	Baseline Concentrations	Scenario-III Night Time Predicted Concentrations	Resultant GLC's	NAAQS Limit
PM_{10}	84.200	2.450	86.650	100
$PM_{2.5}$	43.900	00.850	44.750	60
SO_2	42.600	11.600	54.200	80
NO_2	32.800	00.340	33.140	80
Hg	00.005	0.006	0.0110	-

The predicted maximum GLC's during night time were observed to on higher side when compared to day time. However, the night time GLC's were found to be within the NAAQ limits.

Site specific data recorded (Sodar Study) at site is used for executing modelling of impact studies. The site specific meteorological data is processed by using AERMET processor.

AVERAGE MIXING HEIGHTS – DURING WINTER SEASON

Day Time		Night Time	
Hours	Mixing Height (m)	Hours	Mixing Height (m)
6:00	400	18:00	200
7:00	400	19:00	100
8:00	450	20:00	100
9:00	500	21:00	150
10:00	600	22:00	200
11:00	800	23:00	200
12:00	800	00:00	100
13:00	800	01:00	100
14:00	1000	02:00	200
15:00	800	03:00	220
16:00	600	04:00	250
17:00	400	05:00	300

Source: Site Specific Sodar Studies

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Considering the mixing height following process stacks height has been revised.

Sr. No.	Stack Name	Earlier considered Height (m)	Revised Height (m)
	Unit-1		
1	Main Stack Secondary Gas Scrubber- I & II (Bi flue) (Convertor Fugitives and Anode & scrap melting furnace	100	150
2	Electric Furnace and Secondary gases from Smelting – I (Bi Flue)	70	100
3	Phosphoric Acid Plant – I	90	100
	Unit-2		
4	Main Stack Secondary Gas Scrubber- I & II (Bi flue) (Convertor Fugitives and Anode & scrap melting furnace	100	150
5	Electric Furnace and Secondary gases from Smelting – II (Bi Flue)	70	100
6	Phosphoric Acid Plant – II	90	100

PREDICTED INCREMENTAL CONCENTRATION DUE TO VARIATION IN MIXING HEIGHTS WITH FSF TECHNOLOGY

Expressed in µg/m³

Parameter	Earlier Scenario submitted in EIA	Scenario-I 24 Hrs	Scenario-II Day Time	Scenario-III Night Time
PM_{10}	1.32	1.13	0.60	2.45
$PM_{2.5}$	0.54	0.40	0.30	0.85
SO_2	10.37	5.33	5.13	11.60
NO_2	0.23	0.16	0.11	0.34
Hg	-	0.005	0.003	0.006

With increase in stack height and with reduced velocity from 22-25 m/sec to 16-18 m/sec the GLC has reduced. The results of the same is presented above.

The detailed report is provided as **Annexure-31.**

1.0 Impact on Air Quality

The air quality modeling and impacts section has been revised as per the discussions and suggestion given by EAC members during the meeting held on 23rd August 2019. Sulphur dioxide (SO_2) and Particulate Matter (PM) emissions and NO_2 emissions are the main pollutants in the copper refinery plant. Further, air dispersion modeling studies were also carried out for mercury and HF. The incremental Ground Level Concentration's (GLC's) due to the proposed copper refinery have been predicted by using air dispersion modeling.

➢ *Details of Mathematical Modelling*

For prediction of maximum Ground Level Concentrations (GLC's), the air dispersion modeling software (AERMOD version 7.1.0) was used. AERMOD is steady state advanced Gaussian plume model that simulates air quality and deposition fields up to 50 km radius. AERMOD is approved by USEPA and is widely used software. It is an advanced version of Industrial Source Complex (ISCST3) model, utilizes similar input and output structure to ISCST3 sharing many of the same features, as well as offering additional features. The model is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases and multiple sources including point, area, flare, line and volume sources. Dispersion modeling using AERMOD requires hourly meteorological data. Site specific data recorded at site is used for executing modeling studies. The site specific meteorological data is processed by using AERMET processor.

➢ *Model Set-up*

The model set-up details are presented in **Table-1** below:

TABLE-1
MODEL SET-UP

Sr. No.	Parameter	Details
1	Model Name	AERMOD (Version 7.1.0)
2	Model Type	Steady state Gaussian Plume Air Dispersion model
3	Topography	Rural, Flat
4	Averaging Time	24 hours
5	Source Type	Point Source
6	Boundary Limits	10 km X 10 km
7	Co-ordinate System	Uniform Cartesian Grid
8	Receptor Height	0
9	Anemometer	10 m
10	Surface meteorological data	Site Specific data processed by AERMET
11	Upper air Data	Site specific data using AERMET processor

- ***Model Input Data***

✓ Atmospheric Inversion Level and Mixing Height Study

The atmospheric inversion studies were carried out at the project site for estimating the site specific mixing heights based on variable weather conditions. Same has been used in modeling in order to have realistic concentration. The upper air data have been generated at site was used for winter season, which represents worst case scenario.

From the studies, the maximum of inversion height is observed during noon hours (1200-1400 hours) when the ground temperature is also maximum and minimum during night time periods of maximum ground cooling (18:00 - 20:00 hours). These observations support the concept of sea breeze and land breeze conditions prevailing at the project site.

✓ **Stack Details**

The stack details have been revised based on the discussions held during the EAC meeting. The main stack secondary gas scrubber I & II and main sulphuric acid plant stack have been increased from 100 m to 150 m. Similarly, stack connected to electric furnace & secondary gases from smelting have been increased from 100 m to 120 m.

Similarly, stacks connected to sulphuric acid plant pre-heater-I & II, slag granulation-I and dust extraction-I (rock phosphate area) have been increased from 30 m to 45 m each. The details of stack emissions of proposed copper refinery project are given in **Table-3.**

The mixing heights observed during the study period are given below in **Table-2** and the diurnal variation of ABL mixing height are shown in **Figure-1**.

TABLE-2
AVERAGE MIXING HEIGHTS – DURING WINTER SEASON

Day Time		Night Time	
Hours	**Mixing Height (m)**	**Hours**	**Mixing Height (m)**
6:00	400	18:00	200
7:00	400	19:00	100
8:00	450	20:00	100
9:00	500	21:00	150
10:00	600	22:00	200
11:00	800	23:00	200
12:00	800	00:00	100
13:00	800	01:00	100
14:00	1000	02:00	200
15:00	800	03:00	220
16:00	600	04:00	250
17:00	400	05:00	300

Source: Site Specific Sodar Studies

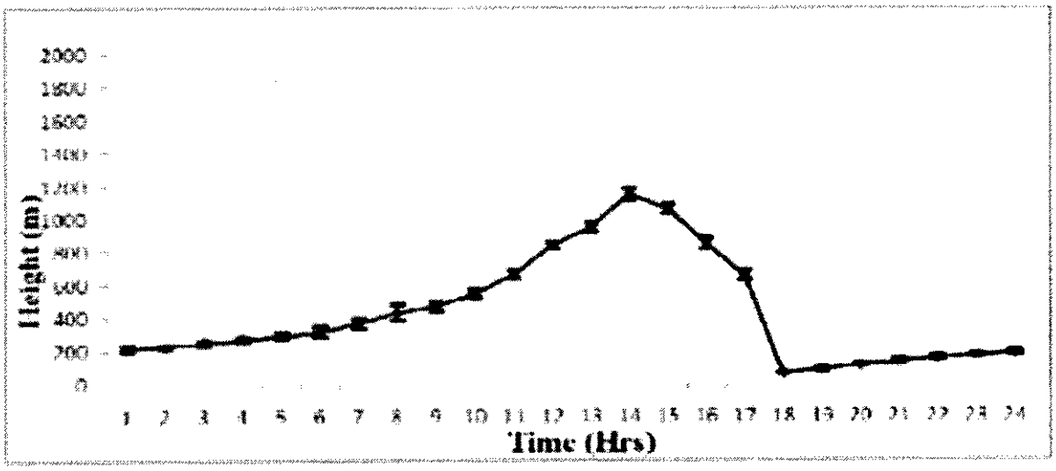


FIGURE-1
DIURNAL VARIATION OF ABL MIXING HEIGHT AT PROJECT SITE

TABLE-3
DETAILS OF STACK EMISSIONS

Sr. No.	Stacks	Height	Dia	Temp	Velocity	Volume	SO_2	SO_2	PM	NOx	NOx	Emission Rates (g/s)		
	Attached to	m	m	° C	m/s	Nm^3/hr	ppm	mg/Nm^3	mg/Nm^3	Ppm	mg/Nm^3	SO_2	PM	Nox
	Unit –I													
	Flue Emission Through Stack attached to Boiler/Furnace/Heater													
1	Waste Heat Recovery Super heater - I*	70	1	150	18	35,000	150	394.5	50	50	102.5	3.8	0.5	1.0
2	Sulphuric Acid Pre Heater-I (Only for plant startup)	45	1.5	250	17	60,000	150	394.5	50	50	102.5	6.6	0.8	1.7
3	Sulphuric Acid Pre Heater-II (Only for plant startup)	45	1.5	250	17	60,000	150	394.5	50	50	102.5	6.6	0.8	1.7
4	DG Set – I (4 MVA Standby)	30	-	-	-	-	-	-	-	-	-	0.0	0.0	-
5	DG Set – II (4 MVA Standby)	30	-	-	-	-	-	-	-	-	-	0.0	0.0	-
6	Boiler – I (operational only when steam is not available from smelter)	70	1	150	15	30,000	150	394.5	50	50	102.5	3.3	0.4	0.9
7	Shaft Furnace of CCR Plant-I*	36	1.5	200	9	37000	25	65.75	50	50	102.5	0.7	0.5	1.1
8	Anode Casting – I	20	0.75	100	17	21,000	-	-	50	15	30.75	0.0	0.3	0.2
9	Anode Casting – II	20	0.75	100	17	21,000	-	-	50	15	30.75	0.0	0.3	0.2
10	Main Stack Secondary Gas Scrubber- I & II (Bi flue) (Convertor Fugitives and Anode & scrap melting furnace) *	150	2.8	60	17	345,900	115	302.45	50	-	-	29.1	4.8	-
			2.0	60	17	171,823	115	302.45		-	-	14.4	0.0	-
11	Electric Furnace and Secondary gases from Smelting – I (Bi Flue) *	120	2.0	150	17	135,000	115	302.45	50	-	-	11.3	1.9	-
			2.2	150	18	168,796	115	302.45		-	-	14.2	0.0	-
12	Main Stack Sulphuric Acid Plant-I & II (Bi flue) *	150	2	75	16	150,760	115	302.45	-	-	-	12.7	0.0	-
			2	75	16	150,760	115	302.45		-	-	12.7	0.0	-
13	Cathode Stripping M C – I*	30	0.3	50	6	1,500	-	-	50	-	-	0.0	0.0	-
14	Cathode Stripping M C – II*	30	0.3	50	6	1,500	-	-	50	-	-	0.0	0.0	-
15	Anode Scrap Washing MC– I*	30	0.3	40	6	1,500	-	-	50	-	-	0.0	0.0	-
16	Electro winning Stack – I*	45	0.3	40	19	4,500	100	263	-	-	-	0.3	0.0	-
17	Slag Granulation – I*	45	1.4	100	18	80,000	25	65.75	50	-	-	1.5	1.1	-
18	Steam Dryer for Copper concentrate – I*	60	1.4	120	15	62,150	25	65.75	50	-	-	1.1	0.9	-
19	Smelting Furnace Area (Emergency Vent-I only during process tripping)	45	1.8	300	18	86,000	150	394.5	50	-	-	9.4	1.2	-
20	PS Convertor Area (Emergency Vent – I (only during process tripping)	45	1.8	300	18	86,000	150	394.5	50	-	-	9.4	1.2	-
21	Dust Extraction – I (Rock Phosphate Handling Area)*	45	0.6	40	15	15,000	-		50	-	-	0.0	0.2	-
22	Precious Metal Recovery Plant – I*	60	0.6	60	16	15,000	115		50	15	30.75	0.0	0.2	-

Sr. No.	Stacks	Height	Dia	Temp	Velocity	Volume	SO_2	SO_2	PM	NOx	NOx	Emission Rates (g/s)		
	Attached to	m	m	° C	m/s	Nm^3/hr	ppm	mg/Nm^3	mg/Nm^3	Ppm	mg/Nm^3	SO_2	PM	Nox
	Unit-II													
23	Waste Heat Recovery Super heater – II*	70	1	150	18	35,000	150	394.5	50	50	102.5	3.8	0.5	1.0
24	Sulphuric Acid Pre Heater-III (Only for plant startup)	45	1.5	250	17	60,000	150	394.5	50	50	102.5	6.6	0.8	1.7
25	Sulphuric Acid Pre Heater-IV (Only for plant startup)	45	1.5	250	17	60,000	150	394.5	50	50	102.5	6.6	0.8	-
26	DG Set - III (4 MVA Standby)	30	0	-	-	-	-	-	-	-	-	0.0	0.0	-
27	DG Set – IV (4 MVA Standby)	30	0	-	-	-	-	-	-	-	-	0.0	0.0	-
28	Boiler – II (operational only when steam is not available from smelter)	70	1	150	15	30,000	150	394.5	50	50	102.5	3.3	0.4	0.9
29	Shaft Furnace of CCR Plant-II*	36	1.5	200	9	37,000	25	65.75	50	50	102.5	0.7	0.5	1.1
30	Anode Casting – III	20	0.75	100	17	21,000	-		50	15	30.75	0.0	0.3	0.2
31	Anode Casting – IV	20	0.75	100	17	21,000	-		50	15	30.75	0.0	0.3	0.2
32	Main Stack Secondary Gas Scrubber-III & IV (Bi flue) (Convertor Fugitives and Anode & scrap melting furnace) *	150	2.8	60	17	345900	115	302.45	150	-	-	29.1	14.4	-
			2	60	17	171823	115	302.45		-	-	14.4	0.0	-
33	Electric Furnace and Secondary gases from Smelting – II (Bi Flue) *	120	2	150	17	135000	115	302.45	150	-	-	11.3	5.6	-
			2.2	150	18	168796	115	302.45		-	-	14.2	0.0	-
34	Main Stack Sulphuric Acid Plant-III & IV (Bi-flue) *	150	2	75	16	150,760	115	302.45	-	-	-	12.7	0.0	-
			2	75	16	150,760	115	302.45	-	-	-	12.7	0.0	-
35	Cathode Stripping M C – III*	30	0.3	50	6	1,500	-	-	50	-	-	0.0	0.0	-
36	Cathode Stripping M C – IV*	30	0.3	50	6	1,500	-	-	50	-	-	0.0	0.0	-
37	Anode Scrap Washing MC-II*	30	0.3	40	6	1,500	-	-	50	-	-	0.0	0.0	-
38	Electro winning Stack – II*	45	0.3	40	19	4,500	100	263	-	-	-	0.3	0.0	-
39	Slag Granulation – II*	45	1.4	100	18	80,000	25	65.75	50	-	-	1.5	1.1	-
40	Steam Dryer for Copper concentrate – II*	60	1.4	120	15	62,150	25	65.75	50	-	-	1.1	0.9	-
41	Smelting Furnace Area (Emergency Vent-II -only during process tripping)	45	1.8	300	18	86000	150	394.5	50	-	-	9.4	1.2	-
42	PS Convertor Area (Emergency Vent – II- only during process tripping)	45	1.8	300	18	86000	150	394.5	50	-	-	9.4	1.2	-
43	Dust Extraction – II (Rock Phosphate Handling Area) *	45	0.6	40	15	15000	-		50	-	-	0.0	0.2	-
44	Precious Metal Recovery Plant – II*	60	0.6	60	16	15,000	115	302.45	50	-	-	1.3	0.2	-
	Phosphoric Acid Plant*						**HF** mg/m^3		**PM**			**HF**	**PM**	
45	Phosphoric Acid Plant – I	120	2.1	50	18	206,000	20		50	-	-	1.1	2.9	-
46	Phosphoric Acid Plant – II	120	2.1	50	18	206,000	20		50	-	-	1.1	2.9	

**denotes stacks considered for modelling*

The simulations have been carried out to evaluate PM, SO_2 and NO_2 likely to be contributed by the proposed copper refinery. Further, pollutants such as hydrogen fluoride and mercury were also considered for air dispersion modelling studies. The Ground Level Concentrations (GLC's) were predicted within 10 km radius covering 16 directions.

FSF technology has been considered for modelling studies.

The maximum predicted GLC's for pollutants such as PM_{10}, $PM_{2.5}$, SO_2, NO_2 and Hg were determined and presented in **Table-4**. In order to find out the maximum GLC's on various land uses, the predicted concentrations (Isopleths) were overlaid on the topo map and presented in **Figure-1** to **Figure-4** respectively.

TABLE-4
PREDICTED SHORT-TERM MODELLING RESULTS (24-HOURLY)

Pollutants	Maximum Incremental Levels (µg/m³)	Distance (km)	Direction
Particulate Matter (PM_{10})	0.99	2.2	NE
Particulate Matter ($PM_{2.5}$)	0.37	2.2	NE
Sulphur dioxide	4.2	2.2	NE
Nitrogen dioxide	0.13	2.2	NE
Hydrogen fluoride (HF)	0.03	2.2	NE
Mercury (Hg)	0.005	2.2	NE

- ***Resultant Concentrations after Implementation of Project***

The resultant concentrations after the implementation of the proposed project are given in **Table-5**.

TABLE-5
RESULTANT CUMULATIVE GROUND LEVEL CONCENTRATIONS (24 HOURLY)

Pollutant	Concentrations (µg/m³)			
	Baseline	Incremental Concentration	Resultant Cumulative Concentration	NAAQS Limits
PM_{10}	84.2	0.99	85.1	100
$PM_{2.5}$	43.9	0.37	44.3	60
SO_2	42.6	4.2	46.8	80
NO_2	32.8	0.13	32.9	80

Observations:

The resultant ambient air quality is observed to be well within the NAAQS 2009 considering the worst case scenario (representing winter season). Hence, it can be concluded that there will not have any major adverse impact on surroundings due to the proposed copper refinery plant. Further, the proposed mitigation measures will bring down these concentrations making the activity more environment friendly.

An attempt has been made by executing the modelling simulations by using day & night mixing heights.

Mixing Height and Concentration of Air Pollutants:

Sodar studies of inversion / mixing height have been undertaken by Vimta Labs Ltd. for the project site at located at project site, district Kutch, Gujarat (India). Study is undertaken for air quality modeling for the proposed copper project.

The continuous Sodar data recorded during the study period (winter season) has been utilized to evaluate hourly averaged mixing /inversion height and presented in this report.

The maximum mixing height is the height of the convective layer associated with the maximum surface temperature. The maximum mixing height exhibits both local and seasonal variations. In addition it is affected significantly by topography and large scale air movements. Maximum values of mixing heights will be observed in day time. Minimum values of mixing height will be observed in the late hours of the night or in the early morning hours and may be the result of a surface based inversion. The pollutants which released into the air from any source of pollution are being continually mixed. On hot days, they are taken up extremely high away from the ground. In contrast to that, in cool days, the mixing height is very low and pollutants remain close to the ground.

The maximum mixing height is 1000 m occurring at 14:00 hours. The convective mixing led to the decrease in concentration of the air pollutants around noon. Similarly, the minimum mixing height is 100 m occurring between 18:00-20:00 hours. Accordingly, the air pollutants are expected to exhibit variations during day and night time.

Modelling simulation were carried out considering 3 scenarios considering 24 hours mixing heights, day time and night time mixing heights. The predicted Ground Level Concentration's (GLC's) for 3 scenarios are presented in Table-6 and Table-6.

Scenario-I: Modeling considering 24 hours Mixing Height- (0.00 Hrs to 23:59 Hrs)
Scenario-II: Modeling considering Day Time Mixing Heights (6:00 AM to 18:00 PM)
Scenario-III: Modeling considering Night Time Mixing Heights (18:01 PM to 5:59 AM)

TABLE-6
PREDICTED INCREMENTAL CONCENTRATION DUE TO VARIATION IN MIXING HEIGHTS

Expressed in µg/m³

Parameter	Scenario-I 24 Hrs	Scenario-II Day Time	Scenario-III Night Time
PM_{10}	0.99	0.53	2.10
$PM_{2.5}$	0.37	0.17	0.71
SO_2	4.2	3.81	8.51
NO_2	0.13	0.1	0.28
Hg	0.005	0.003	0.006
HF	0.03	0.02	0.06
Distance	2.2	2.8	1.4
Direction	NE	N	SSW

In order to determine resultant GCL's during night time (representing worst case scenario) the reported baseline concentrations were added to the maximum predicted night GLC's and the resultant GLC's were presented in the **Table-7** below:

TABLE-7
RESULTANT GLC's – WORST CASE SCENARIO

Expressed in µg/m³

Parameter	Baseline Concentrations	Scenario-III Night Time Predicted Concentrations	Resultant GLC's	NAAQS Limit
PM_{10}	84.2	2.10	86.3	100
$PM_{2.5}$	43.9	0.71	44.6	60
SO_2	42.6	8.51	51.1	80
NO_2	32.8	0.28	33.1	80

The predicted maximum GLC's during night time were observed to on higher side when compared to day time. However, the night time GLC's were found to be within the NAAQ's.

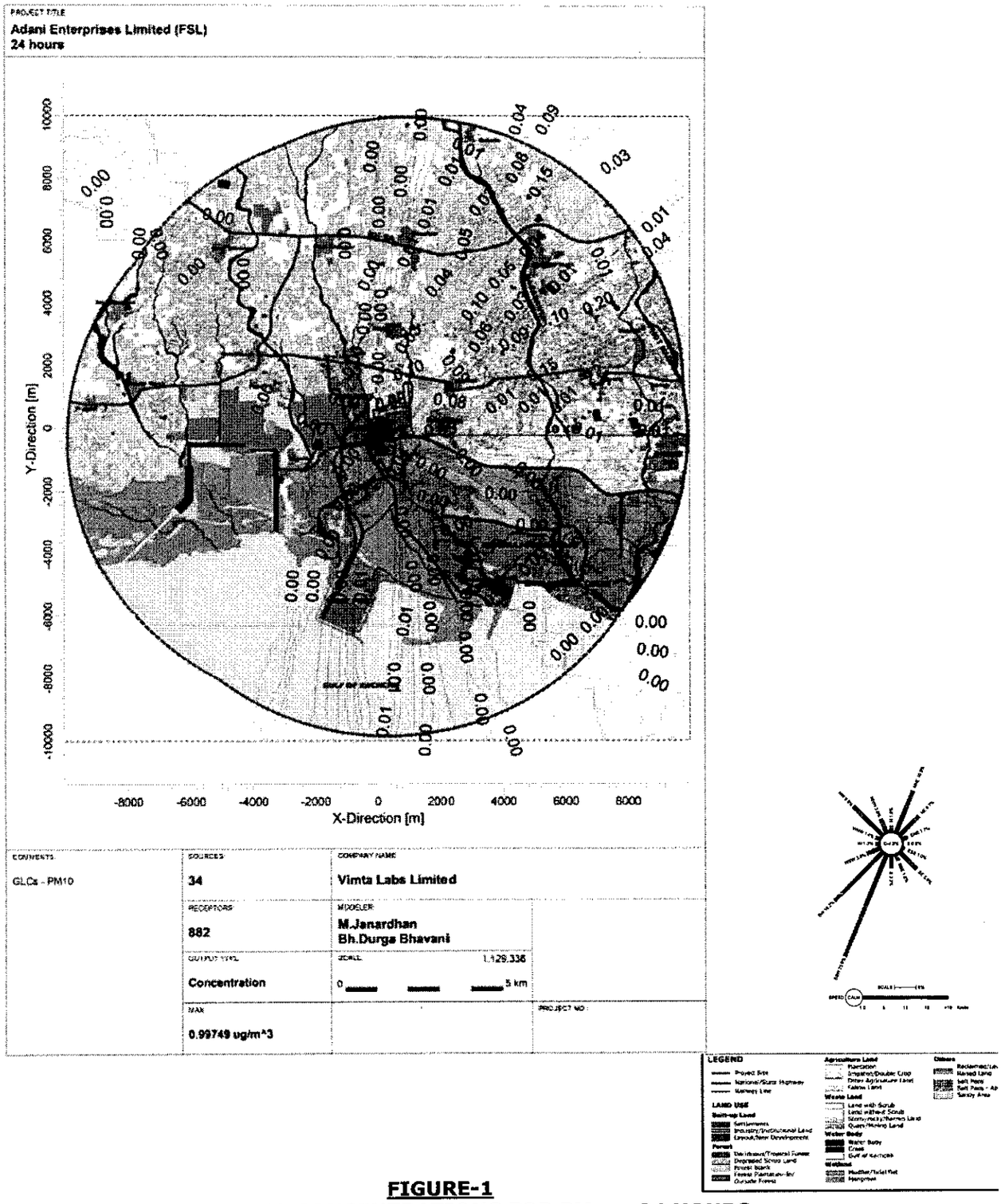


FIGURE-1
INCREMENTAL CONCENTRATIONS FOR PM_{10} – 24 HOURS

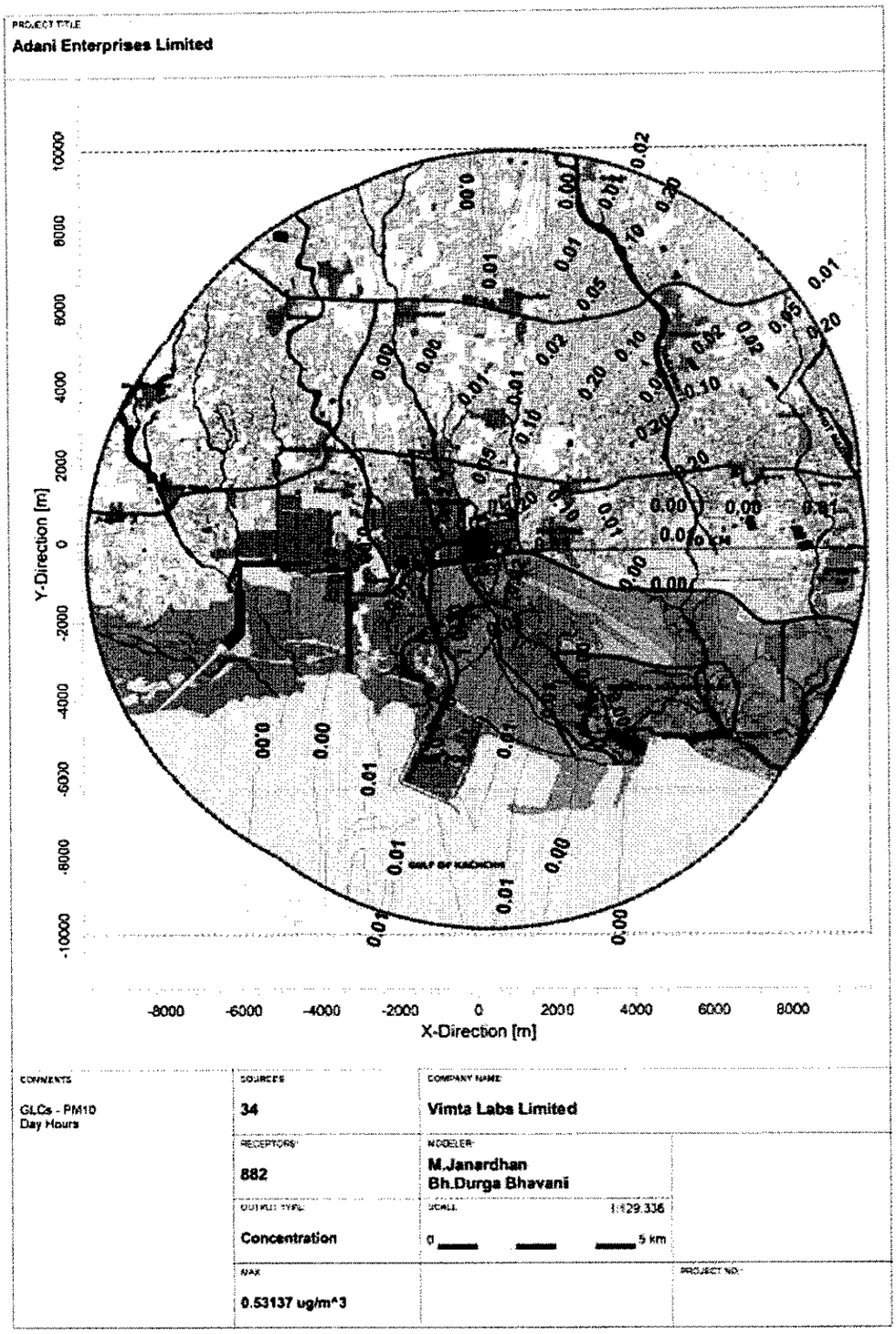


FIGURE-2
INCREMENTAL CONCENTRATIONS FOR PM_{10} –DAY TIME

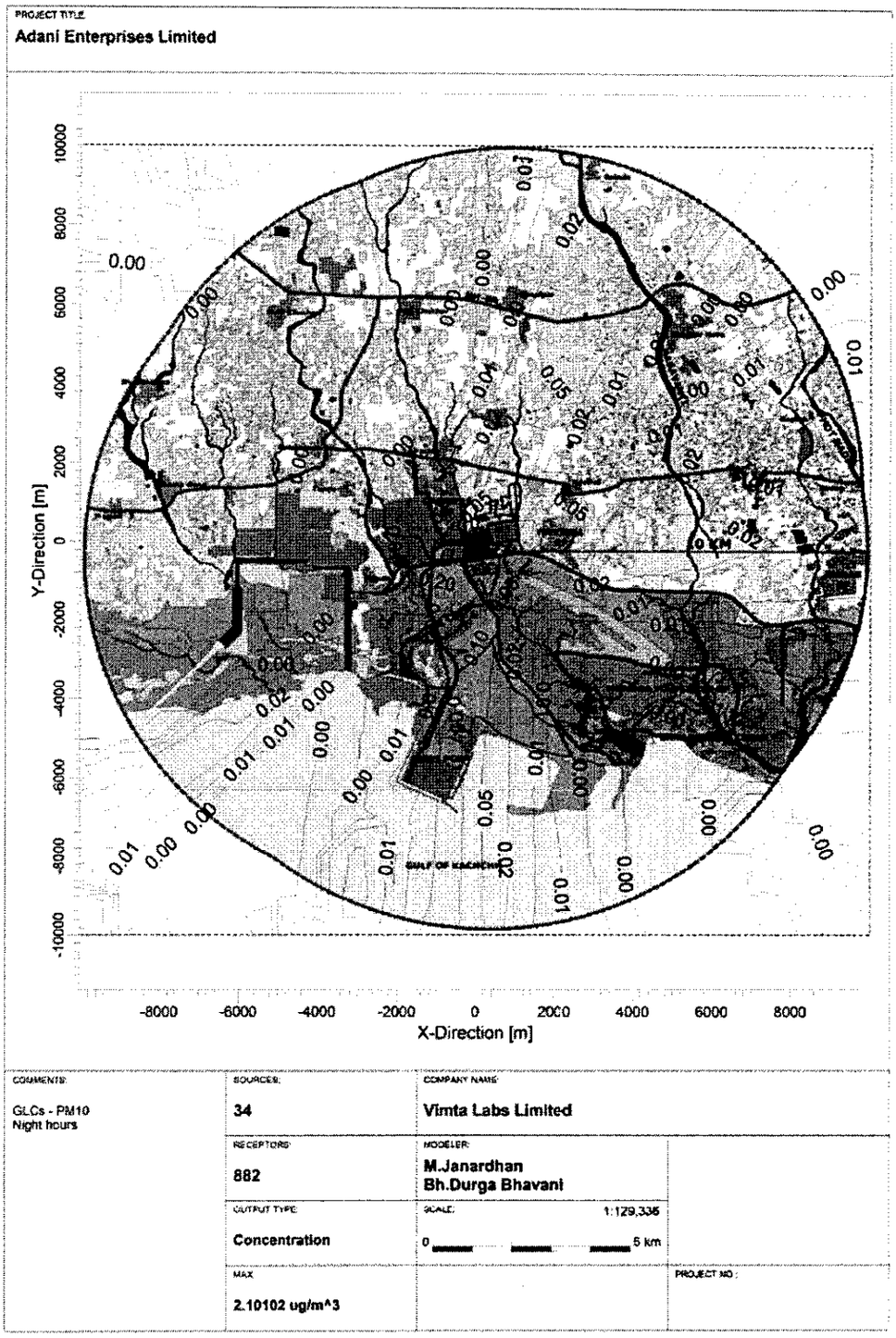


FIGURE-3
INCREMENTAL CONCENTRATIONS FOR PM_{10} –NIGHT TIME

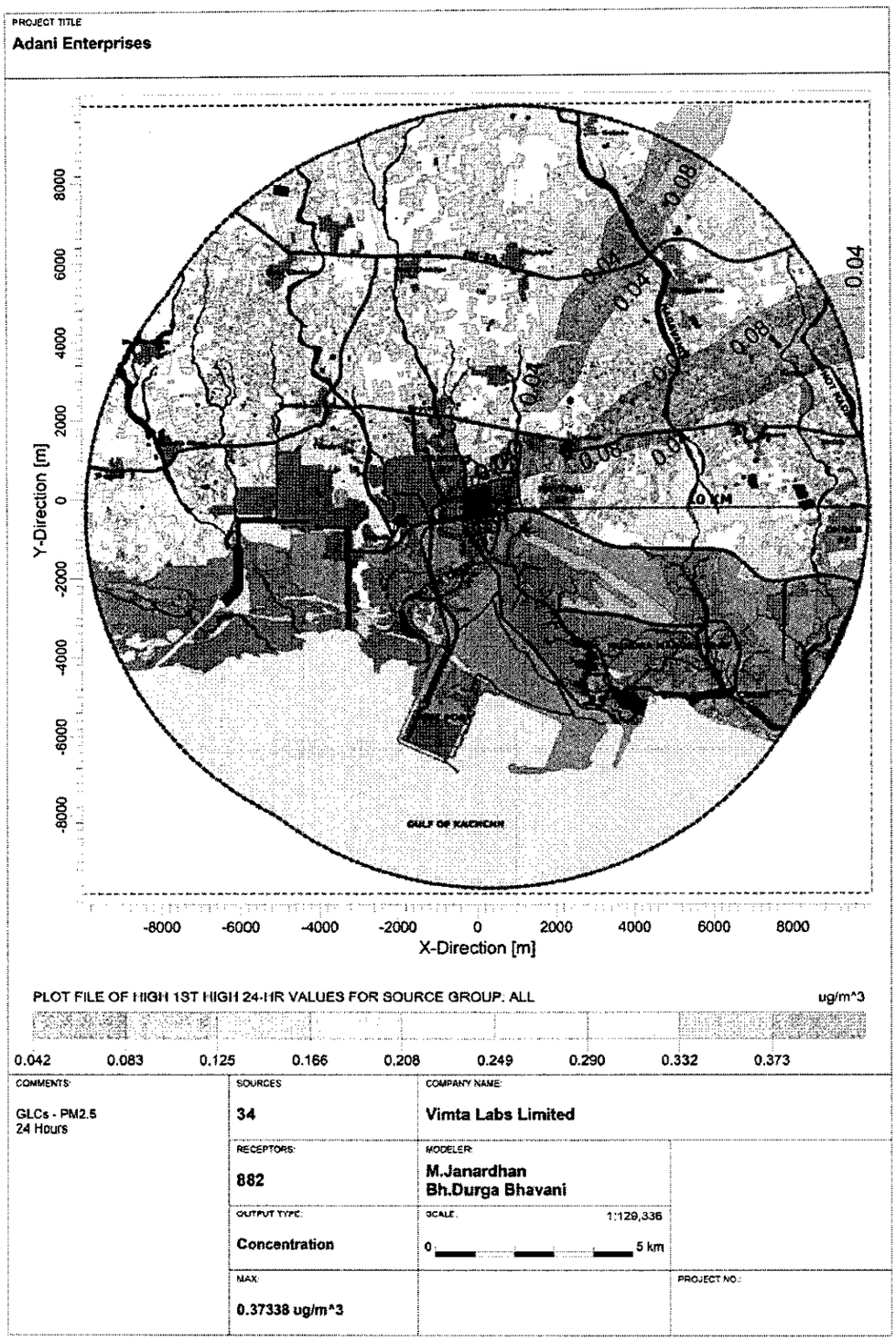
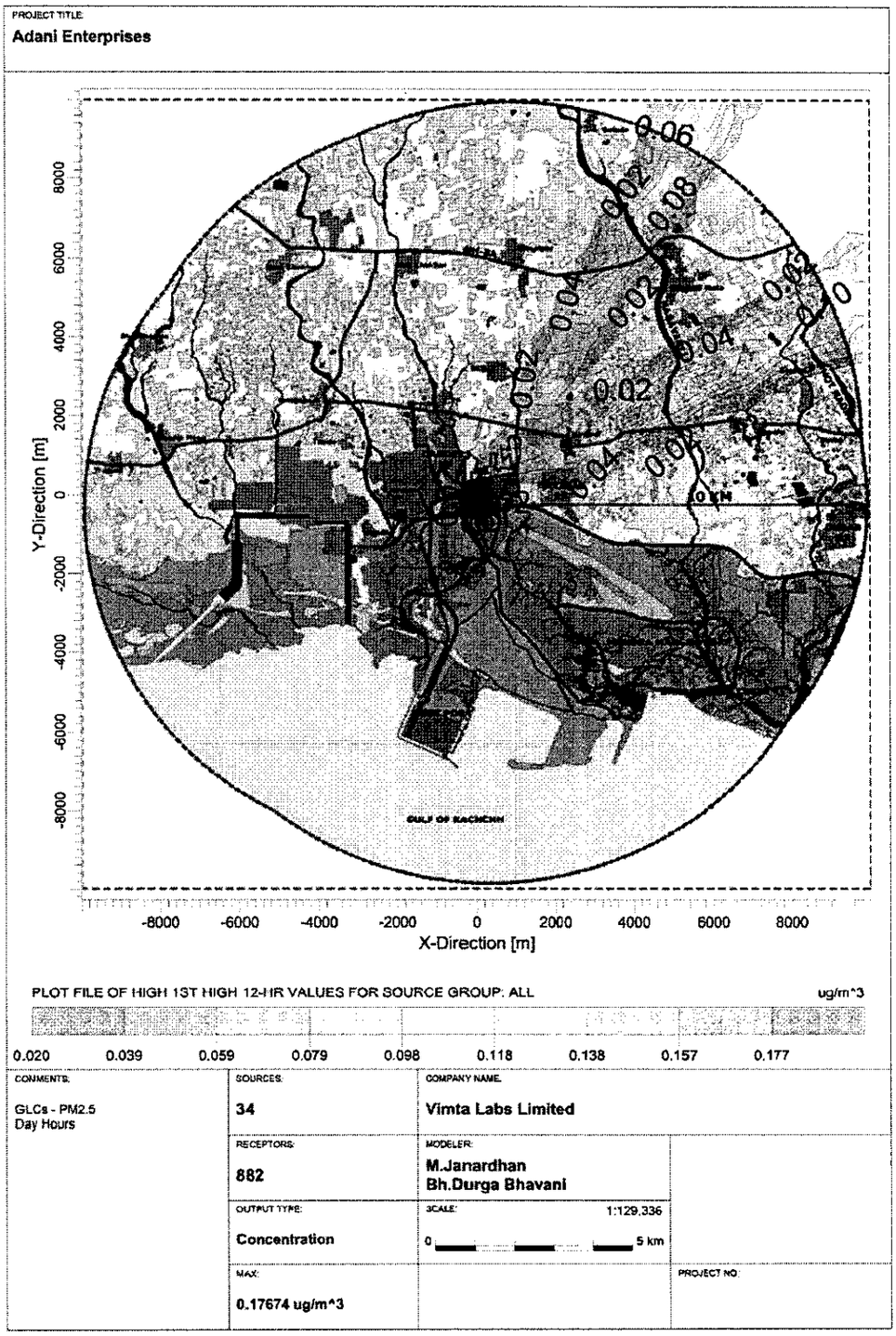


FIGURE-4
INCREMENTAL CONCENTRATIONS FOR $PM_{2.5}$ – 24 HOURS


PROJECT TITLE:
Adani Enterprises
Y-Direction [m]
X-Direction [m]
8000
6000
4000
2000
0
-2000
-4000
-6000
-8000
0.06
0.02
0.08
0.04
0.02
0.02
0.04
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0.04
0.02

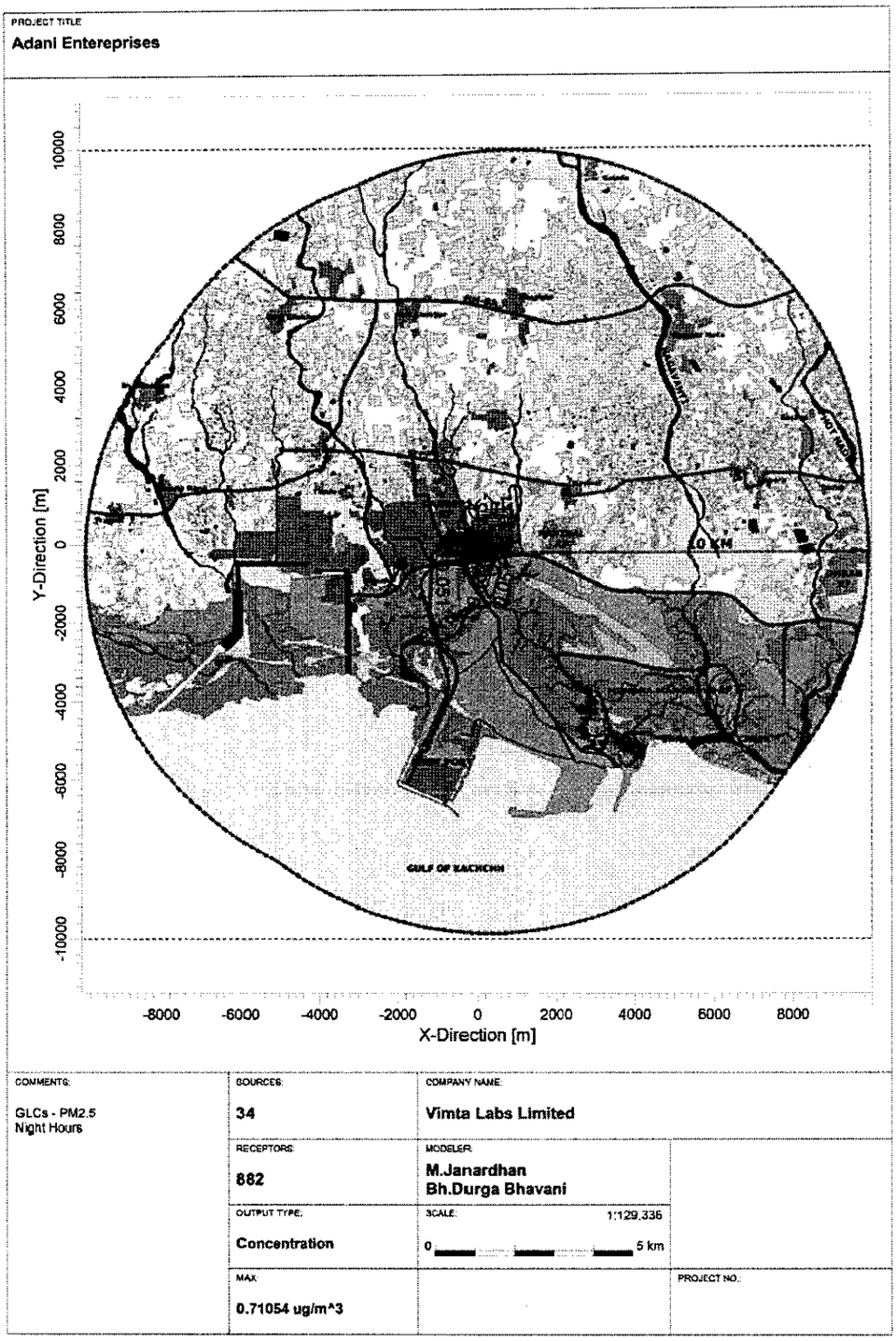


FIGURE-6
INCREMENTAL CONCENTRATIONS FOR $PM_{2.5}$ – NIGHT TIME

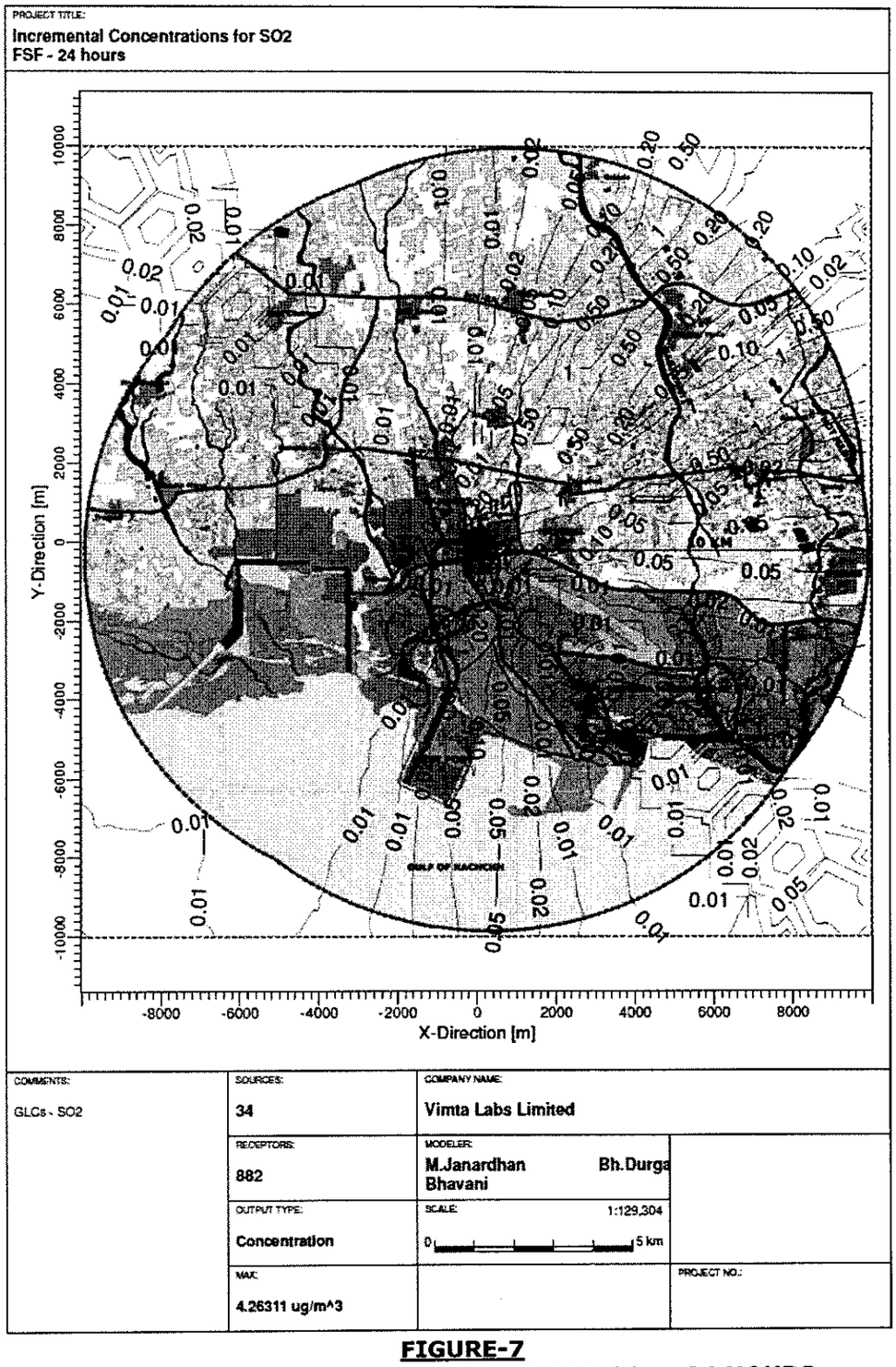


FIGURE-7
INCREMENTAL CONCENTRATIONS FOR SO_2 – 24 HOURS

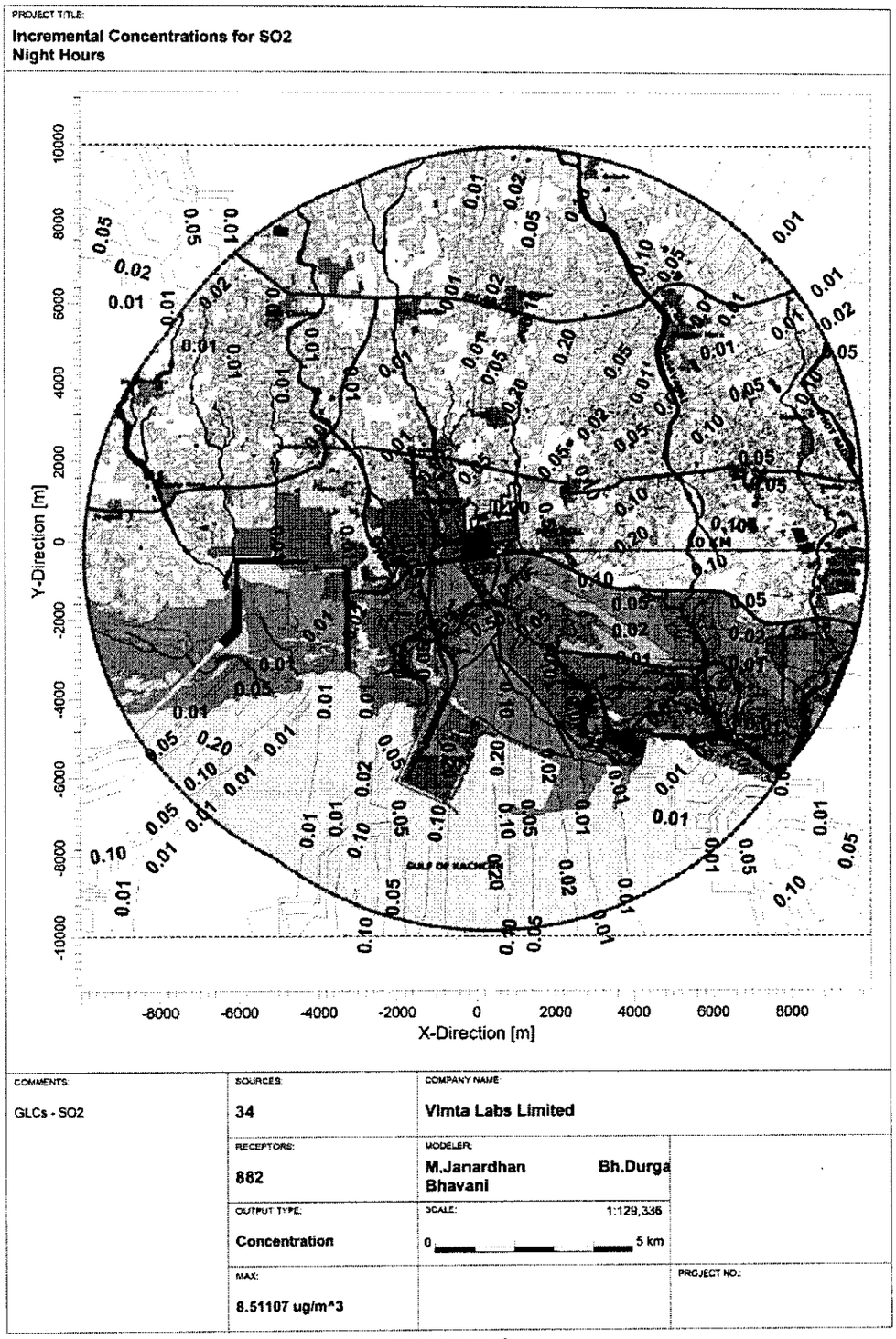


FIGURE-9
INCREMENTAL CONCENTRATIONS FOR SO_2 – NIGHT TIME

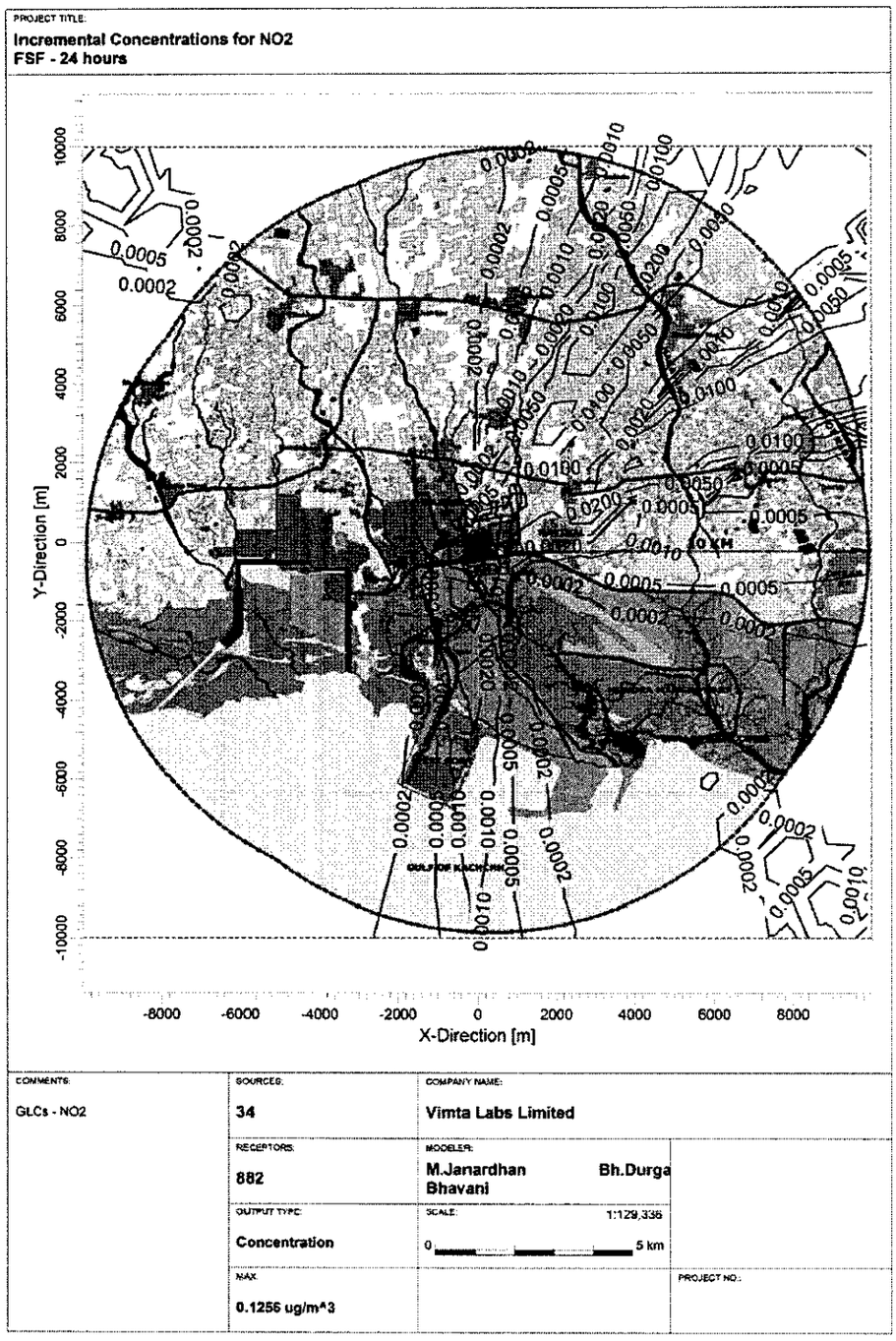


FIGURE-10
INCREMENTAL CONCENTRATIONS FOR NO_2 – 24 HOURS

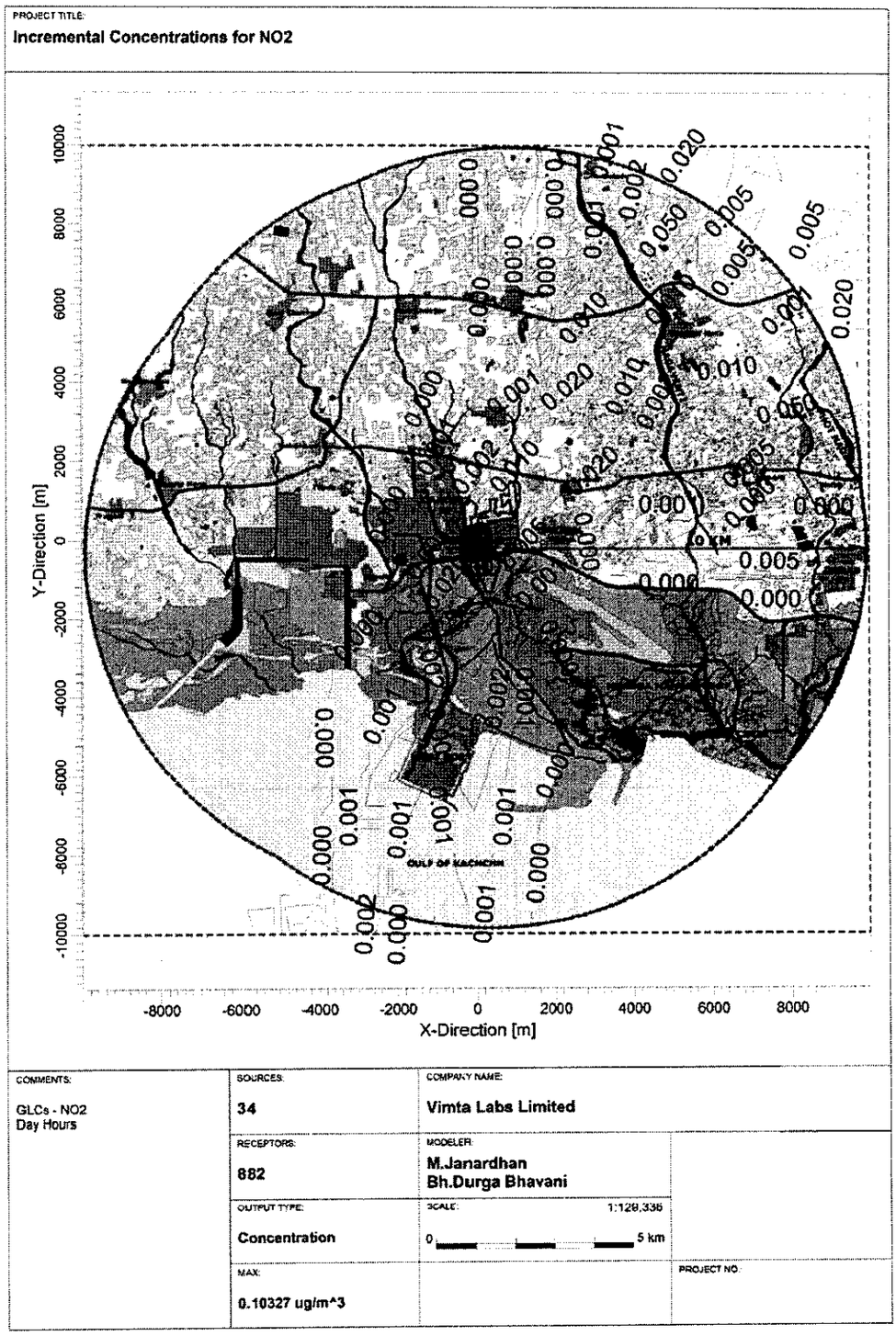


FIGURE-11
INCREMENTAL CONCENTRATIONS FOR NO_2 – DAY TIME

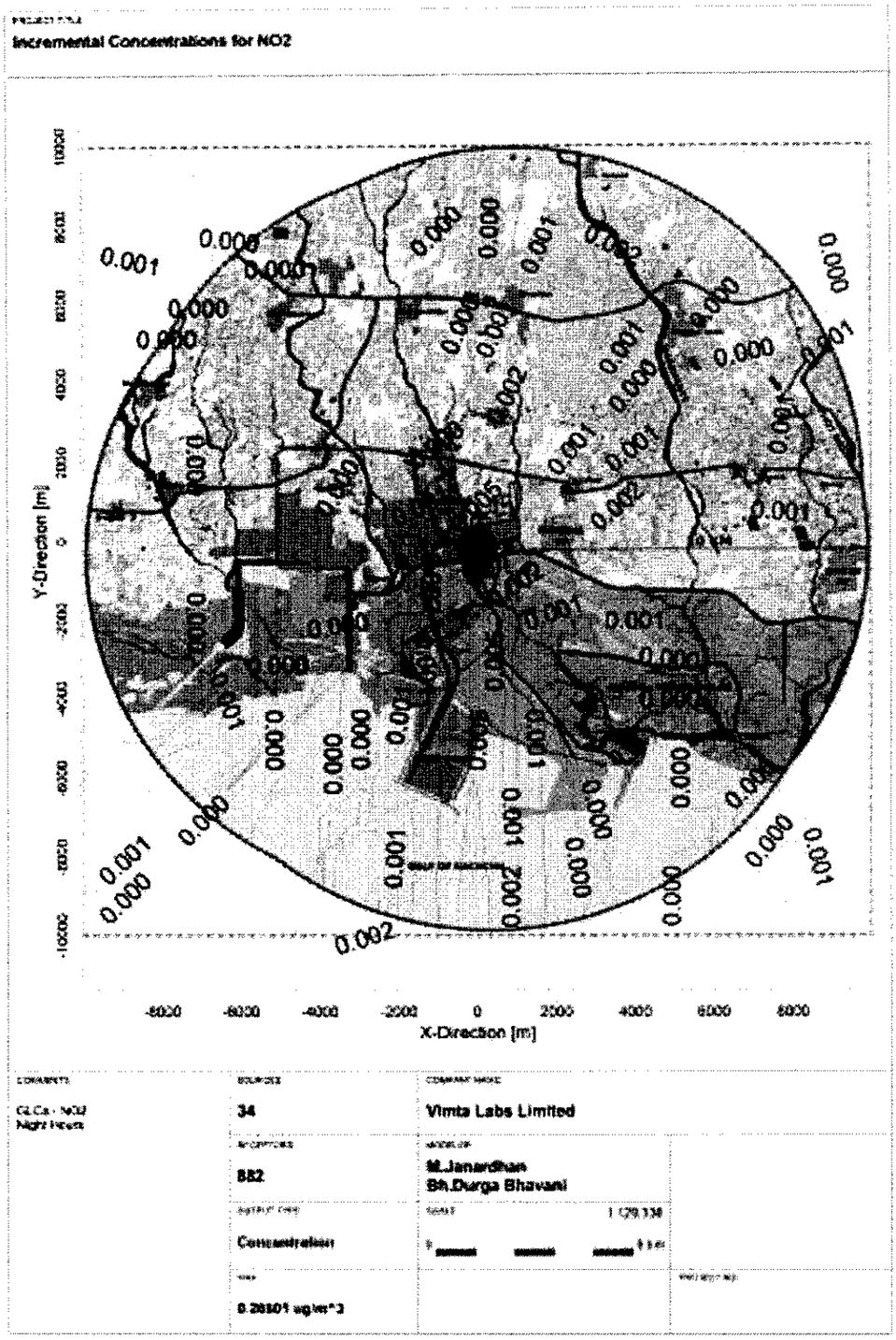
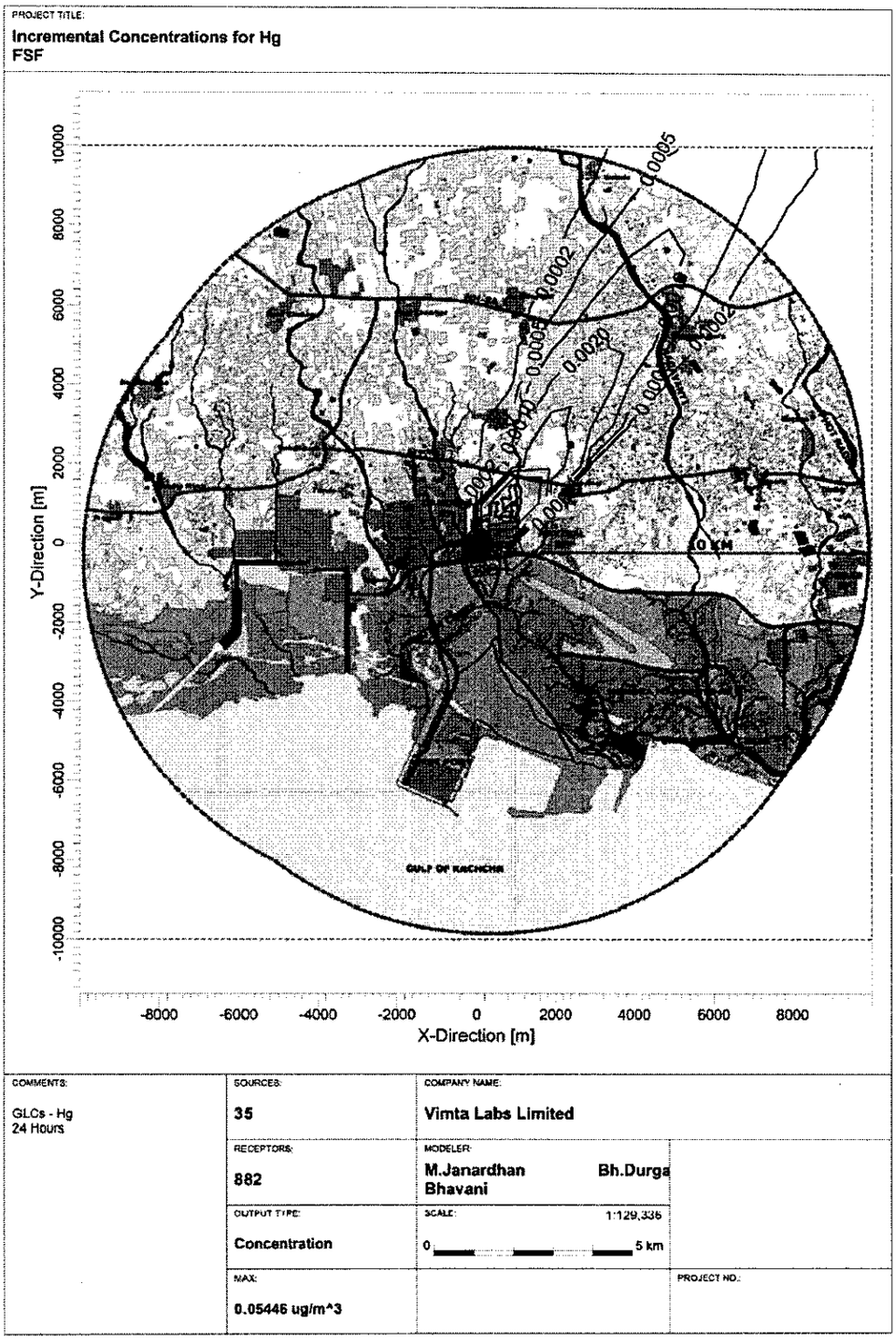


FIGURE-12
INCREMENTAL CONCENTRATIONS FOR NO_2 – NIGHT TIME


PROJECT TITLE:
Incremental Concentrations for Hg
FSF
Y-Direction [m]
X-Direction [m]
10000
8000
6000
4000
2000
0
-2000
-4000
-6000
-8000
-10000
-8000
-6000
-4000
-2000
0
2000
4000
6000
8000
0.0005
0.0002
0.0002
0.0005
0.0020
0.0002
0.0005
0.0002
0.0005
0.0002
0.0005

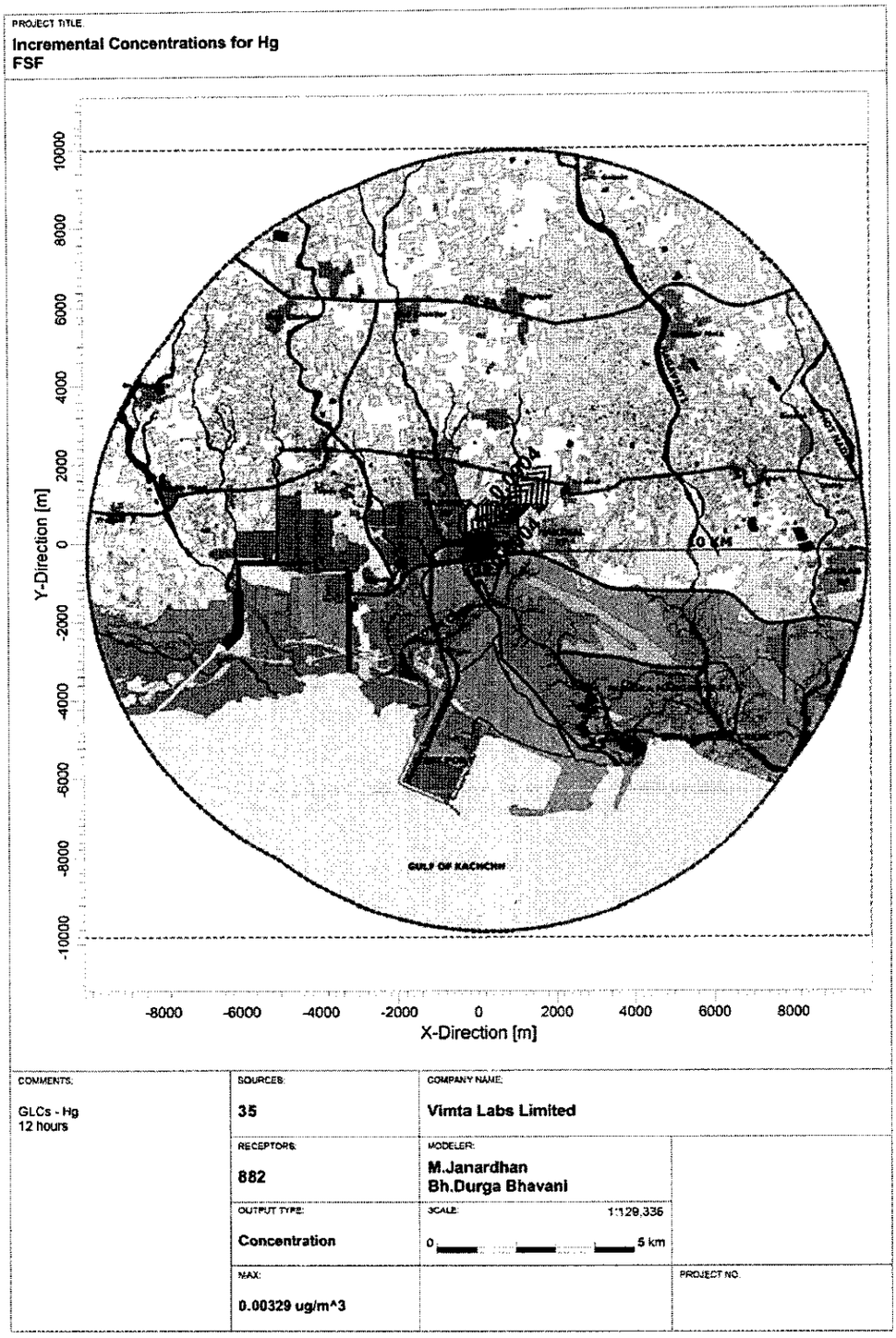


FIGURE-14
INCREMENTAL CONCENTRATIONS FOR HG – DAY TIME

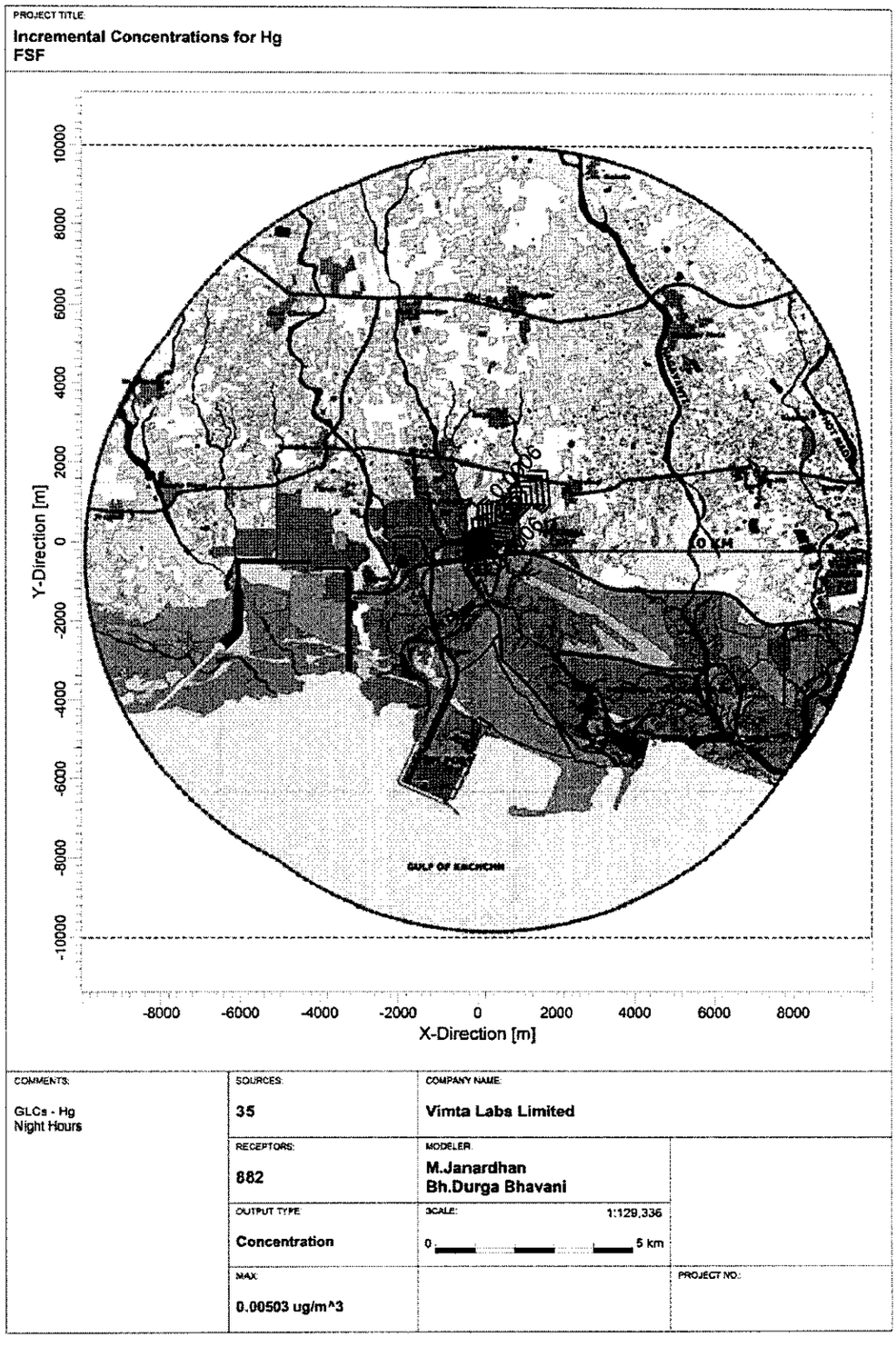


FIGURE-15
INCREMENTAL CONCENTRATIONS FOR HG – NIGHT TIME

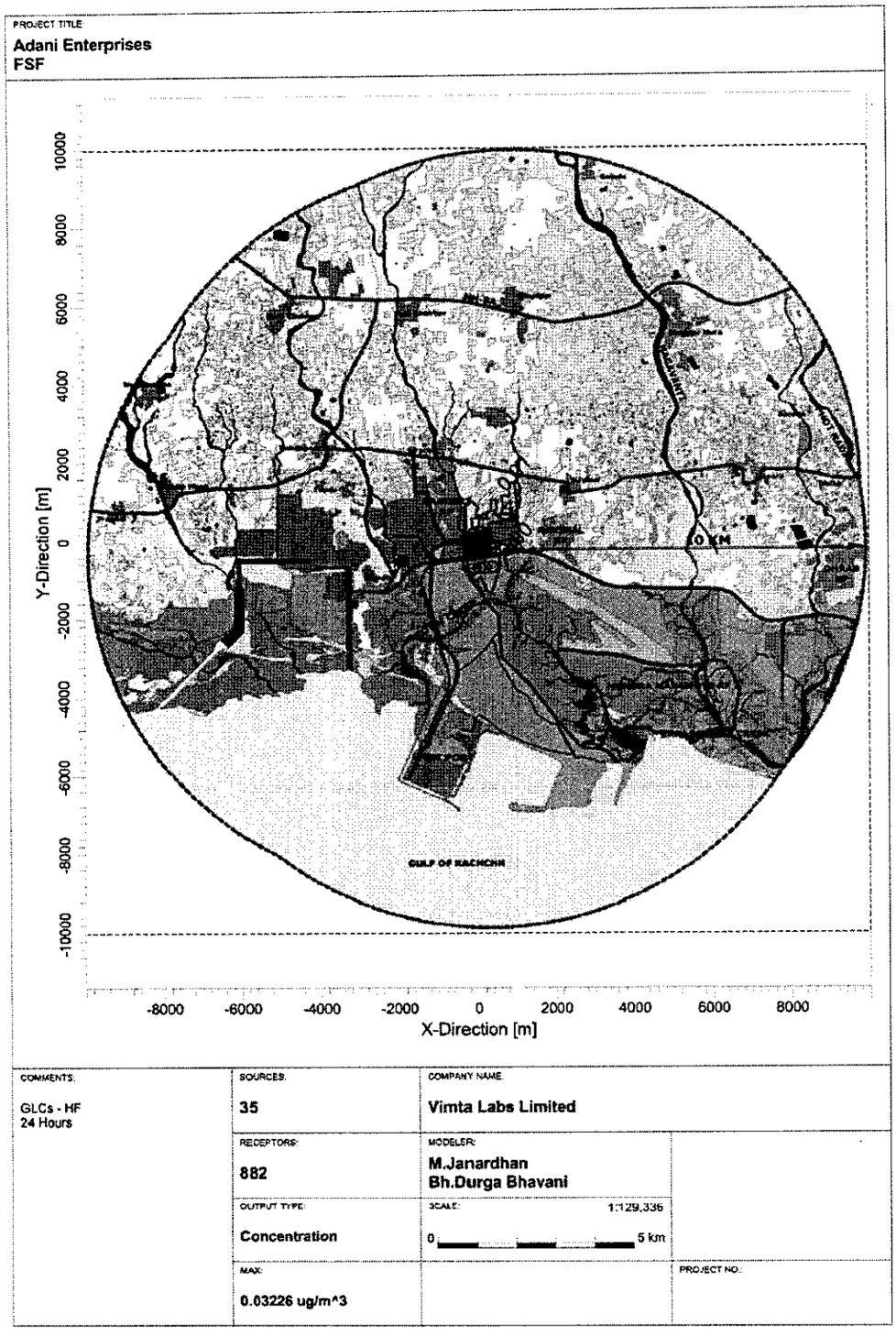


FIGURE-16
INCREMENTAL CONCENTRATIONS FOR HF – 24 HOURS

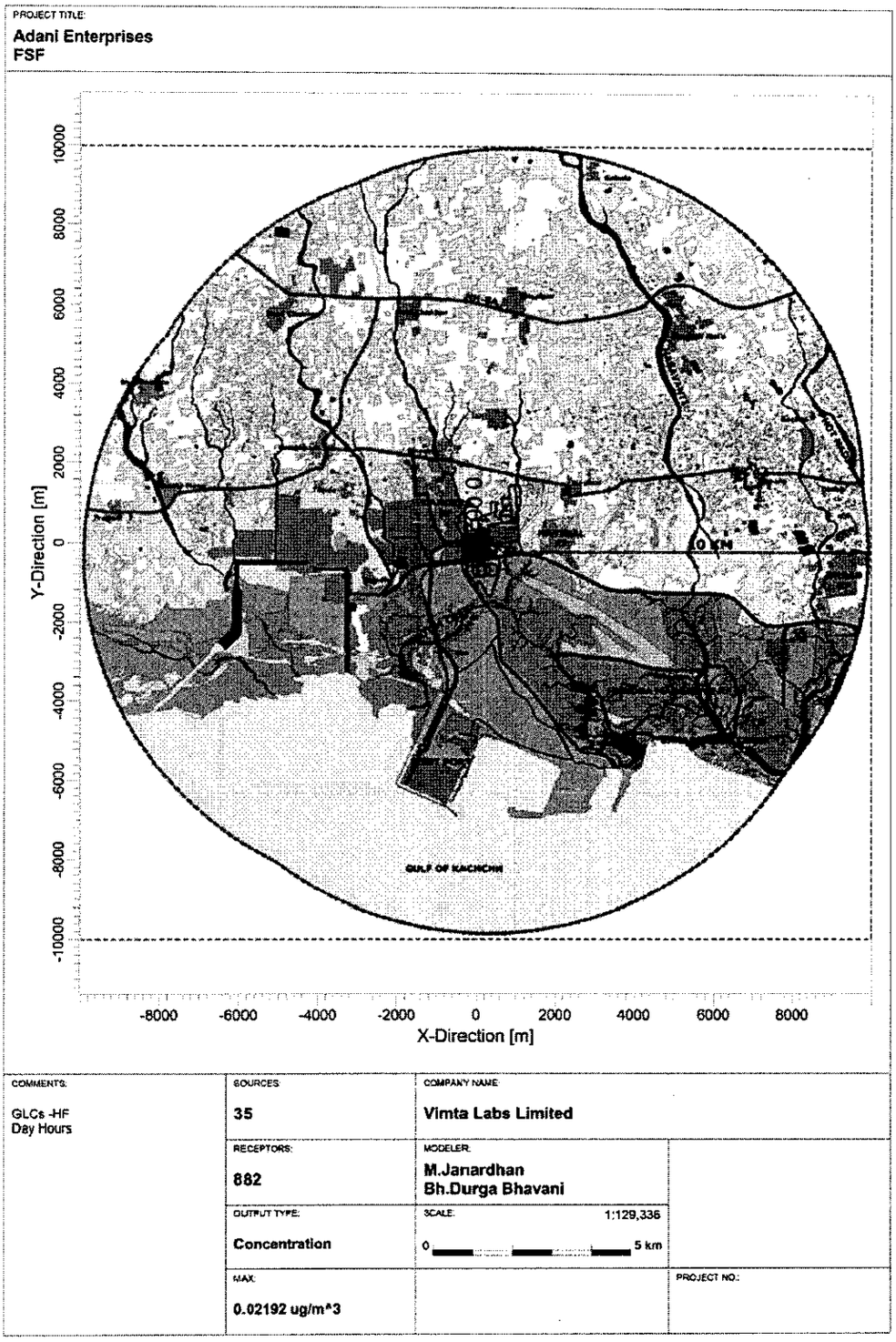


FIGURE-17
INCREMENTAL CONCENTRATIONS FOR HF – DAY TIME

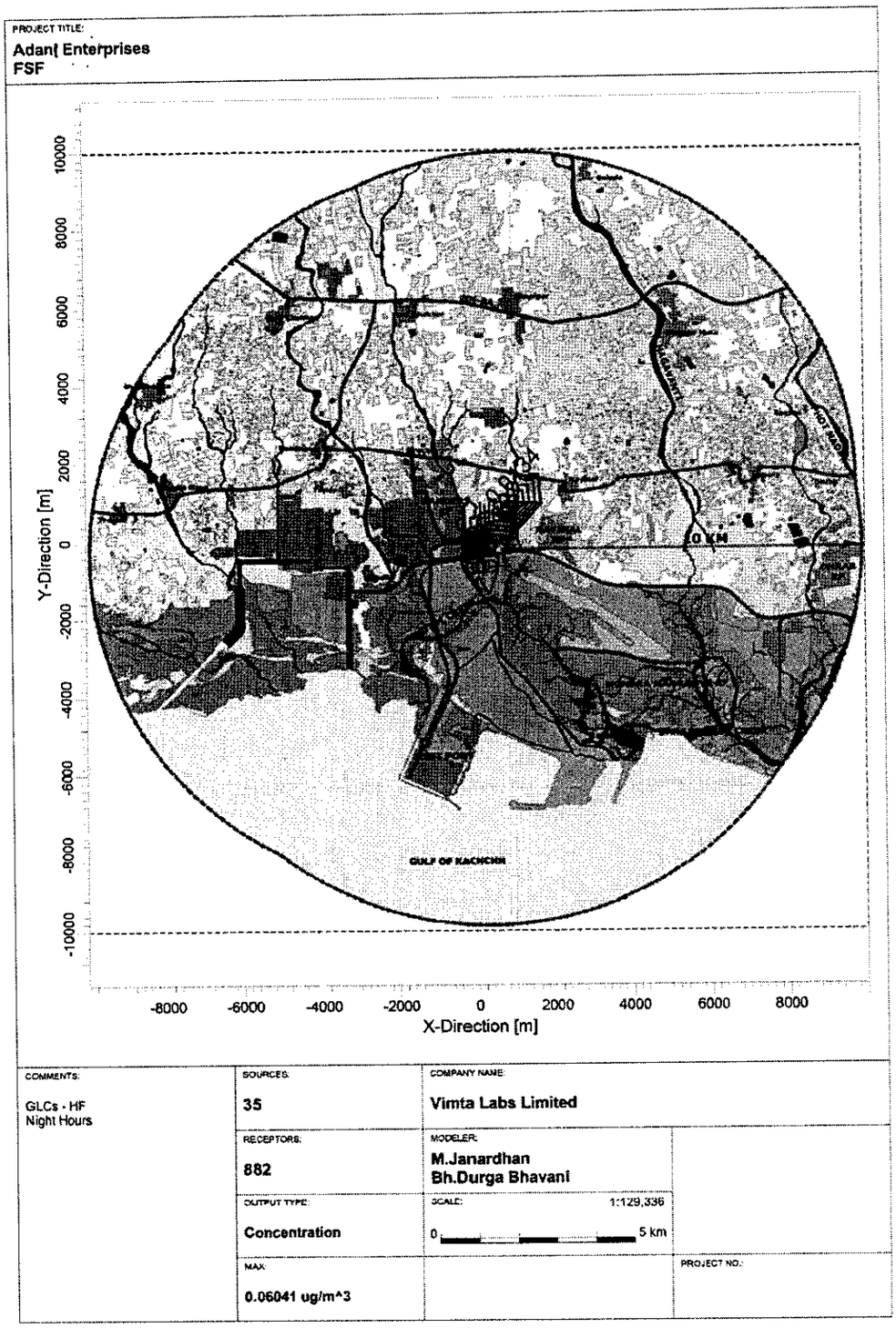


FIGURE-18
INCREMENTAL CONCENTRATIONS FOR HF – NIGHT TIME

EAC OBSERVATION:

"The Environmental Policy of the Organization is not meeting the requirements given in ToR Point No. 9(i), 9(ii), 9(iii), 9(iv)."

i. **Does the Company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA Report.**

REPLY:

Company has a well laid down "Environment. Health & Safety Policy" approved and prescribes for SOP's by the Chairman and same is available in Final EIA Report, Volume-II, Annexure-XVI.

For the proposed project, it is proposed that EHS and energy management system will be developed as per ISO:9001, ISO:14001, OSHAS:18001, ISO:50001

The same is displayed below:

adani

ENVIRONMENT, HEALTH & SAFETY POLICY

We at Adani, strive to make our businesses sustainable, that benefits our customers, our employees, our shareholders and society in general. We believe that in addition to integrated infrastructure business, there is a bottom line in performing our operations according to prescribed standards, specifications and regulations on governance, which are safe in working and environmental friendly for the well-being of the working community.

As a responsible corporate, we at ADANI have a firm conviction that the industrial injuries, occupational hazards as well as safety and environmental incidents are preventable. We recognize and trust people as our most important asset and have commitment to provide safe and healthy work environment impacting not only those, who are working in our industry but also community, which is living in the vicinity.

To achieve this objective, we shall

a. Develop, implement, maintain and sustain EHS Management System across the Group to set up new benchmarks for the respective sector of operations, which superimpose the regulatory and statutory requirements.

b. Verify, audit and periodically review EHS performance and set new targets to revise these benchmarks.

c. Formulate EHS objectives and targets for continual improvement and to have a periodic review for ensuring that these are in conjunction with the individual business and corporate levels.

d. Conduct all our operational activities in such a manner as to avoid harm to employees, contractors, stakeholders and community at large.

e. Inculcate safety & health as a personal value through behavioral intervention and recognize it across levels with continuous correction of unsafe behavior.

f. Provide adequate training and resources so as to bring awareness and ability to carry out work safely.

g. Emphasize responsibility and accountability to all employees and contractor workforce for safe performance on the job and encourage safe behavior off the job.

h. Evolve ways to reduce or eliminate the use or release of toxic and hazardous material and prevent pollution by conserving natural resources, recovering and recycling the raw materials for safe, healthy and clean environment.

GAUTAM S ADANI

Date: 01.01.2016

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EAC OBSERVATION NO.- 32

ii. Does the Environment Policy prescribe for standard operating process/ procedures to bring into focus any infringement/ deviation/ violation of the environmental or forest norms/ conditions? If so, it may be detailed in the EIA.

REPLY:

Environment. Health & Safety Policy clearly emphasises the purpose and use of standard operating process & procedures in such manner so as to avoid harm to employees, contractors, stakeholders and community at large.

1. To address significant HSEQ risks / impacts - Procedures will be developed and documented to address significant HSEQ risks / impacts and potential deviations. The procedures and / or work instructions will include the required operating criteria. Plant and equipment having a potential to impact HSEQ performance will be maintained to meet design descriptions and specifications. Risks / impacts will be identified, documented, communicated and controlled.

2. Procedures and / or work instructions will be developed, documented, communicated and followed where their absence could cause deviations from required operating criteria or could lead to deviations from the HSEQ policy, objectives, targets or requirements. This includes the implementation of the controls identified for the pre-task risk assessment level, or Job Hazard Analysis (JHA).

3. Plant and equipment - Critical plant & equipment that have a potential to impact HSEQ performance will have a documented procedure for the maintenance, inspection, testing and modification to ensure it meets the design description and specifications.

4. Personnel - The competency of personnel will be verified and documented prior to carrying out procedures with significant HSEQ risk. Competency would be assessed as a result of training, education, experience, behaviour, attitudes and attributes required to effectively perform the role.

5. HSE Committee – HSE Committee will be formed to plan, implement and control the use of standard operating process & procedures in such manner so as to avoid harm to employees, contractors, stakeholders and community at large. Committee also will review periodically the compliance status for the environmental conditions as well as corrective and preventive action required if any.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details for this system may be given.

REPLY:

The hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions has defined as below

Role & Responsibility for Reporting mechanism of Environmental Non-compliance and Emergencies:

Site Environmental Head:

- Developing effective Environment Management System;
- To monitor the Environmental Compliance Conditions;
- To monitor the progress of the Environmental Targets set for the year; and
- To report all the environmental non-compliance as and when it happens to the Location Head.

Location Head:

- Effective implementation of the Environment Management System;
- Monthly review of the Environmental Compliance Conditions;
- Monthly review of the progress of the Environmental Targets set for the year;
- To report all the environmental non-compliance to the Business CEO within 24 hrs; and
- To report any environmental emergencies to the Business CEO on immediate basis.

Business CEO:

- Quarterly review of the Environment Management System;
- Quarterly review of the Environmental Compliance Conditions;
- Quarterly review of the progress of the Environmental Targets set for the year;
- To report all the environmental non-compliance to the Board of Directors on Quarterly Basis; and
- To report any environmental emergencies to the board of Directors on immediate basis.

Risk Management Committee:

- Quarterly review of the Environmental Compliance Conditions.
- Compliance of escalation and review system on environment non-compliance as per Environment Management System.
- Provide a summary of the Annual Environmental Performance Statement to concerned Stakeholders.

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EAC OBSERVATION NO.- 32

iv. Does the company have system of reporting of Non-compliances/ violations of environmental norms to Board of Directors of the Company and/ or shareholders or stakeholders at large? This Reporting mechanism shall be detailed in EIA Report.

REPLY:

Company will have system of reporting of Non-compliances/ violations of environmental norms to Board of Directors of the Company and/ or shareholders or stakeholders at large.
AEL Board has empowered "Risk Management Committee" to manage health, safety & environment risks and achieve compliance with sustainable development responsibilities. A board resolution in this regards is attached as **Annexure 32**

The current scope of Risk Management Committee is as follows:
"The Committee is required to lay down the procedures to inform to the Board about the risk assessment and minimization procedures & the Board shall be responsible for framing, implementing & monitoring the risk management plan of the company."

Additional Scope of Risk Management Committee will be as follows:

"The Committee will also oversee management processes, standards and strategies designed to manage Health, Safety & Environment and Social risks and ensure maintaining the highest standards and compliance with applicable statutory provisions."

The risk management committee will review all the environmental compliance if any on quarterly basis along with its corrective and preventive measures. This will be the permanent agenda point for all board meetings.

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CERTIFIED TRUE COPY OF THE RESOLUTION PASSED AT THE MEETING OF THE BOARD OF DIRECTORS ("BOARD") OF ADANI ENTERPRISES LIMITED ("COMPANY") HELD ON 29TH MAY, 2019.

"RESOLVED THAT in continuation to the earlier resolution passed by the Board of Directors, existing terms of reference of Risk Management Committee be modified and substituted as under:

1. To review the Company's risk governance structure, risk assessment and minimisation procedures and the guidelines, strategies and policies for risk mitigation on short term as well as long term basis.

2. To monitor and review the risk management plan of the Company.

3. To review the current and expected risk exposures of the organization, to ensure the same are identified, qualitatively and quantitatively evaluated, analysed and appropriately managed;

4. Carry out any other function as is referred by the Board from time to time or enforced by any statutory notification / amendment or modification as may be applicable.

5. To review cyber security function of the Company.

6. To oversee management processes, standards and strategies designed to manage Health, Safety & Environment and Social risks and ensure maintaining the highest standards and compliance with applicable statutory provisions."

Certified True Copy,
For Adani Enterprises Limited

Jatin Jalundhwala
Company Secretary &
Joint President (Legal)

ADANI ENTERPRISES LIMITED Ahmedabad

Adani Enterprises Ltd
Adani House,
Nr Mithakhali Circle, Navrangpura
Ahmedabad 380 009
Gujarat, India
CIN: L51100GJ1993PLC019067

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Registered Office : Adani House, Nr. Mithakhali Circle, Navrangpura, Ahmedabad 380 009, Gujarat, India

4327

EAC OBSERVATION NO.-33

EAC OBSERVATION:

The CER shall be calculated on the slab rates as per the Office Memorandum issued on 1st May, 2018.

REPLY:

CER budget has been revised from Rs. 40 Crores to Rs. 58 Crores in line with the slab rate as per Office Memorandum (OM) of MoEF&CC dated 1st May, 2018.

Sr. No.	Capital Investment / Additional Capital Investment / (in Rs)	Greenfield Project - % of Capital Investment	Detailed break up for Rs. 10,000 crores Budget	Amount (in Rs. Crores)
1	< 100 crores	2.00%	Rs. 100 Crores @2%	2.00
2	> 100 crores to < 500 crores	1.50%	Rs. 400 Crores@1.5%	6.00
3	> 500 crores to < 1000 crores	1.00%	Rs. 500 Crores@1%	5.00
4	> From 1000 crores to < 10000 crores	0.50%	Rs. 9000 Crores@0.50%	45.00
	Grand Total			**58.00**

For the proposed Copper refinery project, AEL has envisaged the following key areas for intervention as CER.

Sr. No.	Key Area Identified for intervention through CSR activities by proposed Copper Smelter Plant	Proposed Expenditure in Project construction phase (Rs.)					Total Proposed Expenditure (Rs.)
		1st Year	2nd Year	3rd year	4th Year	5th Year	
A	**Education Initiatives**	**7,280,000**	**23,172,000**	**22,984,000**	**24,984,000**	**18,984,000**	**97,404,000**
	1 Smart Classes	7,280,000	19,172,000	22,984,000	18,984,000	18,984,000	87,404,000
	2 Renovation/development of primary/middle schools		4,000,000		6,000,000		10,000,000
B	**Community Health Initiatives**	**19,250,000**	**31,250,000**	**36,000,000**	**33,500,000**	**-**	**120,000,000**
	1 Fully Furnished and equipped Trauma Centre with Burnt Care Unit at Bhuj Hospital	14,250,000	23,750,000	28,500,000	28,500,000		95,000,000
	2 Burnt Care Unit at Mundra	5,000,000	7,500,000	7,500,000	5,000,000		25,000,000
C	**Sustainable livelihood**	**11,900,000**	**13,200,000**	**19,100,000**	**17,200,000**	**6,300,000**	**67,700,000**
	1 Development of 3 Cowsheds at Kandagara	1,000,000	1,000,000				2,000,000
	2 Skill Development Centre (SDC) to make the youth for achieving their Goals in life by becoming Skilled Professionals.	5,000,000	5,000,000	10,000,000	10,000,000		30,000,000
	3 Support for tissue culture and soil laboratory development for farmers in the area.	1,500,000	2,000,000	3,000,000	3,000,000	3,000,000	12,500,000
	4 Support for Drip Irrigation for farmers in the area.	2,000,000	2,200,000	2,200,000	2,400,000	2,400,000	11,200,000
	5 Support and provide plant saplings for plantation in school and common land in the area.	2,400,000	3,000,000	3,900,000	1,800,000	900,000	12,000,000
D	**Community Rural Infrastructure Development**	**31,000,000**	**61,105,000**	**66,717,350**	**78,337,565**	**57,966,194**	**295,126,109**
	1 Drinking Water Facility	**20,000,000**	**40,000,000**	**40,000,000**	**40,000,000**	**20,000,000**	**160,000,000**
	i) Ovehead Water Tanks of 500kL at 8 locations	20,000,000	40,000,000	40,000,000	40,000,000	20,000,000	160,000,000
	2 Water Conservation Ground water recharge	**9,500,000**	**19,500,000**	**25,000,000**	**36,500,000**	**36,000,000**	**126,500,000**
	i) Deepening of Ponds	4,500,000	4,000,000	4,000,000	4,500,000	4,500,000	21,500,000
	ii) Check Dams	5,000,000	15,500,000	21,000,000	32,000,000	31,500,000	105,000,000
	3 Solar Street Lights	**1,500,000**	**1,605,000**	**1,717,350**	**1,837,565**	**1,966,194**	**8,626,109**
Total Expenditure (Rs)		**69,430,000**	**128,727,000**	**144,801,350**	**154,021,565**	**83,250,194**	**580,230,109**

4329

ENVIRONMENTAL IMPACT ASSESSMENT

FOR

THE PROPOSED GREENFIELD COPPER REFINERY PROJECT (1.0 MTPA) AT ADANI PORT SPECIAL ECONOMIC ZONE LAND IN VILLAGES SIRACHA AND NAVINAL, TALUKA MUNDRA, DISTRICT KUTCH, GUJARAT

REPLY TO EAC OBSERVATIONS RAISED DURING MEETING HELD ON 24TH DECEMBER 2019

Sponsor :

adani

M/s. Adani Enterprises Limited (AEL)
Siracha and Navinal Villages, Taluka Mundra,
District Kutch, Gujarat

Prepared by :

Vimta
Driven by Quality, Inspired by Science.

Vimta Labs Limited
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(NABL Accredited and ISO 17025 Certified Laboratory, Recognized by MoEF&CC, New Delhi)

February 2020

PREFACE

M/s. Adani Enterprises Limited (AEL)

Siracha and Navinal Villages, Taluka Mundra,
District Kutch, Gujarat

ENVIRONMENTAL IMPACT ASSESSMENT

FOR

THE PROPOSED GREENFIELD COPPER REFINERY PROJECT (1.0 MTPA) AT ADANI PORT SPECIAL ECONOMIC ZONE LAND IN VILLAGES SIRACHA AND NAVINAL, TALUKA MUNDRA, DISTRICT KUTCH, GUJARAT

REPLY TO EAC OBSERVATIONS RAISED DURING MEETING HELD ON 24TH DECEMBER 2019

For and on behalf of VIMTA Labs Limited

Approved by : **M. Janardhan**

Signed :

Position : **Head & Vice President (Env)**

Date : 5th February, 2020

The report has been prepared inline with the prescribed TORs issued vide letter No.J-11011/113/2016-IA.II(I) dated 21st June 2016 of Ministry of Environment, Forests and Climate Change, New Delhi.

This report has been prepared by **Vimta Labs Limited** with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

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adani

4033

Ref:AEL/Copper/MoEF&CC/2020/Feb-05

Date: 5th Feb 2020

To,
Director
I.A. Division – Industry I
Ministry of Environment Forest & CC
Indira Paryavaran Bhavan,
Jor Bagh Road, Aliganj,
New Delhi – 110003

Subject: Request to increase the size of attachment to 70 MB at PARIVESH Portal for EC application & ADS submission.

Reference: SW/ 83372/2018, and Proposal No.**IA/GJ/IND/86812/2016** for Environmental Clearance application of 1 (One) million Ton per annum (MTPA) Copper Refinery Plant, Proposed by M/s. Adani Enterprises Ltd. at Mundra, Dist. Bhuj, Gujarat.

Sir,

Above referred project has been appraised 3 times by EAC, i.e. during the month Jan 2019, August 2019 and Dec 2019.

We have received ADS dated 3rd Feb 2020 and for your information, we are able to upload our responses and study reports in compliance to the EAC MOM dated 24th Dec 2019 only, due to limitation for attachment file size at PARIVESH Portal. Hence we are keeping our responses to EAC MOM dated 23rd August 2019 on Google Drive and also providing link **(https://drive.google.com/open?id=1S4jujCQ4ea4cwFbcT6VpaYaIaTGoTKw5)**, till EC is granted by MoEF & CC, while submission to ADS reply at PARIVESH Portal.

We request you to increase the attachments size at PARIVESH Portal to 70 MB for this project, so that we can upload total responses against MOM dated 23rd Aug 2019 and 24th Dec 2019; together. If increase in the size of the attachment at PARIVESH PORTAL is not possible, we are able to upload responses to EAC MOM dated 24th Dec 2019.

Kindly advice to us, if any alternate action is required from our end; apart from keeping our responses against EAC MOM 23rd August 2019 at Google Drive, till EC is granted by MoEF & CC.

Authorized Signatory

(Prasad Suryarao)
Adani Enterprises Ltd.

CC: Member Secretary EAC – Industry I

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UPDATES OF EAC OBSERVATION OF MEETING ON 23RD AUGUST 2019

4335

UPDATE ON THE OBSERVATIONS OF THE SUB-COMMITTEE AND ADS POST SITE VISIT AND DISCUSSION WITH PROJECT PROPONENT

Sr. No.	ADS Point - Aug 2019	Out Come of the Discussions - Post Site Visit	Responses - Feb 2020
1	According to the EIA report, the land requirement for the project is 256.58 ha. Out of 256.58 ha, 154.19 ha is APSEZ area and 102.39 ha is a Forest land. The land use conversion plan of 154.19 ha for industrial purpose has not been obtained from the Competent Authority concerned. Further, PP has obtained stage I forest land diversion approval for 1576.81 ha in the name of M/s. Adani Ports and SEZ Limited. The factual agreement between M/s. Adani Enterprises Limited and M/s. Adani Ports and SEZ Limited for the utilization of 102.39 ha is a Forest land is not clear.	The committee found that ADS reply given is satisfactory in view of the fact that entire land proposed for the project 256.58 ha is within the APSEZ out of which 154.19 ha is already notified as SEZ and the balance land of 102.39 ha is under process of forest diversion. There is an agreement through MoU between APSEZ and Adani Enterprises Ltd (AEL).	-
2	CRZ map inter-alia including demarcation of HTL/LTL/CRZ land classification along with super imposition of plant site through competent agencies has not been submitted.	CRZ map was prepared by Centre of Earth Science Studies (CESS), Thiruvanthapuram. Site is outside the CRZ, geographically separated by road and railway track. This CRZ map is awaiting finalization as part of ICZMP which is in the process by Govt. of Gujarat.	This CRZ map as part of ICZMP which is in the process approval with MoEF&CC.
3	Source of copper ore concentrate, characteristics, mode of transportation from source to plant EAC, confirmed ore linkage document has not been submitted.	The indicative figures of weight fractions of copper concentrate from the various sources were discussed. However, there is no such analysis report is available on the records. The mode of transport from port to the plant and transit covered storage at port, conveyor, storage at plant ensured without leakage and safe handling. AEL has already got commercial enquiries from copper concentrate suppliers: 1) Mitsubishi Corporation Rtm International Pte, Singapore 2) Transmine Trading SA 3) Trifigura India Pvt Ltd	The responses covered in the EAC observation No. 1 reply.

4042

4336

UPDATE ON THE OBSERVATIONS OF THE SUB-COMMITTEE AND ADS POST SITE VISIT AND DISCUSSION WITH PROJECT PROPONENT

Sr. No.	ADS Point - Aug 2019	Out Come of the Discussions - Post Site Visit	Responses - Feb 2020
		4) MITSUI & Co, Japan It seems, the origin copper concentrate may be Australia and South America Continent.	
4	Water consumption of 10 LTPA Copper smelter is 32790 KLD whereas the water requirement for existing 4.5 LTPA copper smelter unit is only 10,000 KLD. Hence, water requirement for the proposed plant has to be reworked out.	In comparison to existing plant of M/s Vedanta Ltd, the water consumption will be more as the cooling system proposed is wet cooling tower which has specific consumption 8.7 m 3/T of copper that of radiator type air cooler (dry cooling). It is found the energy requirement for fans in case of dry cooling system will be more in turn more carbon footprint.	Water Balance for the proposed Copper refinery project has been revised. Water requirement has been reduced from 32,800 KLD to 29,678 KLD; resulting in reduction of specific water consumption from 8.7 m^3/ t copper to 7.8 m^3/ t copper. Detailed technical comparison between the wet cooling tower and the radiator type air-cooler with their references in the various sulfuric acid plants, is covered in EAC observation No.2 response.
5	According to the EIA records, Dhaneshwari river is passing through the project site and the mangrove reserve forest is existing within the project site. Quantification of these mangroves and conservation measures for mangroves and the river stream has not been submitted.	No mangroves are present in the plant site. Presence of the mangroves are sighted on the southern side, along the Kodti Creek. It is informed that the company appointed ecological expert who is working on the monitoring of the mangroves and conservation of the same in the identified patches of coastal areas in consultation with the State Forest Department. Further, report on Wildlife Conservation plan /Mangrove Conservation Plan was discussed at a length in terms of biodiversity, socio-economic values for the locals, monitoring mechanism etc. Mud flats were not mapped in the CRZ map.	The responses covered in the EAC observation No. 8 response.
6	Storage arrangements made for the raw materials are found to be not adequate. Open storage of raw materials such as coal, limestone etc., shall be avoided.	AEL explained the Engineering drawings of covered storage yards for raw material storage.	-

4043

UPDATE ON THE OBSERVATIONS OF THE SUB-COMMITTEE AND ADS POST SITE VISIT AND DISCUSSION WITH PROJECT PROPONENT

Sr. No.	ADS Point - Aug 2019	Out Come of the Discussions - Post Site Visit	Responses - Feb 2020
7	Sulphur balance of the copper smelter unit has not been submitted.	The sources of SO2 (97%), Copper Concentrate, Furnace Oil and Met Coke were taken into account. Fixation of Sulphur in copper slag, Chemical gypsum, ETP Sludge and residual off gas from SAP and FGD system. **SAP:** Catalytic converter bed with DCDA with conversion of 99.92% and cesium sulphuric acid catalyst in final bed catalytic converter for greater conversion efficiency at temperature lower than 400°C. Tail gas scrubbing to scrub the residual gases coming out of the final absorption tower. **FGD:** Scrubber with amine technology for treating off gas for smelting furnace, electric furnace and PS converter and slag cleaning furnace. Lime scrubber is proposed for treating fugitive off gas from anode furnace and scrap melting furnace.	Sulphur Balance is submitted as a part of ADS as **Attachment-I**.
8	Copper slag disposal site co-ordinates, concrete mode of utilization, maximum time frame envisaged for the storage at the disposal yard i.e., one month (or) 15 days has not been submitted.	Slag disposal storage was proposed for three months. Complete reuse of the copper slag is yet to be explored to draw action plan.	The Copper slag disposal site co-ordinates are given in site observation No. 5 response. The utilization plan for the copper slag with details of the storage yard is covered in EAC observation No. 6 response.
9	Phospo-gypsum disposal site co-ordinates, concrete mode of utilization, maximum time frame envisaged for the storage at the disposal yard i.e., one month (or) 15 days has not been submitted.	To be revised in accordance with location / lay out plan	The Phospo-gypsum disposal site co-ordinates are given in site observation No. 5 response. The utilization plan for the Phospo-gypsum with details of the storage yard is covered in EAC observation No. 6 response.

4338

UPDATE ON THE OBSERVATIONS OF THE SUB-COMMITTEE AND ADS POST SITE VISIT AND DISCUSSION WITH PROJECT PROPONENT

Sr. No.	ADS Point - Aug 2019	Out Come of the Discussions - Post Site Visit	Responses - Feb 2020
10	Lining details for Phospo-gypsum disposal yard, leachate collection system envisaged, and details of piezo-well installation has not been made available.	To be revised in accordance with location / lay out plan	The responses covered in the EAC observation No. 6 response.
11	Secured land fill EAC co-ordinates, lining details, leachate collection system envisaged, and details of piezo-well installation has not been made available.	After reviewing the layout plan, the committee felt SLF shall be designed at one location only with adequate facilities for sampling and testing instead of two locations in the layout. The layout area of SLF shall not be made congested. Adequate space shall be earmarked for safe handling and movement of vehicles.	The responses covered in the EAC observation No. 5 response.
12	Baseline health status of the people living in the study area of the project site has not been collected.	Baseline health survey was conducted by M/s TALEEM Foundation Ahmedabad. The general issues identified are live birthe and infants' survival, anaemia, disrrheoa etc,	-
13	Details regarding disposal of arsenic bearing sludge has not been submitted.	Arsenic sludge generated from the ETP after tertiary treatment, will be sent to SLF. The general chemical characteristics of the arsenic bearing sludge is given in ADS reply. However, the same may be required in the EMP in the post project monitoring.	The responses covered in the EAC observation No. 8 response.
14	Mercury in ambient air has not been monitored.	Mercury monitoring was carried out which was found to be <0.5 ng/Nm3	-
15	Conservation plan prepared for the Schedule-I species is not meeting the requirement of the conservation of the species that are identified. Therefore, the plan shall be revised considering the requirements of the conservation of the species identified and shall be approved by the competent authority concerned.	To be discussed in the EAC	The responses covered in the EAC observation No. 8 response.
16	Collection of runoff water from the raw material storage area, slag and gypsum	Storm water management plan is to be revised based on the peak rainfall.	The responses covered in the EAC observation No. 9 response.

4045

UPDATE ON THE OBSERVATIONS OF THE SUB-COMMITTEE AND ADS POST SITE VISIT AND DISCUSSION WITH PROJECT PROPONENT

Sr. No.	ADS Point - Aug 2019	Out Come of the Discussions - Post Site Visit	Responses - Feb 2020
	storage yard and its treatment has not been submitted.		
17	Study on installation of rainwater harvesting structure based on annual rain fall pattern and details regarding amount of water to be conserved has not made available.	Rainwater harvesting structures shall be designed as per the quantification of the rainwater runoff based on the average rainfall in the region.	The responses covered in the EAC observation No. 9 response.
18	Impact on hydro geology regime of the project site has not submitted.	Stage of development shall be defined based on the hydro logical survey as the APSEZ and ADANI Power Ltd is operating since long.	Submitted as a part of ADS as **Attachment-II.**
19	Occupational health assessment envisaged for the employees and workers has not been submitted.	Occupational health survey was conducted by ICMR-NIOSH. Monitoring mechanism as per the is not clear in the report.	The responses covered in the EAC observation No. 10 response.
20	As per the Public hearing proceedings, it is noted that there are strong oppositions from the stake holders against the installation of copper smelter unit. Consolidated list of pointwise issues raised and response provided along with action plan for implementation has not been submitted.	To be revised	The responses covered in the EAC observation No. 11 response.
21	The Chapter-5 consists of only listing of alternative technologies. The committee opened that the PP shall select out of alternative technologies available, based on the selection of the technology, the impact prediction shall be made and mitigation measures shall be proposed.	Outotec Flash melting furnace is selected for the proposed project due to Operational ease and Environmental friendly. Copper concentrate, flux additives need to have moisture content below 0.3 %. Rotary steam dryer is used for drying.	-
22	Quantitative representation of mitigation measures was not presented.	All the process flow, outlet and inlet flows shall be mentioned in the same unit system. Stack height (20m) of anode casting may be revised.	The responses covered in the EAC observation No. 14 response.
23	Revised water balance shall be submitted.	Water balance diagram is illegible.	The responses covered in the EAC observation No. 13 response.

4340

UPDATE ON THE OBSERVATIONS OF THE SUB-COMMITTEE AND ADS POST SITE VISIT AND DISCUSSION WITH PROJECT PROPONENT

Sr. No.	ADS Point - Aug 2019	Out Come of the Discussions - Post Site Visit	Responses - Feb 2020
24	HIRA shall be prepared for worst case scenario	HIRA is inadequate	The responses covered in the EAC observation No. 15 response.
25	Management of white ash shall be spelled out	To be discussed in EAC	Management of white ash is submitted as a part of ADS **Attachment-III**.
26	Material balance shall be revised.	Satisfactory	-
27	The involvement of geological expert shall be provided.	Hydrogeological expert was involved.	-
28	The compliance of specific conditions of the environmental clearance of the SEZ shall be provided.	Satisfactory	-
29	The reply to TOR point No. (4) is not proper.	Satisfactory	-
30	The data retrieved from the LULC studies shall be utilized for the prediction of impacts and mitigation measures.	To be revised	The responses covered in the EAC observation No. 12 response.
31	The Air Quality modelling studies shall be re-worked out including the mercury and keeping the mixing height in view.	Suitability of model used as per the EAC characteristics in view of complex atmospheric conditions of coastal line.	The responses covered in the EAC observation No. 12 response.
32	The Environmental Policy of the Organization is not meeting the requirements given in ToR Point No. 9(i), 9(ii), 9(iii), 9(iv).	Environmental Policy was not furnished. Reporting system of non-compliances/ violation is also not in place.	The responses covered in the EAC observation No. 16 response.
33	The CER shall be calculated on the slab rates as per the Office memorandum issued on 1st May,2018.	CER shall be revised explicitly on SIA/Need based Assessment and issues raised iin the Public Hearing	The responses covered in the EAC observation No. 11 response.

4047

ATTACHMENT-I

4341

EAC OBSERVATION No-7:

Sulphur balance of the copper smelter unit has not been submitted.

REPLY:

Sulphur is one of the major ingredient in the copper concentrate. Sulphur from the copper concentrate will be largely converted as Sulphur DI- Oxide during smelting process which will be input raw material for Sulphuric Acid plant for production of Sulphuric Acid with 98% concentration. Sulphuric Acid plant is designed to convert 99.92% of SO_2 into concentrated Sulphuric Acid.

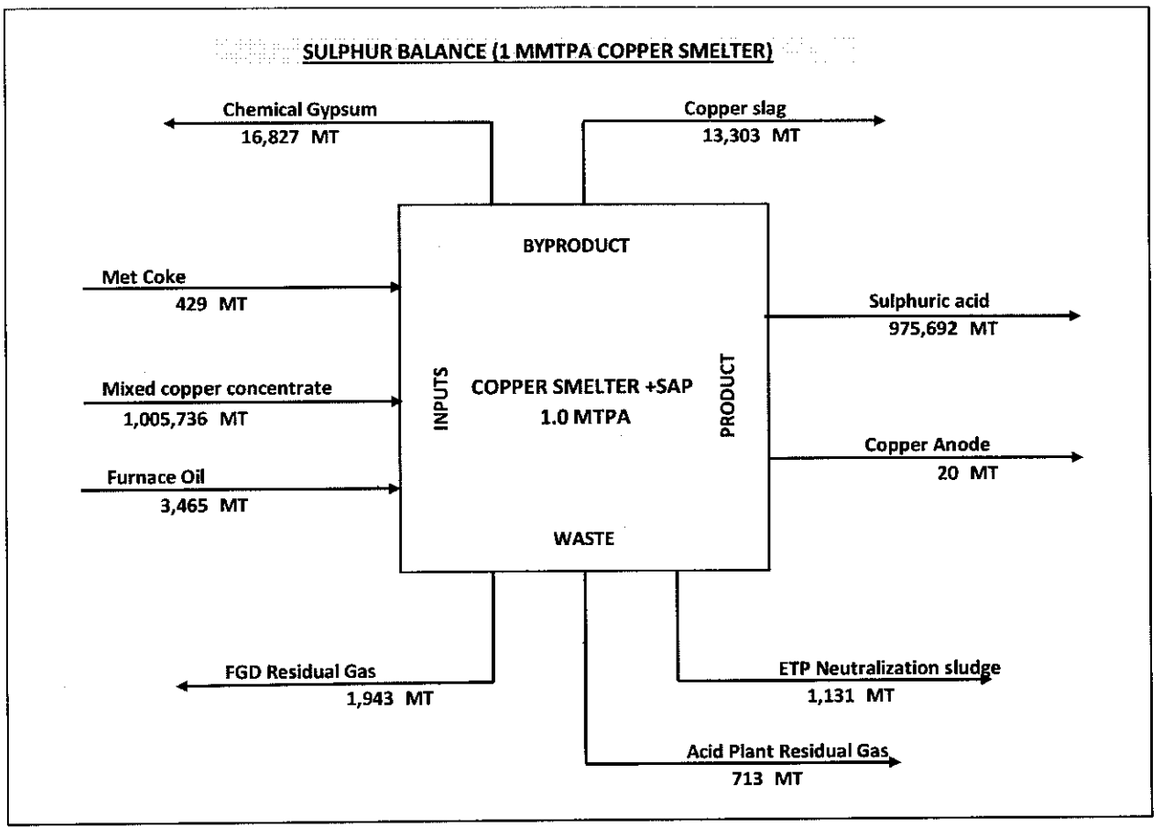
A detail sulphur balance has been reworked out considering various input and output material characteristics. Sulphur from various sources such as Copper concentrate, Furnace Oil, Met Coke will largely (~ 97%) converted into concentrated Sulphuric Acid and rest will be available in by product (Copper slag) and waste material such as chemical gypsum and ETP sludge. Residual Off- gas from Sulphuric Acid plant and Flue Gas Desulphurization system will have SO_2 ~ 300 mg/Nm^3.

The following pollution control measures are proposed to reduce SO_2 around ~300 mg/Nm^3 from Sulphuric Acid Plant (SAP) and Flue Gas Desulphurization (FGD):

SAP	FGD
SO_2 emission of ~300 mg/Nm^3 from the residual off-gases coming out of sulphuric acid plant stack will be achieved by: a) Catalytic converter bed configuration of 3+2 with Double Conversion Double Absorption (DCDA) process, for the sulphuric acid plant; with SO_2 conversion efficiency of 99.92%. b) Use of super cesium sulphuric acid catalyst in the final bed of the catalytic converter, which has better conversion efficiency at a temperature lower than 400 ^{0}C. c) Tail gas scrubber to scrub the residual gases coming out of the final absorption tower.	SO_2 emission of ~300 mg/Nm^3 from the residual off-gases coming from Flue Gas Desulphurization system connected to treat smelter secondary off gases, following system will be achieved by: a) Scrubber with amine technology will be installed for treating secondary off gases from smelting furnace, PS converter and slag cleaning furnace. b) Lime scrubber will be installed for treating secondary off gases from electric furnace, anode Furnace and scrap melting furnace.

Sulphur Balance - for 1 MTPA copper plant					
No.	Material description	Qty. (t/a)	S content (%)	S amount (t/a)	% Distribution
A	Input				
1	Mixed copper concentrate	3,142,924	32.00	1,005,736	99.61%
2	Furnace Oil	99,000	3.5	3,465	0.34%
3	Met Coke	33,000	1.3	429	0.04%
	Total	**3,274,924**	**30.83**	**1,009,630**	**100.00%**
B	Output				
1	Sulphuric acid	2,988,058	32.65	975,692	96.64%
2	Copper Anode	1,003,009	0.002	20	0.00%
3	Copper slag	1,900,373	0.70	13,303	1.32%
4	Chemical Gypsum	156,968	10.72	16,827	1.67%
5	ETP Neutralization sludge	43,348	2.61	1,131	0.11%
6	FGD Residual Gas	~ 1,643,038 Nm3/hr	300 mg/Nm3*	1,943	0.19%
7	Acid Plant Residual Gas	~ 603,040 Nm3/hr	300 mg/Nm3*	713	0.07%
	Total			**1,009,630**	**100.00%**

* Denotes SO_2 Content



4343

ATTACHMENT-II

EAC OBSERVATION No-18:

Impact on hydro geology regime of the project site has not submitted.

REPLY:

Stage of Ground Water Development:

The study area forms part of Mundra and Mandvi blocks of Kachchh district. The average stage of ground water development in these blocks as per CGWB assessment is 82.26% and categorized as "Semi-critical" (Mundra at 63.28% as "Safe" and Mandvi at 101.23% as "Over-exploited").

No ground water is being used or proposed for APSEZ and Adani Power Ltd. The ground water abstraction in the study area is mainly for domestic and irrigation purposes. The present stage of ground water development in the study area is estimated as 102.73% and can be categorized as "Over-exploited".

"Mundra falls under "dark" category as ground water development is between 85-100%. Mandvi is categorized as "OE" (Over Exploited) meaning the ground water is over exploited to the extent of development above 100% (GIDE, 2000)".

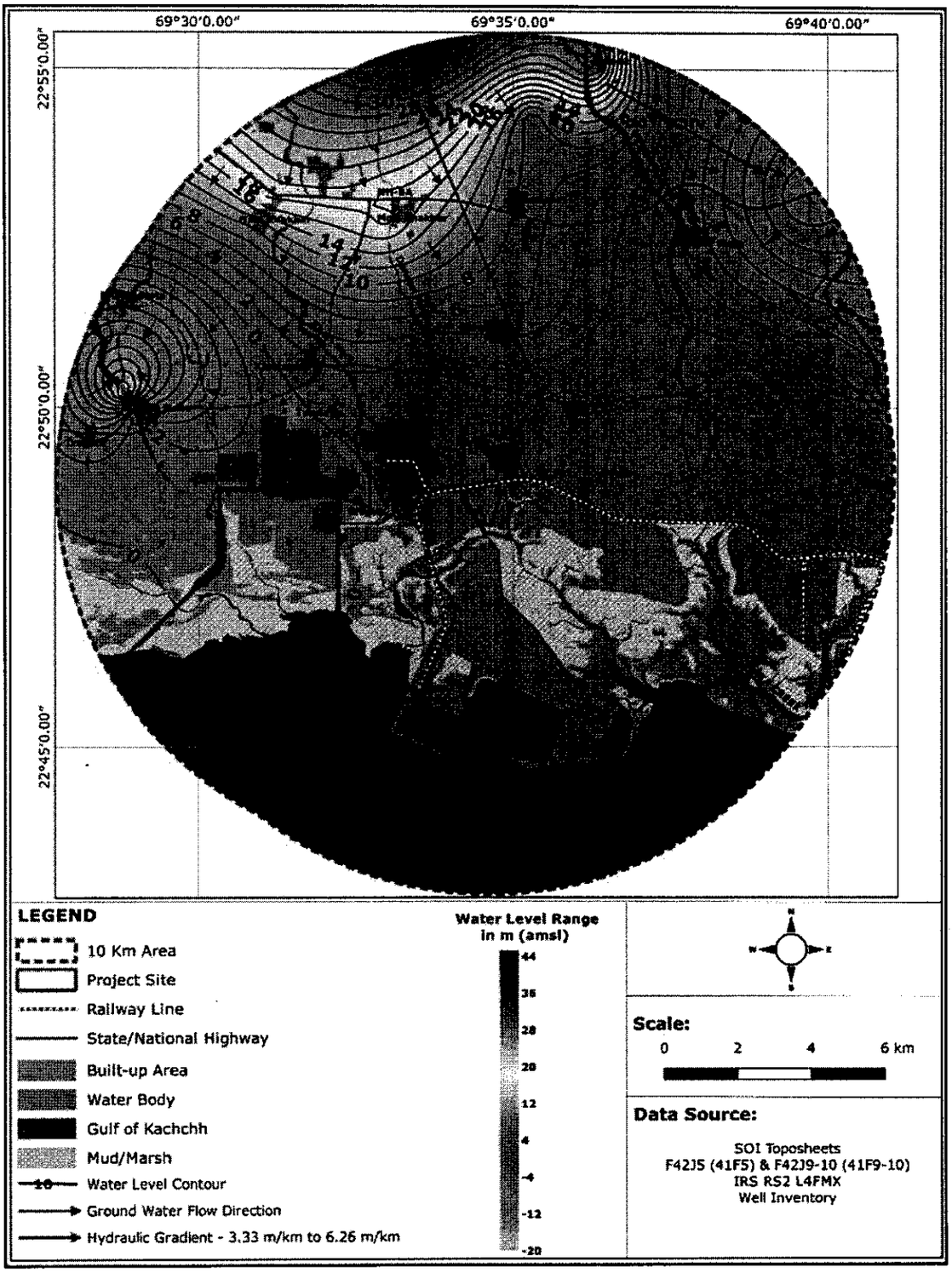
Salinity/Sea Water Intrusion:

Water level contours prepared based on the well inventory during field study during February 2019 for the study area indicate that the water levels in and around Tragadi, Bhadia Nana, CGPL, Wandh, Navinal and Jarpara are below mean sea level and these areas are prone to saline water intrusion.

Salinity in water is usually defined by the Total Dissolved Solids content (TDS, mg/l or g/l) or the Chloride content (Cl, mg/l) although the Chloride ion comprises only a fraction of the total dissolved salts in water. The classification of ground water based on TDS suggests four categories as given below:

Water Type	TDS Range (mg/l)
Fresh water	0 - 1000
Brackish	1000 - 10,000
Saline	10,000 - 1,00,000
Brine	>1,00,000

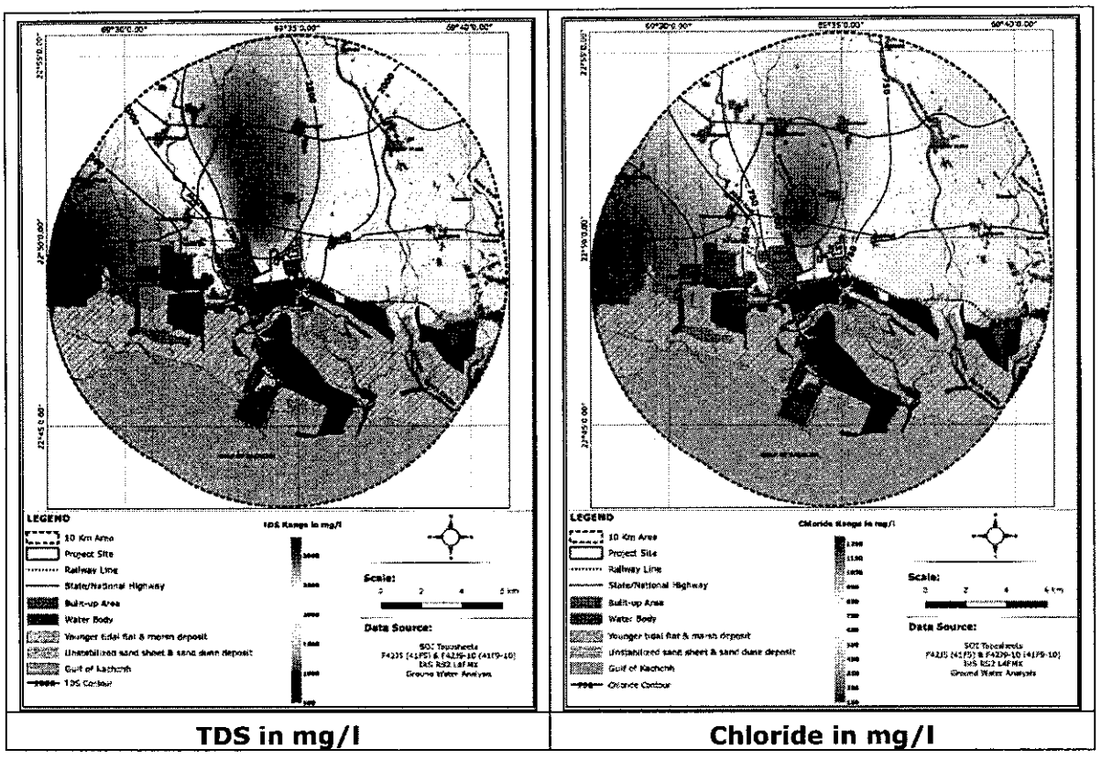
A review of maps showing TDS and Chloride distribution in ground water in the inland area reveal that the TDS and Chloride distribution in the inland area show similar pattern and the ground water in entire area except around Tragadi and Bhadia Nana is moderately brackish with TDS more than 1000 mg/l. TDS and Chloride values of more than 3000 mg/l and 1000 mg/l respectively around Siracha and Moti Khakhar does not show any continuity from coast line and appears to be native to the deeper aquifers/formations.



WATER LEVEL CONTOURS

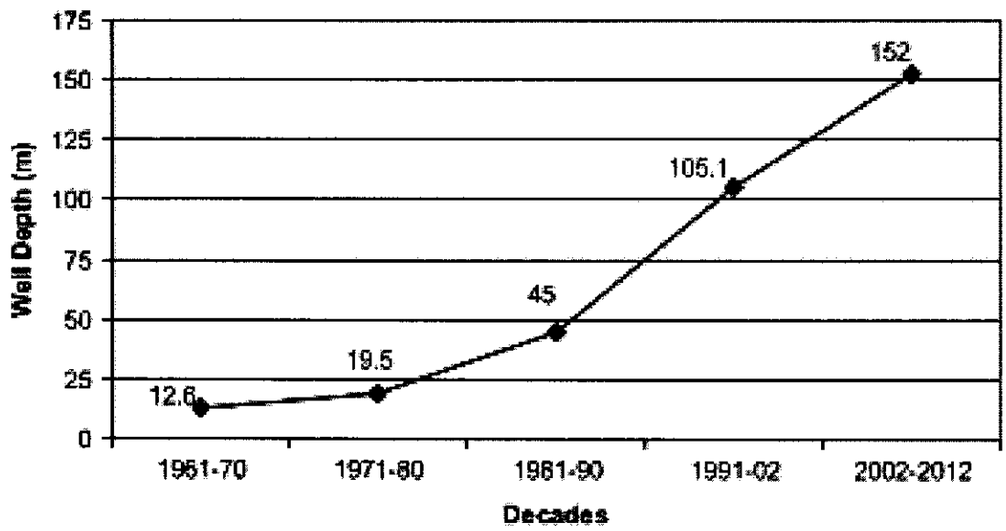
4345

ATTACHMENT-II



TDS in mg/l | **Chloride in mg/l**

The sandstone is the only deep and potential aquifer in the coastal region. Maximum observed depth of bore well in the study area is 180 m. The sandstone is intercalated with impervious clay lenses. The study carried out by Raju (2003) based on bore hole records has revealed that the clays are embedded within Kankavati formation have tapering thickness varying from 10 to 25 m at thinner end and maximum of 50 m at centre. The clay lenses are observed at various depths. He has also reported that ground water extraction from this potential aquifer has gone down from 30 m to 150 m below ground level in last three decades and this over exploitation has led to its quality deterioration too. This exceptional lowering of water levels after 1990, has probably initiated the problem of sea water intrusion leading to ground water quality deterioration. Decadal change in well depths of wells is presented below:



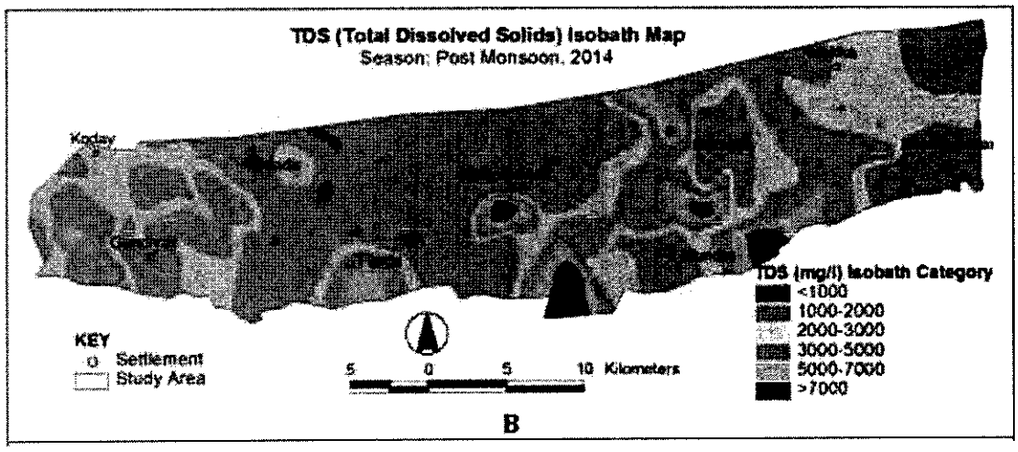
Gujarat Institute of Desert Ecology (GUIDE) Observations:

GUIDE had conducted geo-hydrological investigations in coastal belt of Mandvi and Mundra regions of Kachchh district covering the coastal area of 50 km length from Bhadreshwar to Mandvi between March 2014 and February 2015 with emphasis on saline water intrusion in ground water in the area.

The ground water salinity in the study area has both the characters i.e., coastal salinity and inherent salinity. Along with this, the region is characterized as arid to semi-arid region, where evaporation salinity also exists. Ground water salinity aspects have been studied for seasonal and long-term duration based on primary and historic ground water quality data.

The TDS content generally increases in some of the study area but on the contrary, there are some areas where TDS content has also decreased like Bharapar, Deshalpar, Gundala, Mundra, Nani Bhujpar, Tunda and Zarpara of the study area. The Chloride content has also increased in the study area, but on the contrary, there are some areas where Chloride content has decreased like Bharapar, Deshalpar, Nani Bhujpar and Ragha. Examining the study area and its ground water quality from the above-mentioned data, it indicated that there is a salt water ingress in the coastal areas and especially in the study area.

From the TDS (salinity) range, it can be said that the ground water in the study area is mainly brackish water as the TDS (salinity) values fall in 1,000-10,000 mg/l range, but some areas are having fresh ground water as the TDS values are below 1,000 mg/l. Pre and post monsoon seasons of 2014, TDS analysis shows there is about 4% area that has highly saline areas around villages of Tunda and Mundra.



CEIA:

The overall quality of water is excellent. Marginal degradation in water quality in localized areas around industrial and urban centre is possible. But such changes are subsided by semi-diurnal tidal flushings associated with moderate to strong tidal currents.

ATTACHMENT-III

EAC OBSERVATION No-25:

Management of white ash shall be spelled out.

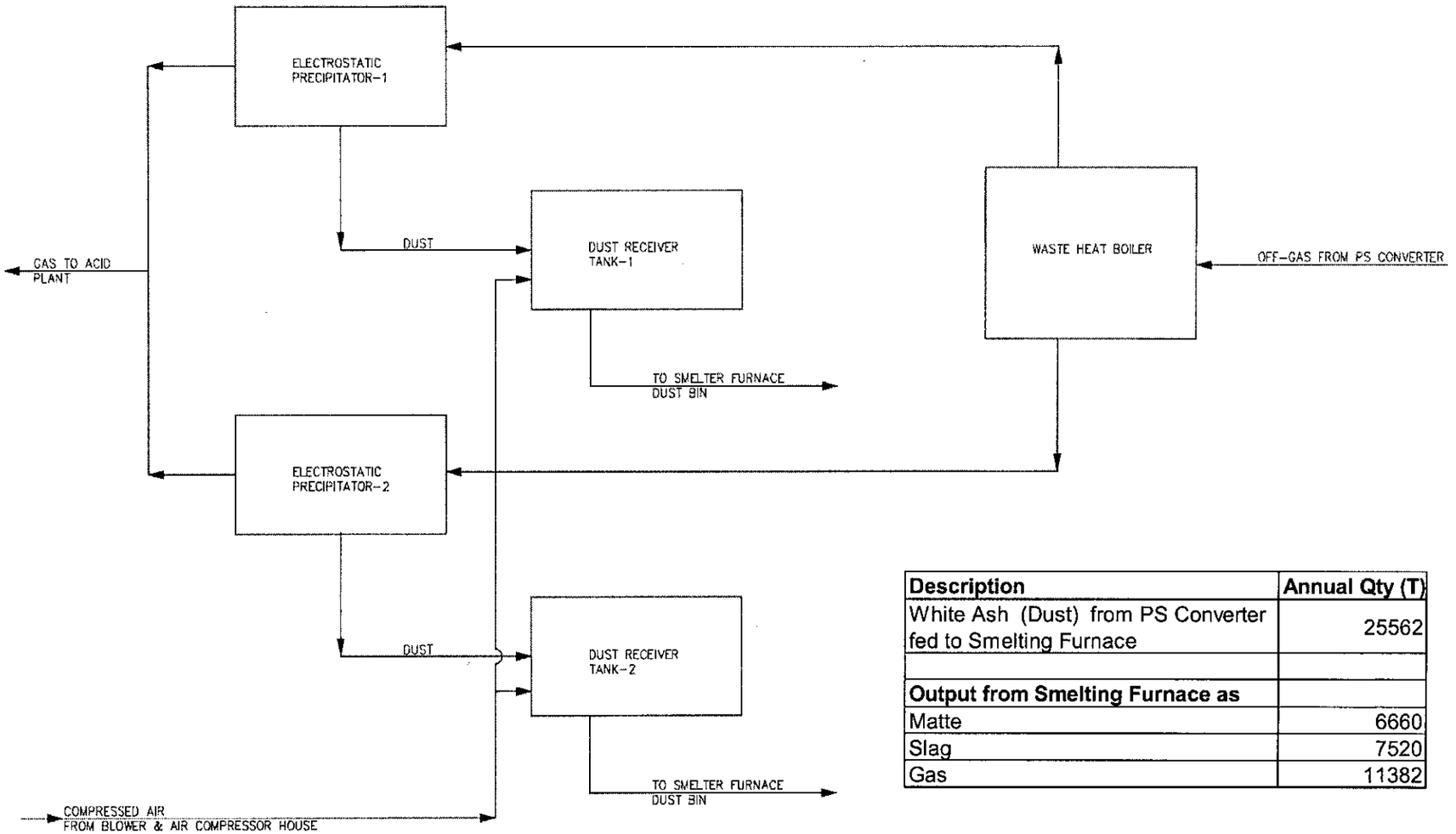
REPLY:

White Ash (Dust) Management:

- High temperature dust-laden gas ~1200^{0}C from Peirce Smith Converter (PSC) goes to the waste heat boiler to recover waste heat and produce steam and cool itself down to about 360^{0}C; while allowing much of the dust entrained in the gas to settle down at the same time; the dust-laden gas from all waste heat boilers reports in the balloon gas duct before it goes to the dust chamber for precipitation and then the ESP for dust removal.
- Dust-removed gas is sent by high temperature exhaust fan to the Sulphuric Acid Plant. The dust captured in the ESP is also called as white dust.
- This dust contains copper along-with impurities such as Lead, Zinc, etc.
- Dust captured in the PSC ESP is delivered by chain conveyor to the white dust bin. Pneumatic conveying system is used to send white dust to smelting furnace dust bin for blended with copper concentrate.
- Total amount of white dust collected will be 25,562 TPA
- Recycled white dust gets converted in the form of matte 6660 TPA, slag 7520 TPA and gas 11382 TPA.

ATTACHMENT-III

BLOCK FLOW DIAGRAM: WHITE DUST (ASH) MANAGEMENT



Description	Annual Qty (T)
White Ash (Dust) from PS Converter fed to Smelting Furnace	25562
Output from Smelting Furnace as	
Matte	6660
Slag	7520
Gas	11382

4055

4 349

RESPONSE TO EAC OBSERVATION OF MEETING ON 24TH DECEMBER 2019

EAC OBSERVATION:

Provide chemical characteristics of the sourcing Copper concentrate.

REPLY:

Adani will be sourcing copper concentrate from various mines present across the World. Hence, the sourcing range of the copper ore concentrate will vary mine to mine. The typical copper ore concentrate sourcing range and smelting input range is shown below:

Parameter	Unit	Sourcing Range	Smelting Input Range
Cu	Wt%	17-46	24 - 28
Fe	Wt%	15-35	24 - 29
S	Wt%	15-40	30 - 34
SiO_2	Wt%	0.5-14	< 10
CaO	Wt%	0.05-7.0	< 1.0
MgO	Wt%	0.03-1.5	< 1.0
Al_2O_3	Wt%	0.03-6.0	< 2
Zn	Wt%	0.001-8.0	< 3
Pb	Wt%	0.005-4.1	< 1.5
Fe_3O_4	Wt%	<1.9	< 1.5
H_2O	Wt%	5.0-10.0	< 8
As	g/t	10-18,000	< 2500
Se	g/t	3-23,000	< 300
Bi	g/t	9-10,000	< 200
Sb	g/t	4-5,000	< 150
Ni	g/t	10-8,000	< 350
Te	g/t	0.9-100	< 100
Cd	g/t	1-250	< 20
Cr	g/t	10-1,000	< 45
Cl	g/t	4-1,000	< 400
F	g/t	20-9,000	< 1500
Hg	g/t	0.4-100.0	< 40

The copper ore concentrate will be blended with various sourced copper ore concentrate within the copper smelter blending facility constituting of number of bins holding various source copper concentrate. Bins are fitted with automatic weighing system to effectively mix copper ore concentrate and required fluxes (silica & limestone) as required to suite copper smelting input range.

The prospective Copper ore concentrate supplier have provided broad specifications for copper ore concentrate. The respective letter have been enclosed as **Annexure-1.**

ANNEXURE-1

4051

MITSUI & CO.,LTD.
1-3, Marunouchi 1-chome,
Chiyoda-ku, Tokyo, 100-8631, Japan
Tel: +81-3-3285-3398

MITSUI&CO.

Date. Jan 15th, 2020
In reply please Address to
Base Metals div.

Mr. Prasad A. Suryarao
Adani Enterprises Ltd
Adani Corporate House, Shantigram,
Ground Floor – South Block
Nr. Vaishnodevi Circle, SG Highway,
Ahmedabad – 382421, Gujarat, India

Dear Mr. Suryarao,

Indicative assays of Copper Concentrate

We are pleased to know that your project is in the final stage of getting environmental approvals.

MITSUI & CO., LTD. reiterate their interest to be associated with the proposed Adani Copper Plant as a prospective supplier of Copper Concentrate. We have our own equity off-take and also trade many other qualities of Concentrates. Based on our current book, these are the indicative assays:

Element	UOM	Min	Max	Typical
Copper	%	18	46	27
Iron	%	18	30	24
Sulphur	%	22	40	33
Al_2O_3	%	0.3	5	2
SiO_2	%	1	10	6
Zinc	%	0.01	4.5	2
Lead	%	0.5	3.5	1
MgO	%	0.4	1	0.2
CaO	%	0.2	2	0.7
Arsenic	%	0.01	1.5	0.4
Bismuth	%	0.01	0.2	0.05
Antimony	%	0.01	0.2	0.02
Chlorine	ppm	10	900	600
Fluorine	ppm	50	3000	1000
Nickel	ppm	50	1000	800
Cobalt	ppm	20	800	600
Chromium	ppm	10	500	80
Selenium	ppm	15	2000	200
Tellurium	ppm	9	100	30
Mercury	ppm	1	100	20
Cadmium	ppm	1	200	100

3452

Kindly note that these indicative assay ranges are combined range of various copper concentrates in the market and these assays and actual assays which might vary from shipment to shipment. Kindly note that assays undergo changes from time to time depending upon the mining plan and other mining disruptions. Further, our profile of the qualities we trade also changes year on year. Consequently, the assay range will keep on getting refreshed from time to time.

Please note that above indicative assay should be considered as a reliable indication only, and we are looking forward to discussing more in detail at an appropriate timing.

Best Regards,

MITSUI & CO., LTD.

Tatsuhiro Torikai
General Manager
Raw Material Marketing Dept.
Base Metals Div.

ANNEXURE-1

4453

Mitsubishi Corporation RtM International

3 Temasek Avenue #32-01, Centennial Tower, Singapore 039190
Co.Reg.No. 201230103M ABN 22 609 587 715

www.mitsubishicorprtm.com/global

January 10, 2020

Mr. Prasad A. Suryarao
Adani Enterprises Ltd.
Adani Corporate House, Shantigram,
Nr. Vaishnodevi Circle, SG Highway,
Ahmedabad 382421
Gujarat, India.

Dear Mr. Rao,

Indicative assays of Copper Concentrate

We are quite pleased to know that the esteemed project is now well into the final phase of getting approvals.

Mitsubishi Corporation RtM International Pte Ltd (RtMI) reiterate their interest to be associated with the proposed Adani Copper smelter as a reliable supplier of Copper Concentrate.

We have our own equity off-take and also trade many other qualities of Concentrates. Based on our current book, these are the indicative assays:

	Assay Range	Typical
Cu	18–45%	26%
S	15 – 40	32%
Fe	15 – 35%	25%
As	0.1 – 1.5%	0.30%
SiO2	0.5–10%	3%
Al2O3	0.03–5.0%	2%
MgO	0.03%–0.2%	0.10%
Ca	0.05–3.0%	1.50%
Pb	0.05–3.0%	1.50%
Sn	0.01 – 0.5%	0.10%
H2O	5 – 12%	8%
Bi	0.01–1.0%	0.10%
Zn	0.5–8.0%	3%
Sb	<0.5%	0.20%
Cl	<0.1%	0.05%
F	0.01 – 0.2%	0.03%
Hg	1 – 100ppm	10ppm
Ni	<0.1%	<0.1%
Co	<0.1%	<0.1%

9454

Mitsubishi Corporation RtM International

3 Temasek Avenue #32-01, Centennial Tower, Singapore 039190
Co.Reg.No. 201230103M ABN 22 609 587 715

www.mitsubishicorprtm.com/global

Please be advised that the above specifications should be considered as a reliable indication only. It is well known that assays undergo changes from time to time depending upon the mining plan. Further, our profile of the qualities we trade also changes year on year. Consequently, the assay range will keep on getting refreshed from time to time.

Looking forward to discuss in greater detail once all the approvals are in the place.

Kindly keep us posted on the progress. Thanks

Best regards,

Mamoru Nakatsu

Mitsubishi Corporation
RtM International Pte Ltd.

ANNEXURE-1

TRANSAMINE
TRADING SA

4455

Date : Jan 6th , 2020

M/s Adani Enterprises
Ahmedabad

Kind Attention : Mr Prasad Surya Rao

Dear Sir

This is with reference to our various discussions on the subject of Copper concentrates supplies to your proposed Copper Smelter project at Mundra. Kindly also refer to our letter dated 1st Feb 2019 on the same subject.

As you are aware the Copper concentrates as produced and traded, have chemical compositions depending on the mineralogy of the ore body from where the same is extracted and beneficiated. However broadly, you can expect the below ranges for the main composition.

UOM		Min	Max	Typical
%	Al2o3	0.17	6	1.92
%	As	0.001	1.5	0.4
ppm	Bi	9	500	100
%	CaO	0.08	7	1.19
ppm	Cd	1	250	100
ppm	Cl	4	800	165
ppm	Co	30	700	200
ppm	Cr	10	1000	100
%	Cu	17	45	26
%	F	0.002	0.9	0.04
%	Fe	17.8	33	25.81
%	Fe3O4	1.9	1.9	1.9
ppm	Hg	0.4	85	6.89
%	MgO	0.066	1.5	0.53
%	Ni	0.001	0.8	0.08
%	Pb	0.005	4.1	0.36
%	S	18	36	30
%	Sb	0.0004	0.4	0.04
%	Se	0.0003	0.23	0.02
%	SiO2	0.0024	20	10
%	Sn	0.0009	0.3	0.05
ppm	Te	0.9	100	37
%	Zn	0.001	5.05	0.77

Thanks and Regards

On behalf of Transamine Trading S.A.

Somnath Ghosh

13 - 15 Cours de Rive, 1204 Geneva, Switzerland - Tel: +41 22 770 00 00, Fax: +41 22 770 00 19

ANNEXURE-1

~~4356~~

From: Amol Mehra <Amol.Mehra@trafigura.com>
Date: 22 January 2020 at 8.39.56 AM IST
To: Prasad Suryarao <Prasad.Suryarao@adani.com>
Subject: RE: [EXTERNAL] RE: Copper Project

Dear Prasad Sir,

Happy to hear regarding status of the project .

As mentioned earlier as per enclosed letter of ours We reiterate we would be interested to be associated with the proposed Adani Copper Plant as a prospective supplier of Copper Concentrate.

As you are aware - We are one of the biggest Trader for Copper Concentrate .Based on your request indicative assays are as under

Element	UOM	Min	Max
Copper	%	20	42
Iron	%	19	28
Sulphur	%	26	38
Al2O3	%	0.4	4
SiO2	%	3	14
Zinc	%	0.05	3.7
Lead	%	0.5	2.9
MgO	%	0.4	1.1
CaO	%	0.2	2.5
Chlorine	ppm	50	600
Fluorine	ppm	40	4100
Arsenic	%	0.01	1.8
Bismuth	%	0.01	0.15
Antimony	%	0.01	0.15
Selenium	ppm	45	1000
Tellurium	ppm	15	80
Nickel	ppm	100	800
Cobalt	ppm	15	500
Chromium	ppm	20	375
Cadmium	ppm	2	100
Mercury	ppm	1	70
Moisture	%	5	9

Kindly note that these indicative assay range are combined range of various copper concentrates in the market and these assays and actual assays might vary from shipment to shipment. It is well known that assays undergo changes from time to time depending upon the mining plan and other mining disruptions.

Further, our profile of the qualities we trade also changes year on year. Consequently, the assay range will keep on getting refreshed from time to time.

Kindly note that these indicative assay should be considered as a reliable indication only

Looking forward to discuss in greater detail once all the approvals are in the place

Wishing you best always

Rgds.amol

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4063

EAC OBSERVATION NO.-2

457

EAC OBSERVATION:

Justification for installation of Water-Cooling Condenser (WCC)

REPLY:

Sulphuric acid plant requires circulating water for meeting cooling requirement of various auxiliaries. Heat from various auxiliaries is gained by circulating water, which is rejected to the atmosphere through cooling tower.

The heat can be rejected from the circulating cooling water either through wet cooling tower or dry cooling tower (i.e., radiator type air cooler, which is water to air cooler).

Wet cooling towers (or open circuit cooling towers) operate on the principle of evaporative cooling. The cooling water from the plant is pumped to a height of about 10 m and distributed over the cooling tower fill, cascading down the fill to the well at the bottom. In this type of cooling tower, some water is lost due to evaporation and drift which is about 2% of circulation rate. Also, in order to keep the dissolved solids in water under control, blow down is taken from the water. To make-up for this loss (~2.5%), water needs to be continuously added into the system.

Radiator type Air Coolers (or Dry cooling towers) work on the principle of convection and conduction to dissipate heat from process fluid to the air stream created by the fans mounted on it. Dry coolers are closed loop systems which eliminate any kind of water loss and thus eliminating the continuous requirement of make-up water.

A comparative study is done with respect to the wet and dry cooling towers for the sulphuric acid plant for Mundra Copper Complex and same is presented below in this note.

Technical Comparison:

Technical comparison of different technical parameters between Water-Cooled Condenser (WCC)/ Wet Cooling tower and the Air-Cooled Condenser (ACC) / Radiator type Air Coolers (or Dry cooling towers) are presented in the table below considering the circulating water requirement for a 1500 KTPA (100% H_2SO_4) of sulphuric acid plant for each phase.

Sr. No.	Description	Unit	WCC	ACC
1	Heat Load	kW	148615	148615
2	Hot Water Inlet Temp	deg. C	42	80
3	Cold Water Outlet Temp	deg. C	32	65
4	Water Quality	-	Desalinated Water	Passivated DM
5	Total Circulating Water	m^3/hr	12781	8521
6	Temperature Range	deg. C	10	15
7	Cycles of Concentration, C		6	0
8	CT evaporation loss, E	m^3/hr	196	0
9	Total CT evaporation loss per day	m^3/day	4693	0
10	CT drift loss @ 0.01% (D) of total CW flow	m^3/hr	1	0
11	Total CT drift loss per day	m^3/day	31	0
12	CT blow down (B) B = (E / C-1) -D, where C = Cycles of Concentration,	m^3/hr	38	0

3458

Sr. No.	Description	Unit	WCC	ACC
13	Total CT blow down per day	m^3/day	908	0
14	CT make-up total (M) M = E* (C /(C-1))	m^3/hr	235	0
15	Total CT make up water required per day for each phase (1500 KTPA SAP)	m^3/day	5632	0
16	**Total CT make up water required per day for both phase (3000 KTPA SAP)**	**m^3/day**	**11264**	**0**
17	Power Consumption to produce desalinate water	kW	1056	0
18	Power Consumption Fans	kW	465	3772
19	Power Consumption for CW Pumps	kW	1786	1191
20	Total Power Consumption for each phase (1500 KTPA SAP)	kW	3307	4963
21	Total Power Consumption for both phase (3000 KTPA SAP)	**kW**	**6614**	**9926**
22	Footprint each phase (1500 KTPA SAP)	m2	808	3614
23	**Area for each phase (1500 KTPA SAP)**	**acre**	**0.200**	**0.893**
24	**Area for the both phase (3000 KTPA SAP)**	**acre**	**0.399**	**1.786**
25	**CO_2 Emission each phase (1500 KTPA SAP)**	**kg**	**936**	**1405**
26	**CO_2 Emission both phase (3000 KTPA SAP)**	**kg**	**1872**	**2810**

Detailed comparison of the water-cooled condenser (WCC) and the air-cooled condenser (ACC) based on the main indicator of choice for the sulphuric acid plant.

Parameter	Water Cooling Condenser	Air Cooling Condenser
Circulating water quality	Desalinated water	Passivated DM water
Water consumption	For both phases, approx. **11,264 m^3/hr** make-up water will be required	The water circulates in closed loop, hence make-up water requirement is not there (negligible, as only leakages have to be topped-up)
Power consumption	Approx. 6,614 kW power will be consumed.	Approx. 9,926 kW power will be consumed, **which is 33.5 % higher than WCC**
Footprint area	Approx. 0.399 acre area will be required	Approx. 1.786 acre area will be required, **which is 77% higher than WCC**
Carbon emission*	Approx. 1872 kg/day CO_2 Emission.	Whereas, Approx. 2810 kg/day CO_2 Emission, **which is 33.5% higher than WCC**
Material of construction	FRP can be used for cooling tower casing and PP/ PVC materials can be used in wet cooling tower for fills & drift eliminators	Radiator type cooler casing/ structure shall be carbon steel with epoxy painting and finned tubes shall be of Stainless steel
Efficiency	High	**Low;** due to the corrosive environment present in the coastal area of the Mundra, which lead to tube leakages.

** In our calculations, we convert kWh to kg of carbon saved based on Greenhouse gas reporting: conversion factors from Department for Business, Energy and Industrial Strategy. The conversion factor is 0.28307 kg CO_2 saved for each kWh produced from a carbon free source. The factor is based on the carbon emissions generated by the current UK power stations per kWh generated. This factor includes other greenhouse gasses such as methane and nitrous oxide which are converted to their carbon dioxide equivalents so the value is really kg CO_2 eq. per kWh.*

EAC OBSERVATION NO.-2

Most of the Sulphuric acid plant uses water cooling system. Selection is largely depend upon the availability of the water. The list of various sulphuric acid plant available with type of cooling system is attached as **Annexure-2.**

Conclusion:

Water-cooled condenser (WCC)/ Wet Cooling Tower is recommended due to the following as detailed above:

1) Lower power consumption 33.5 %
2) Lower carbon footprint by 33.5%
3) Lower land requirement by 77%
4) No need of DM water
5) Reliable performance as no issues of fouling being an open system

***

Prasad Suryarao 4460

From: Hannes Storch <hannes.storch@outotec.com>
Sent: Tuesday, January 28, 2020 2:46 PM
To: Prasad Suryarao
Cc: Kanjanabha Bhattacharyya; Manidipa Bose; Stefan Mohsler
Subject: RE: SAP Cooling tower
Attachments: Outotec_cooling_water_Systems_used_in_recent_plants_for_adani_copper_smelter_information-rev00.pdf

Dear Surya,
good to hear from you and I trust this email finds you well.
Please find attached the information you requested from us with regard to cooling tower concepts. This list is covering the our latest references only. Please note, that the selection of the cooling system is pre-defined by client and usually the drivers are : availability of cooling water source, temperature of cooling water and allowable temperature increase (in case from sea- or river-water), quality of cooling water, energy cost etc.
Based on such information, Outotec can support in the financial evaluation for selecting the solutions, that will result in best ROI for the entire installation. Please let us know if we can assist you here.

Looking forward to talk to you soon, best regards

Hannes

Dr. Hannes Storch

Managing Director

Vice President
Metals and Chemicals Processing

Tel.: +49-6171-9693-182
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Fax: +49-6171-9693-251
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Handelsregisternummer/commercial registry N°: Bad Homburg v.d. Höhe: HRB 11397
Geschäftsführer/Managing Directors: Jari Ålgars, Nina Kiviranta, Mathias Noll, Dr. Hannes Storch

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Outotec

TECHNICAL INFORMATION
Rev 00

Adani Cu Smelter

AO / Stefan Mohsler

27 Jan 2020

INFORMATION ON COOLING WATER SYSTEMS FROM RECENT COMMISSIONED OUTOTEC PLANTS

The table below shows the cooling water systems Outotec (or responsible partner) installed for recently commissioned Outotec Acid plants. It is prepared for the Adani Copper Smelter project.

It is difficult to give a Basis of selection, as this is always a customer decision (taking the local conditions of the site into account). Where the driver for the solution was clear the table shows "Availability" and else "by customer".

Note that gas cleaning in metallurgical sulphuric acid plants needs suitable low cooling water temperatures for cooling.

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Name of the Plant	Place & Country	Sulphur Based/ Metallurgical based (Cu/ Zn/ Ni)	Capacity of the Plant (TPD)	Year of Commissioning	Type of Cooling tower (Water Cooled CT/ Air Cooled Condenser/ Fin Fan Cooler/ Sea water based CT)	Basis of Selection
Almalyk	Almalyk, Usbekistan	Cu	2300	2015	Water Cooled CT	by customer
Boliden Harjavalta	Harjavalta, Finnland	Cu/Ni	2240	2018	River water cooling closed loop	Availability
Boliden Rönnskär	Rönnskär, Sweden	Cu/Pb (revamp)	2000	2019 (Absorption)	brackish seawater	Availability
Codelco MMH	Calama, Chile	Cu	915	2014	Water cooled CT	by customer
Eti Bakir - Mazidagi	Mazidagi, Turkey	Pyrite	2082	2018	Water cooled CT for Acid & GC plant, Air Cooled Condensor for Steam Turbine	by customer
Eti Bakir - Samsun	Samsun, Turkey	Cu	1315	2017	Seawater	Availability
Kansanshi	Solwezi, Zambia	Cu	4500	2015	Water Cooled CT based on river water	Availability
Ma'aden	Raz a Zwar, Saudi Arabia	3xS-burning	3x5000	2011	Seawater	Availability
Namibia Customs Smelter	Tsumeb, Namibia	Cu	1540	2015	Fin-Fan cooler for ~50% of GC plant (weak acid cooling) and ~95% of SAP strong acid cooling. Other cooling by water cooled CT (ground water)	limited availabilty of water
NCIC	Ain Sohkna, Egypt	2xS-burning	2x1900	2019	Water Cooled CT	by customer
Noracid PAM	Mejillones, Chile	S-burning	2060	2011	Fin-Fan Cooler for SAP and turbine, (except for product acid coling)	by customer

ANNEXURE-2

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MECS DUPONT

This document is prepared to enable Mundra Copper take a decision on Cooling Media for Acid Coolers

MECS has designed and built over 650 Sulphuric Acid plants globally, with around 40% of these plants above 2000 MTPD capacity. These plants require Strong Acid Coolers to take out the heat from system. Some of plants like Metallurgical Off Gas and Spent Acid based plant need additional Weak Acid Coolers in Gas Cleaning Section.

Cooling Tower Water is the preferred media for cooling in these coolers from operational and maintenance perspective. But some customers chose to have Sea Water Or Closed Loop Fin Fan system. This selection is based on the availability of sources of water.

For Metallurgical Off Gas and Spent Acid plants, cooling media used is always Cooling Tower Water for Weak Acid Coolers due to low temperature requirements in process. Similarly, most of the Product Acid Coolers are on Cooling Tower to meet the storage temperature requirement of 40 degC or lower.

The list below is the partial reference list of the plants designed by MECS and the type of Cooling media used in Acid Coolers. **The selection of cooling media is solely done on the basis of availability and overall site requirements.**

Name and Location	Capacity, MTPD	Type of Plant	Year Of Commissioning	Media used in Acid Coolers
Paradeep Phosphates, India	2000	Sulphur Burning	2016	Cooling Tower Water
Hindalco Industries, India	1800	Copper Smelter Off Gas	1997	Cooling Tower Water
Hindalco Industries, India	2800	Copper Smelter Off Gas	2005	Cooling Tower Water
Reliance Industries, India	1000	Spent Acid Regeneration	2007	Cooling Tower Water
Kennecott Copper, USA	3700	Copper Smelter Off Gas		Cooling Tower Water
GCT, Tunisia	Various Plants of >2000 MTPD	Sulphur Burning	2002 to 2012	Sea Water
OCP, Morocco	Various Plants of >2000 MTPD	Sulphur Burning	2008 to 2019	Sea Water
LS Nikko, South Korea	2700	Copper Smelter Off Gas	2005	Cooling Tower Water
LS Nikko, South Korea	2700	Copper Smelter Off Gas	2008	Cooling Tower Water
Magma Copper, USA	2000	Copper Smelter Off Gas	1995	Cooling Tower Water

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MECS DUPONT

Plant in Zambia	2350	Copper Smelter Off Gas	2014	Cooling Tower Water
Plant in GCC	Various Plants of >2000 MTPD	Sulphur Burning	2016 to 2018	Fin Fan Cooler
Kazzink, Kazakhstan	1800	Copper Smelter Off Gas	2011	Cooling Tower Water
Guixi, China	2474	Copper Smelter Off Gas	2007	Cooling Tower Water
Guixi, China	1900	Copper Smelter Off Gas	1997	Cooling Tower Water
Plant in China	4820	Copper Smelter Off Gas	2015	Cooling Tower Water

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BUSINESS MANAGER-SALES

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EAC OBSERVATION NO.-3

EAC OBSERVATION:

Provide details for proposed flue gas desulfurization.

REPLY:

Two type of FGD systems have been proposed in the copper refinery plant for abatement of the SO_2 coming from secondary gases coming from Copper smelter unit and Sulphuric acid plant tail gases.

1. Regenerable Amine Based SO_2 Scrubbing System:

The secondary gases from flash smelting furnace, PS converter and tail gases from the Sulphuric acid plant are treated in this system. This process helps to convert lean SO_2 secondary gases (~ 2000 mg/Nm^3) into production of concentrated Sulphur dioxide (~ 85%) and fed to proposed Sulphuric acid plant for production of Sulphuric Acid. This will help to **reduce the solid waste generation quantity by ~ 70%** and produce valuable Sulphuric acid and thereby **increasing acid ratio by ~ 1%.**

2. Lime slurry based Scrubber:

The combustion gases from Anode Furnace, Slag Cleaning Furnace and Scrap melting Furnace go into the lime based scrubbing for SO_2 abatement system. Post scrubbing, scrubbed slurry will be aerated to make $CaSO_3$ into $CaSO_4$. This will help to produce **high quality chemical gypsum suitable to cement industries**.

Amine based SO_2 Scrubbing System for Metals Smelting and Refining applications needs:

The dominant gas desulfurization technology today is limestone or lime-based scrubbing in various forms, produce large quantities of solid waste products; i.e. chemical grade-gypsum. Demand for resource recovery and recycling / regenerable type SO_2 removal processes are becoming increasingly more desirable. But, for many industries the preferred byproducts are SO_2, elemental sulfur or sulfuric acid. This needs addresses by the diamine based SO_2 Scrubbing System; selectively absorbing SO_2 and regenerating a pure by-product without consuming reagents or creating waste.

EAC OBSERVATION NO.-3

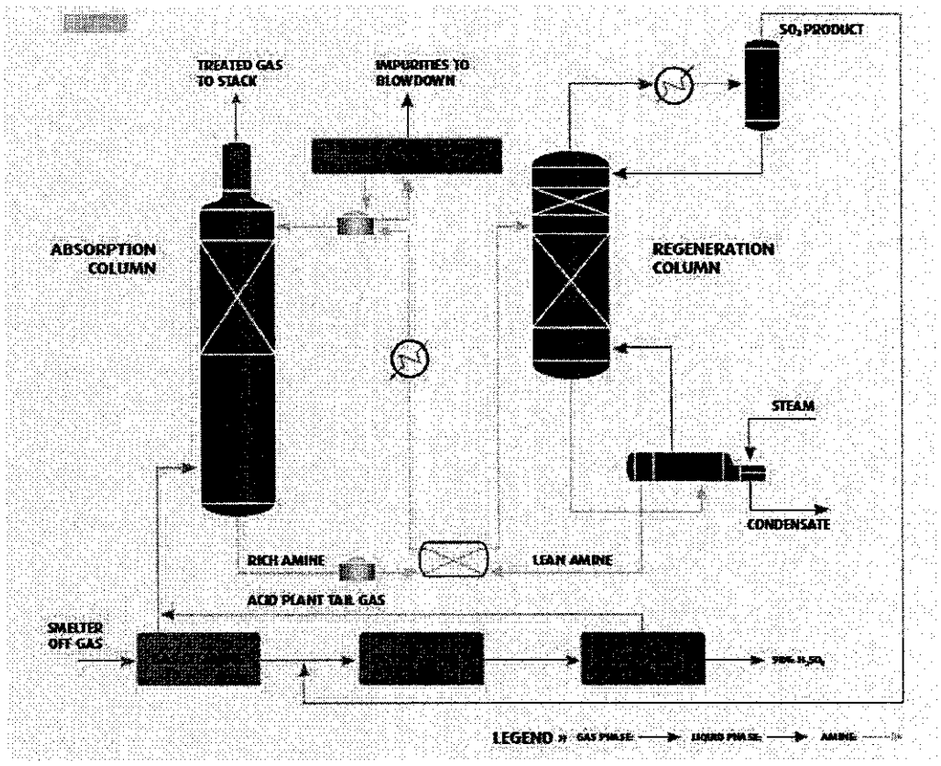


FIGURE-1:
PROCESS FLOW DIAGRAM OF THE AMINE BASED SO_2 SCRUBBING

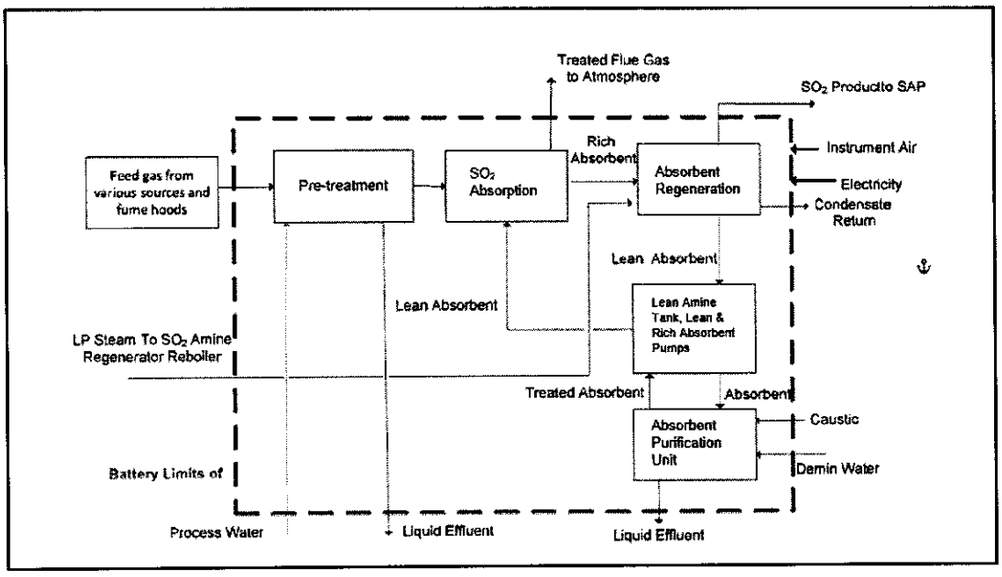


FIGURE-2:
PRELIMINARY - BLOCK FLOW DIAGRAM OF THE AMINE BASED SO_2 SCRUBBING

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EAC OBSERVATION NO.-3

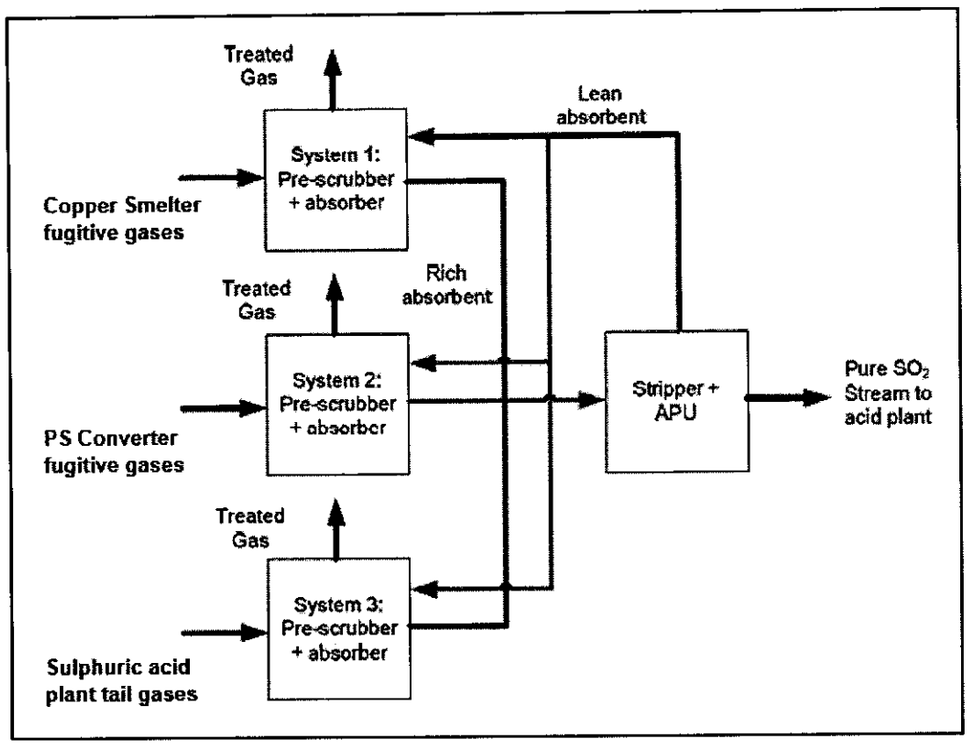


FIGURE-3:
PRELIMINARY SECONDARY AND TAIL GASES FLOW IN THE AMINE BASED SO_2 SCRUBBING

Process Descriptions:

Gas Pre-Treatment Unit:

1. The Gas Pre-Treatment Unit installed upstream of the SO_2 Scrubbing System cools the secondary gases from copper smelter and converter and Sulphuric acid plant tail gases to its adiabatic saturation temperature and removes some of the acid mist and particulate matter coming with the incoming gas. The unit includes an open spray hot gas quench and associated water circulation pumps. The quenched gas leaving the Gas Pre-Treatment unit is directed towards the bottom of the SO_2 Absorber.

SO_2 Absorption and Regeneration:

1. Gas from the Pre-treatment unit is routed to the bottom of the SO_2 Absorber. The SO_2 is first absorbed from the flue gas by counter-current contact with the amine absorbent introduced from the top of the SO_2 absorption section packing.
2. The amine absorbent rich in SO_2 is collected in the SO_2 absorber sump and pumped by the rich amine absorbent pumps to the SO_2 stripper for regeneration via the lean/rich exchanger on level control. The treated gas exits the absorber with an SO_2 content as low as 300 mg/Nm^3, depending on design parameters.
3. The rich amine absorbent is stripped in the SO_2 stripper in a counter current way by steam generated in the stripper reboiler. The overhead vapour product is directed

EAC OBSERVATION NO.-3

towards the Air cooled condensers, where it is partially condensed. The mixed phase stream is separated in the reflux accumulator. The gas phase exiting the reflux accumulator, which is typically 85-95% by volume SO_2 saturated with water, is delivered to the downstream acid plant drying tower (expected destination). The liquid phase from the reflux accumulator is pumped to the top rectification bed of the SO_2 stripper by reflux pumps.

4. The stripped absorbent (lean absorbent) leaving the bottom of the SO_2 stripper is pumped by the lean absorbent pumps to the lean absorbent tank through the lean/rich exchanger and the lean absorbent cooler on level control. From the lean absorbent tank, the lean absorbent is pumped by the lean absorbent feed pump to the top of the SO_2 absorber thereby completing the cycle.
5. A separate stream of lean absorbent leaves the lean absorbent tank through the absorbent filter feed pumps and is sent to the absorbent filtration unit. This unit is comprised of activated carbon filter with its after-filter for particulate removal.
6. The filtered absorbent is either directed to the lean absorbent tank or sent intermittently through the Absorbent Purification Unit (APU), which removes heat stable salts (HSS).

Absorbent Purification Unit (APU):

The Absorbent Purification Unit is designed to remove heat stable salts (HSS) from the absorbent. These salts are continuously formed within the absorbent, rendering it inactive for further SO_2 absorption if salt levels are too high. HSS are not heat-regenerable and, as a result, will not be removed from absorbent through steam stripping. Although a certain level of HSS is desirable within the absorbent, any excess HSS must thus be removed.

Ion exchange (IX) is a reversible process in which ions are exchanged between the absorbent solution and the resin. The reaction occurs in an ion exchange column, a vessel containing the resin. The absorbent is passed through the column, where a portion of the undesired HSS is adsorbed onto the ion exchange resin sites. The absorbent exiting the column thus contains a lower concentration of HSS.

Amine Absorbents provide significant advantages:

1. Since the amine absorbent is always present in the process as a salt, it is totally Non-volatile and equilibrium vapor phase losses of solvent to the **treated gas are Zero**
2. High thermal and chemical stability
3. Low foaming tendency
4. Inhibition of SO_2 oxidation by oxygen to sulfate
5. High water solubility, giving a homogeneous liquid absorbent

Regenerative SO_2 abatement scrubber - Amine-based				
No. of System: 2				
Description	**UOM**	**Source - 1**	**Source - 2**	**Source - 3**
Gas Source		**Smelting Furnace Secondary Gases**	**PS Converter Secondary Gases**	**Sulphuric Acid Plant Tail Gases**
Preliminary - Gas Volume	Nm^3/Hr	168,796	345,900	301,520
Preliminary - IN-SO_2 Content	mg/Nm^3	1,500	3,000	600
Residual gas SO_2	mg/Nm^3	300	300	300

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EAC OBSERVATION NO.-3

6. Air is injected into the sump of the vessel to complete the oxidation of the sulfites to sulfate. After the sulfite oxidation, a blow downstream is withdrawn from the vessel and sent to client waste water treatment system, at where the filter removes the insoluble calcium sulfate (gypsum) and captured particulates.
7. The gypsum (calcium sulfate) can be filtered to a relatively dry 85 wt.% solid, after which it can be dispose.
8. The filtrate can be recycled back to the scrubbing system as make-up water for evaporation losses.
9. The treated gas exits the scrubber with an SO_2 content as low as 300 mg/Nm^3, depending on design parameters.

Lime Slurry - based SO_2 abatement scrubber			
No. of System: 2			
Description	**UOM**	**Source - 1**	**Source - 2**
Gas Source		**Anode & Scrap Melting Furnace Combustion & Secondary Gases**	**Electric Furnace Combustion & Secondary Gases**
Preliminary - Gas Volume	Nm^3/Hr	171,823	135,000
Preliminary - IN- SO_2 Content	mg/Nm^3	1,000	1,500
Residual gas SO_2	mg/Nm^3	300	300

Conclusion:

The secondary gases from the smelter, the converter and the tail gases from the sulphuric acid plant treated in the SO_2 abatement system based on regenerative amine and the combustion gases from Anode Furnace, Slag Cleaning Furnace and Scrap melting Furnace go into the lime based scrubbing for SO_2 abatement. The treated gas exits from the both system with an SO_2 content as low as 300 mg/ Nm^3, depending on design parameters which well be within the limit as per the CPCB.

EAC OBSERVATION NO.-3

Lime slurry based Scrubber:

The combustion gases from Anode Furnace, Slag Cleaning Furnace and Scrap melting Furnace goes to the wet lime slurry based scrubber for SO_2 abatement.

Process Description:

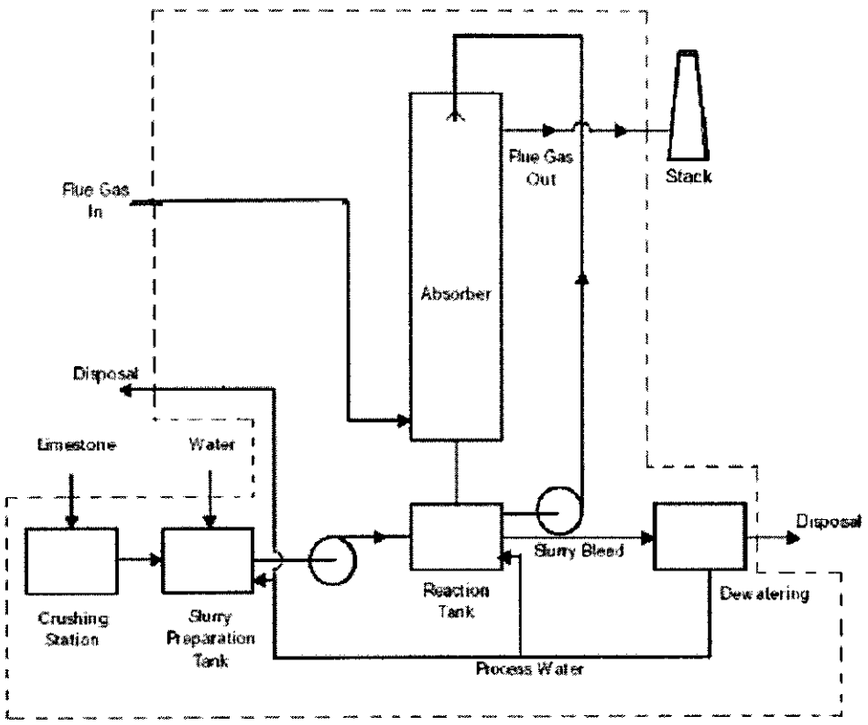


FIGURE-4:
PRELIMINARY SECONDARY GASES FLOW IN THE LIMESTONE BASED SO2 SCRUBBING

1. Feeding of the limestone slurry to the scrubber.
2. The limestone slurry is recirculated in the scrubber by the pump from the scrubber sump.
3. Gas from the anode furnace & Casting and Slag Cleaning Furnace is routed to the bottom of the SO_2 scrubber. The SO_2 is first absorbed from the flue gas by counter-current contact with the lime based sorbent introduced from the top of the scrubber by the sprays/ nozzle.
4. Formation of the calcium sulphite ($CaSO_3$) as result of the desulphurization process.

   After combining many of the intermediate steps, the net reaction is:

   $$SO_2 + Ca(OH)_2 \rightarrow CaSO_3 + H_2O$$

5. The calcium sulfite product is a suspended solid. Because of its crystal structure, calcium sulfite ($CaSO_3$) cannot be filtered. To facilitate the disposal and handling of the by-products, the calcium sulfite must be further oxidized to calcium sulfate ($CaSO_4$) as follows:

   $$CaSO_3 + 1/2O_2 \rightarrow CaSO_4$$

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EAC OBSERVATION NO.-4

EAC OBSERVATION:

Reduce carbon foot print by heat recovery system generating from the plant.

REPLY:

- The heat is captured from the smelter, converter and SAP plant with the help of waste heat recovery boiler
- The high-pressure steam generated by the waste heat recovery boiler is sent to the steam turbine for the power generation, i.e. 40 MW
- By adopting a waste heat recovery system in the plant, we reduce the carbon footprint by 0.25 million tonnes per year

Reduction in carbon footprint by using waste heat recovery system:

Carbon Foot Print Calculation	UOM	Value
Per day power generated from the waste heat recovery	MW	40
Number of operating days	-	330
Number of hours per day	-	24
Availability	%	95
CO_2 factor for western grid	t/MWh	0.81
Total CO_2 saved per year	t/a	243,778

Total CO_2 saved = 40 x 330 x 24 x 0.95 x 0.81
= 243,778 t/a equivalent to 244 kg/t-Cu

Total CO_2 emitted from proposed plant due to use of hydrocarbon and Limestone excluding external power consumption is around 290 kg/t- Cu.

By implementing waste heat recovery system in smelter and sulfuric acid plant of the proposed copper refinery plant, there will be approximately 25% energy savings.

EAC OBSERVATION NO.-5

EAC OBSERVATION:

Access roads to be provided for all the solid waste storages such as copper slag, gypsum storage & secured land fill and adequate green belt to be developed around all the solid waste storages.

REPLY:

The covered conveyor system will be provided for transporting copper slag and phospho-gypsum from point of generation to respective storage facility, designed as per CPCB guidelines. Arsenic bearing sludge generated from ETP will be transported by covered truck to SLF, designed as per CPCB guidelines.

Approach road around the boundary of all solid waste storages such as copper slag, gypsum storage and secure land fill (SLF) will be provided as per CPCB guidelines. The 10 m wide approach road will be provided. The approach road will be used for transportation of the solid waste/ by product. We will be providing a **15 meter wide green belt around solid waste storages** to control dust emissions from the storage. A greenbelt along with safety zone (towards river bank with gabion and gully plugs) to avoid erosion of plant if any to avoid 100 m wide will be developed along the side of **Dhaneshwari Nadi** wherever storage of solid waste is proposed.

Adequate arrangements such as **water sprays** will be provided to arrest the fugitive dust emission as required.

The layout map of proposed project is enclosed as **Annexure-5**.

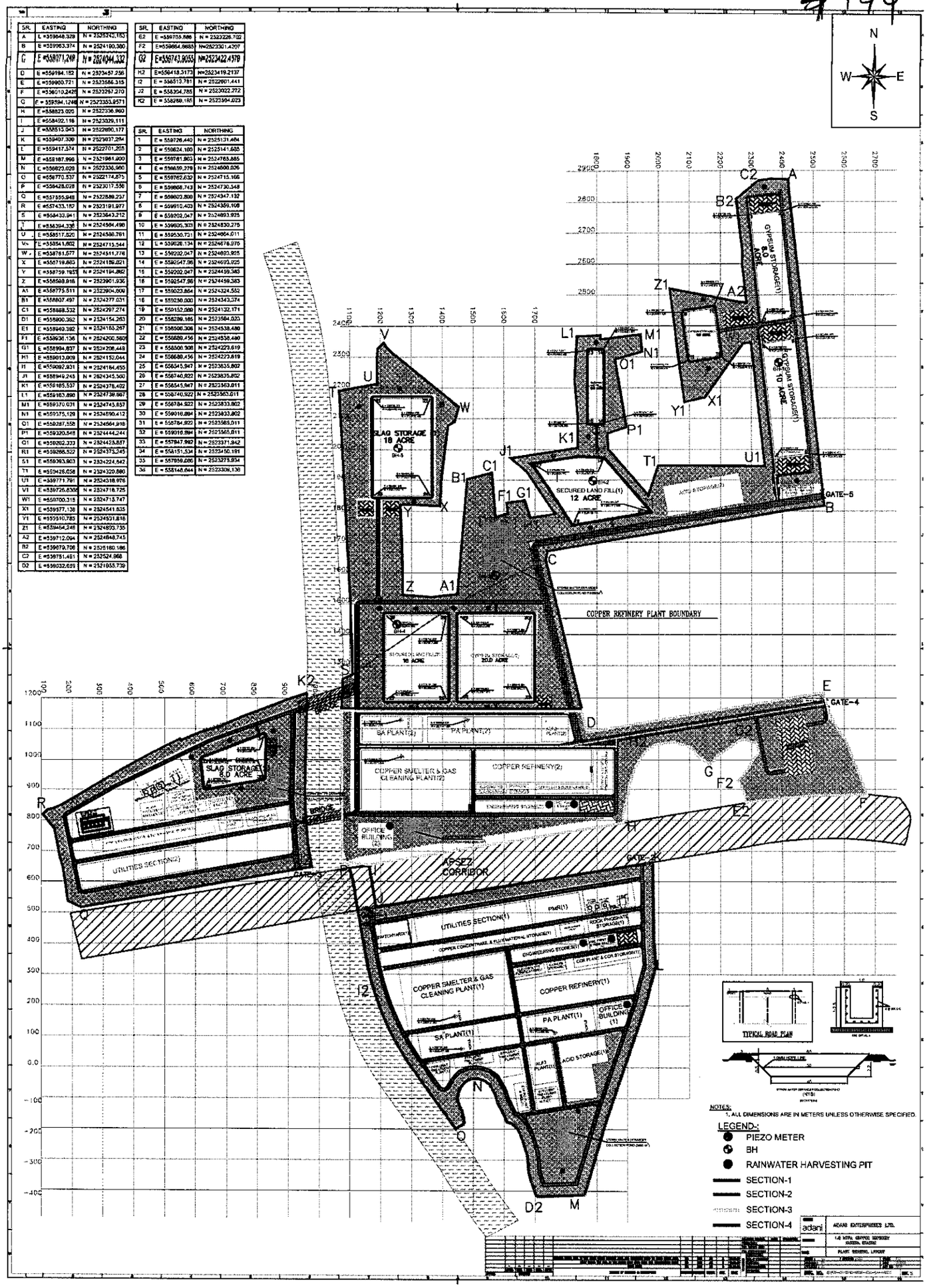
ANNEXURE-5

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SR.	EASTING	NORTHING
A	E =559648.329	N = 2525740.185
B	E =559963.374	N = 2524180.380
C	E =559071.249	N = 2524044.332
D	E =559194.182	N = 2523457.256
E	E =559900.721	N = 2523586.315
F	E =559010.2426	N = 2523267.270
G	E = 559594.1246	N = 2523353.9571
H	E =558823.005	N = 2522936.960
I	E =558402.116	N = 2523029.111
J	E =558513.043	N = 2522980.177
K	E =559407.330	N = 2523937.264
L	E =559417.574	N = 2522701.265
M	E =558187.998	N = 2521961.900
N	E =556823.020	N = 2522336.960
O	E =556770.537	N = 2522174.875
P	E =558428.028	N = 2523017.556
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U	E =558517.020	N = 2524588.781
V	E =558541.602	N = 2524715.544
W	E =558761.677	N = 2524511.778
X	E =558719.663	N = 2524189.221
Y	E =558759.165	N = 2524194.862
Z	E =558568.916	N = 2523901.936
A1	E =558775.511	N = 2523904.009
B1	E =558807.497	N = 2524277.031
C1	E =558868.532	N = 2524297.274
D1	E =558900.362	N = 2524154.263
E1	E =558940.392	N = 2524183.267
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G1	E =558994.837	N = 2524208.448
H1	E =559013.009	N = 2524152.044
I1	E =559092.931	N = 2524184.455
J1	E =558949.245	N = 2524345.360
K1	E =559165.537	N = 2524378.402
L1	E =559163.896	N = 2524739.867
M1	E =559370.031	N = 2524743.857
N1	E =559375.129	N = 2524590.412
O1	E =558287.558	N = 2524564.918
P1	E =559320.548	N = 2524444.244
Q1	E =559202.333	N = 2524423.887
R1	E =559266.522	N = 2524375.245
S1	E =559363.903	N = 2524224.542
T1	E =559426.658	N = 2524320.580
U1	E =559771.791	N = 2524318.976
V1	E =559726.8300	N = 2524716.725
W1	E =559700.315	N = 2524713.747
X1	E =559577.138	N = 2524541.835
Y1	E =559510.785	N = 2524931.818
Z1	E =559464.248	N = 2524809.735
A2	E =559712.094	N = 2524848.745
B2	E =559879.706	N = 2525180.186
C2	E =559751.481	N = 2525241.968
D2	E =559032.689	N = 2521955.739

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H2	E=559418.3173	N=2523419.2137
I2	E = 558513.781	N = 2522901.441
J2	E = 558304.785	N = 2523022.272
K2	E = 558289.185	N = 2523304.023

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4	E = 559659.278	N = 2524668.826
5	E = 559762.632	N = 2524715.166
6	E = 559868.743	N = 2524730.348
7	E = 559802.896	N = 2524347.132
8	E = 559610.403	N = 2524369.198
9	E = 559702.047	N = 2524893.925
10	E = 559605.303	N = 2524830.275
11	E = 559530.721	N = 2524864.011
12	E = 559626.134	N = 2524678.975
13	E = 559202.047	N = 2524803.805
14	E = 559247.36	N = 2524693.925
15	E = 559202.047	N = 2524439.340
16	E = 559247.36	N = 2524439.340
17	E = 559023.864	N = 2524324.552
18	E = 559230.000	N = 2524343.374
19	E = 559152.089	N = 2524132.171
20	E = 558289.185	N = 2523564.025
21	E = 558506.306	N = 2524538.486
22	E = 558689.456	N = 2524538.486
23	E = 558500.306	N = 2524223.619
24	E = 558689.456	N = 2524223.619
25	E = 558545.947	N = 2523835.802
26	E = 558740.922	N = 2523835.802
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28	E = 558740.922	N = 2523563.011
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35	E = 557856.086	N = 2523275.934
36	E = 558146.644	N = 2523309.136



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EAC OBSERVATION NO.-6

EAC OBSERVATION:

Provide utilization plan for copper slag and Phospho-gypsum, with details of storage yard.

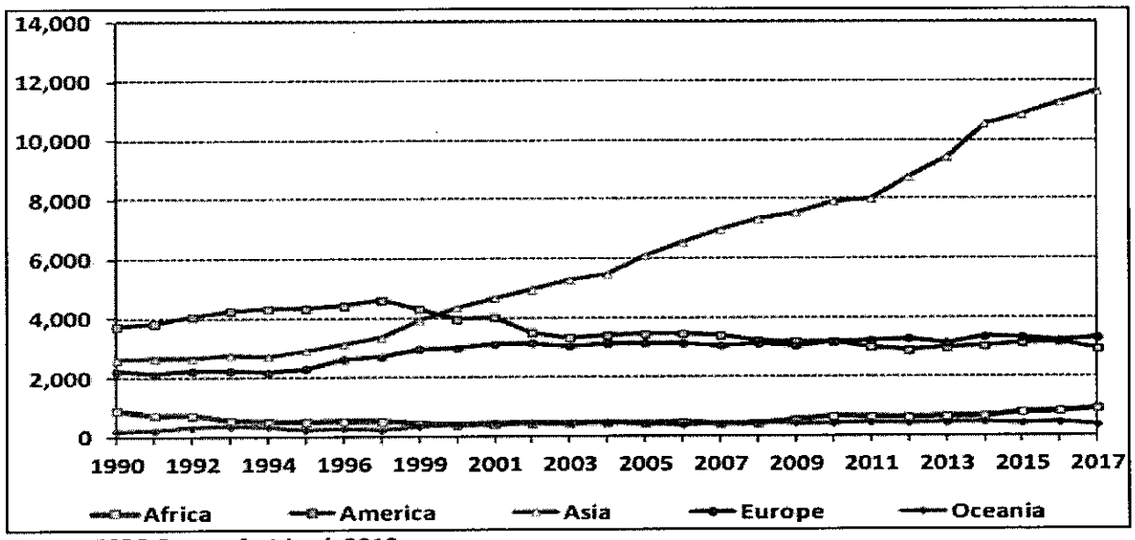
REPLY:

A) COPPER SLAG:

Copper slag, which is produced during the pyrometallurgical production of copper from copper concentrates, contains valuable metals such as copper, zinc, lead, cobalt, and nickel. For every tonne of metal produced, about 2.2 – 3.0 tonnes of slags, mainly copper smelter and converter slags, are generated. The conventional methods for treating slags are disposal in slag dumps or stockpiles. The increasing dumping of slags not only occupies large areas of land, but also wastes resources. It is therefore desirable to use slags by the current options of recycling, metal recovery, and production of high value- added materials.

Because of the favorable physico-mechanical characteristics of Copper slag can be considered a promising source of secondary raw material. It can be used to produce different products such as cement, concrete, fine aggregate, fill material, road base construction, abrasive material, roofing granules, cutting tools, railway ballast material, tiles and glass *(Reference: Gorai, Bipra, and R. K. Jana. "Characteristics and utilisation of copper slag—a review." Resources, Conservation and Recycling 39.4 (2003): 299-313).*

The global annual production of copper from concentrate smelting is around 19.5 million tons.



Source: ICSG Copper fact book 2018

COPPER SMELTER PRODUCTION BY REGION 1990-2017
(THOUSAND METRIC TONNES)

Asia's share of world copper smelter output is 61% and Europe & America together account for 33% of the world copper smelter output.

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EAC OBSERVATION NO.-6

- Slag cleaning : Slag from Smelting and Converting is treated to recover Copper metal
- Granulation: Post recovery of metal, slag is granulated.
  1. Use of water for quenching operation to increase surface area for cooling
  2. As per customer specification for reuse.
  3. Stacking for reuse and supplying

The flow sheet show the pyro metallurgical method of copper slag manufacturing.

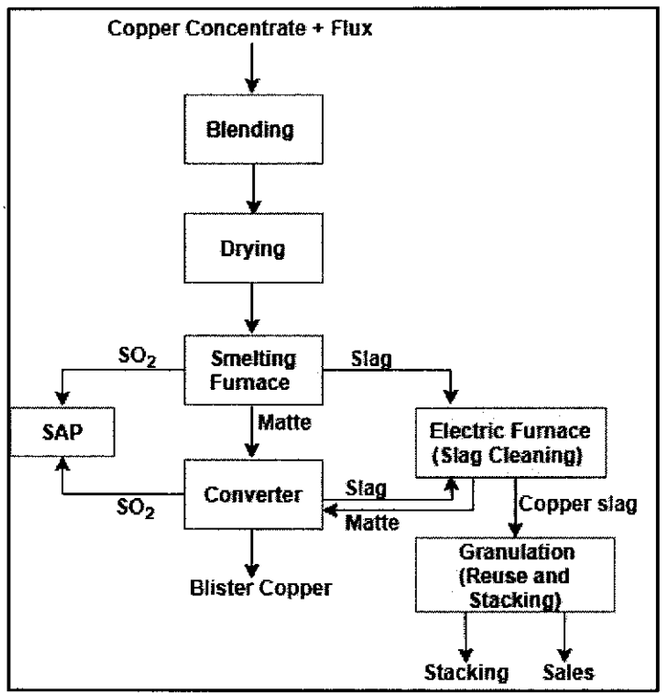


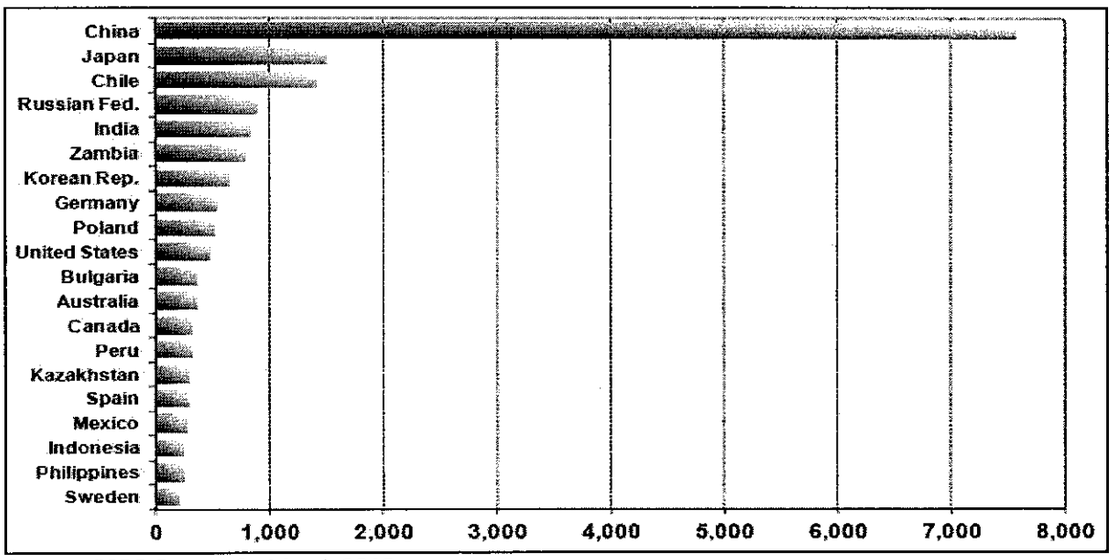
TABLE-2
CHEMICAL COMPOSITION OF THE PYROMETALLURGICAL COPPER SLAG

Element	Weight %
Fe_2O_3	42 – 60
Fe_3O_4	6 – 25%
SiO_2	27 – 33
Al_2O_3	1 – 4
CaO	< 3
Cu	< 1
S	0.3 – 1
Free Moisture	< 2

TABLE-3
PHYSICAL AND CHEMICAL CHARACTERISTICS OF COPPER SLAG

Characteristics	Description
Appearance	Black glassy granules
Color	Gray/black
Granule shape	Angular, sharp
Density, g/cm3	3.16 – 3.87
Specific gravity	2.8 – 3.8
Bulk density, T/m3	1.8 - 2.31

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Source: ICSG Copper fact book 2018

COPPER SMELTER PRODUCTION BY TOP 20 COUNTRIES (THOUSAND METRIC TONNES)

China produces ~ 40% of world copper smelter production, followed by Japan 8%, Chile 7%, etc.

The global annual production of copper slag is about 43 million tons. The copper slag generation for different continents are depicted in the **Table-1** below:

TABLE-1
COPPER SLAG GENERATION IN VARIOUS REGIONS (2017)

Regions	Copper Production (million tons/year	Copper Slag Generation (million tons/year)
Asia	11.30	24.86
America	3.00	6.60
Europe	3.40	7.48
Africa	0.90	1.98
Oceania	0.45	0.99
Total	**19.05**	**41.91**

Source – ICSG Copper Factbook 2018 (Slag quantity is calculated based on copper production with factor of 2.2)

Due to the huge amount of slag generated, the potential applications of copper slag have been investigated in the past few decades. Current options of management of copper slag are recycling, recovering of metal, production of value added products and disposal in dumps or stockpiles *(Reference: Shi, C., Meyer, C., & Behnood, A. (2008). Utilization of copper slag in cement and concrete. Resources, Conservation and recycling, 52(10), 1115-1120).*

Copper Slag is produced during copper smelting process, by oxidation of iron from copper concentrate and combining with silica, to form Iron Silicate, called as copper Slag.

Process consists following process steps:

- Smelting : Slag Generation ~ 70%: Slag Cleaning
- Converting : Slag Generation ~ 30%: Slag Cleaning

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b. Grit blasting

Copper slag is used as blast cleaning abrasive for all application fields in conventional corrosion protection on almost all surfaces. Its sharp hard cutting edges allow for fast cleaning action and hence is excellent for surface profile preparation (for that free crystalline silica content should be <1% in copper slag).

It absorb no water, during the manufacturing of the abrasive no crushing or grinding is required, it retains its extreme hardness and tenacity and dust content is also reduced *(Reference: NAstra® Iron silicate by Sibelco - Germany).*

c. Road Application

Copper slag-pond mixes with 50 to 75% copper slag content could be used in embankment construction, while the mix with 75% copper slag content could be used in sub base layer of road pavement.

Copper slag-soil mixes with 25 to 75% copper slag content could be used in embankment construction while the mix with 50 to 75% copper slag content could be used in sub base layer of road pavement. *(Reference: Experimental study on use of Copper Slag in embankment and pavement construction – Geotechnical Engineering Division, CRRI, New Delhi).*

d. Sand / Landfilling

100% replacement & best alternative option for gravel/ red soil/ river sand. Heavy metals in the slag are stable and difficult for leaching. The slag obtained after the copper removal in the electric furnace can be safely applied in various economic sectors including cement and concrete production. The slag after the copper removal process became more environmental friendly and can be stored on dumping grounds of neutral wastes or utilized at roads and bridges building, as a concrete matrix. *(Reference: Assessment of the harmfulness of the slags from copper smelting process in an aspect of their management by M. Holtzer, A. Bydałek, W. Wołczyński, A. Kmita from Poland).*

Copper slag can be used as sand replacement material for plastering of floorings and horizontal up to 50% by mass of the fine aggregate and for vertical surfaces such as brick wall it can be used up to 25% (generally fine aggregate passing 2.36 mm sieve is suitable for plastering). Upper limit for sand replacement by copper slag is 50% for conventional grades of concrete and 75% for high grade concrete *(Reference: Study on use of copper slag as replacement material for river sand in building constructions by C. K. Madheswaran, P. S. Ambily, J. K. Dattatreya, N. P. Rajamane).*

e. Paver Blocks and Bricks manufacturing process

It is observed that paver block with copper slag gains 10% strength more than to that of paver block with conventional. The optimum content of copper slag that can be used as a replacement material for fine aggregate for the manufacture of paver blocks is 30%. Compared to the conventional specimen the copper slag based paver block shows an increase in density up to 10%. *(Reference: An experimental investigation on partial replacement of copper slag as fine aggregate in paver block by S.Kalaiselvi, S.Prabhakaran, Jagadeesan.K).*

Limitations of Copper Slag valorization – need of storage

However, it has been estimated that copper slag is **utilized only about 15-20% of the copper slag generated** in value added applications, the rest of material is dumped as waste

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Copper slag does not feature in the hazardous waste category in schedule-1 of the hazardous waste management rules issued by MOEF&CC, India in 2016.

Copper slag has been excluded from the listed hazardous waste category of United States Environmental Pollution Agency (USEPA).

Copper Slag will be stacked in a designated place for reuse and supplying.

The TCLP, multiple extraction procedure test (MEP) and sulfuric acid leaching results indicate that the heavy metals present in the slag are very stable and have **poor leachability, the copper slag also has a long-term stability and weather is unlikely to activate the slag.**

The **MEP** indicates that the heavy metals present in the **slag are highly stable** and are not likely to dissolve significantly even through repetitive leaching under acid rain in a natural environment.

Copper Slag Uses:

Sector	Usage	Purpose
Cement Industry	▪ As an Additive	▪ To increase Iron
Construction	▪ Concrete, ▪ Road making as sub layer ▪ Surface coating	▪ Replacement of Sand & Aggregates ▪ Substitute for stone flour in asphalt & as an additive in bed structure stabilization. ▪ Anti-Skid purpose
Blasting	▪ Marine/ Shipping industry, ▪ Construction and Mechanical Industry	▪ Shot Blasting ▪ In place of Sand blasting
Infrastructure	▪ Port Construction & Low lying area ▪ In Paver block As an additive ▪ Blocks of concrete with slag.	▪ Back Filling Application ▪ To improve sintering and abrasion resistance ▪ To protect coastal shore lining

In Indian market various applications have been envisaged, and consumption of the Copper Slag is picking up.

a. Concrete Applications

As per the Indian Standard (IS) 383, the copper slag can be used as partial replacement to natural fine aggregates to an extent of 35% in reinforced concrete, up to 40% in plain concrete and 50% in lean concrete.

It is observed that there is 70% improvement in compressive strength with 50% replacement of copper slag. There is almost 5% increase in density comparing with the concrete of control mixture. The flexural strength and tensile strength were similar to control mixture (100% sand) spending up to 50% copper slag replacement of sand *(Reference: Use of copper slag as sustainable aggregate by Alinda Dey, Deepjyoti Dev, and Purnachandra Saha, KIIT University, Bhubaneswar, Odisha).*

Lower permeability, resistance to chloride ion penetration, resistance to sulphate attack, lower hydraulic conductivity, higher compressive and flexural strength are the added advantages of copper slag over the conventional mixture of concrete.

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(Reference: Anbarasan, Replacing river sand with granulated copper slag in cement, International Journal of Scientific & Engineering Research, Volume 7, Issue 5, May-2016).

The preliminary utilisation plan for copper slag is presented as **Annexure-6(a).**

Based on the above, a **10 Hectare storage area** has been proposed in the Copper Refinery Project.

To make the Indian industry competitive and create an equal level playing field, we shall be allowed to stack for the 5 year generation quantity for reuse. We will use this period to stabilize the plant, slag quality, develop the market and meet the quality for reuse based on demand.

We request MOEF&CC to make a policy decision for utilisation of Copper Slag by circular economy concept similar to China and Japan.

However, we will make serious efforts in the various areas of use to reduce storage. In addition to this, we will also conduct research projects to increase sales of Copper Slag.

Copper Slag Storage Yard Note:

- Copper slag does not feature in the hazardous waste category in schedule-1 of the hazardous waste management rules issued by MOEF & CC, India in 2016.
- The Toxicity characteristic leaching procedure (TCLP), Multiple Extraction Procedure (MEP) test and sulfuric acid leaching results indicate that the heavy metals present in the slag are very stable and have poor leachability, the copper slag also has a long-term stability and weather is unlikely to activate the slag.
- Therefore, the ground base for open storage of copper slag will be prepared to harden to withstand the load of stored material.
- Copper slag will be stored inside the Bund wall around and a garland drain will be provided around the boundary of the Bund wall.

B) PHOSPHOGYPSUM:

Justification for the Phosphogypsum Storage:

In the manufacture of phosphoric acid (P_2O_5), the Phosphogypsum (PG) generated as a by-product, in which phosphate rock is digested with Sulphuric acid. The basic chemistry of the wet process is exceedingly simple:

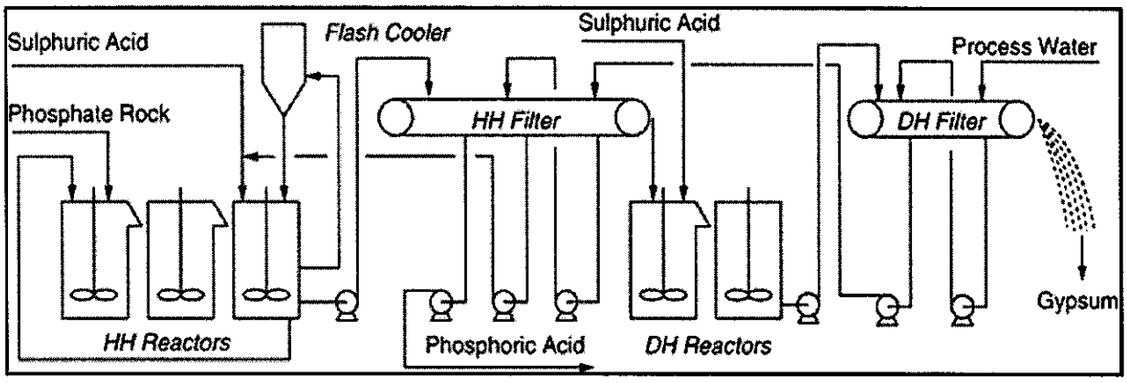
The phosphate rock is converted by reaction with concentrated Sulphuric acid into phosphoric acid and the insoluble salt calcium sulphate.

$$Ca_{10}F_2(PO_4)_6 + 10\,H_2SO_4 + 10\,n\,H_2O \rightarrow 6H_3PO_4 + 10\,(CaSO_4.nH_2O) + 2HF$$

Where n = 0, ½ or 2 depending on the hydrate form in which the calcium sulphate is crystallized.

We will be using Hemi-Di-hydrate technology for production of Phosphoric Acid and Phospho-gypsum. A typical process flow diagram is shown below:

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1 ton of phosphoric acid (as P_2O_5) recovered = 4.5 – 5.0 tons of Phosphogypsum (dry basis) generated.

In India, The **total production of phosphoric acid is about 2.3 Million Ton**, and the **Phosphogypsum generation is about 11.5 Million Tons per annum** during the year 2018-19.

Presently, most of the phosphoric acid plants are disposing the Phosphogypsum within the plant premises in stack (s). Depending on the demand, the phosphoric acid units sell the Phosphogypsum for different applications as mentioned in the below Table.

Sector	Usage	Purpose
Cement	▪ As a retardant	▪ To control the setting time of cement
Agriculture	▪ As a Fertilizer	▪ To correct the Alkaline Soil condition & as a Nutrient
Construction	▪ Road Sub Layer ▪ Gypsum Blocks/ Bricks ▪ Gypsum Fiber Boards	▪ Replacement of Soil ▪ Replacement of Aggregate and sand
Others	▪ Plaster, Plaster Boards	▪ Alternative material

We understand that the cement industries in the state of Madhya Pradesh and Maharashtra, uses chemical gypsum to the tune of 50% and 70% respectively of its annual total requirement. However, cement industries in the state of in Rajasthan and Gujarat, uses chemical gypsum to the tune of 9% and 25% respectively of its annual total requirement.

Therefore, we request MOEF&CC to make a policy decision for utilisation of Phospho-Gypsum by circular economy concept similar to China and Japan.

To make the Indian industry competitive and create an equal level playing field, we shall be allowed to stack for the 5 year generation quantity for reuse. We will use this period to stabilize the plant, Phospho-gypsum quality, develop the market and meet the quality for reuse. We should be allowed to dry stacking of unsold quantities of the Phospho-gypsum till circular economy process has been put in place across the industries.

However, we will make serious efforts in the various areas of use to reduce storage. In addition to this, we will also conduct research projects to increase sales of Phosphogypsum as a part of circular economy initiative.

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Based on the market potential and future market development, we propose preliminary utilisation plan is as below subject to change based on future demand supply. The preliminary utilisation plan for phospogypsum is presented as **Annexure-6(a).**

Handling & Management of Phospho-Gypsum in EUROPE

Location	Company	Process type	Gypsum disposal	Capacity ktonnes P_2O_5
Belgium	Nilefos	DH	Stacking, fraction sold	130
	Prayon SA	DHH	Stacking 20%, sold 80%	180
Czech Rep.	Fosfa	Thermal		50
Finland	Kemira GrowHow	DH	Stacking	300
France	Grand Quevilly (closed)	DH	Stacking	200
Greece	PFI Ltd., Kavala	DH	Stacking	70
	PFI Ltd., Thessaloniki	DH	Stacking	110
Lithuania	AB Lifosa	HH	Stacking	350
Netherlands	Hygro Agri Rotterdam (closed)	HDH-2	Sea	160
	Kemira Agro Pernis (closed)	HDH-1	Sea	225
	Thermphos	Thermal		155
Poland	Police S.A., Police	DH	Stacking	400
	Fosfory N.F., Gdansk	DH	Stacking	110
	Alwernia S.A.	Thermal		40
	Wizow S.A.	HH	Stacking	50
Spain	Fertiberia S.A.	DH	Stacking	420
	FMC Foret S.A.	DH	Stacking	130

Source: EU IPPC - Reference Document on Best Available Techniques in Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilizers Industries. August 2007

Considering the proposed phosphor-gypsum utilization plan, a **17 Hectare storage area** has been planned for storage of Phospho-gypsum designed & developed as per **CPCB guidelines for Management, Handling, Utilisation and disposal of Phospho-gypsum generated from Phosphoric Acid Plants: 2014-2015**; in the proposed Copper Refinery Project.

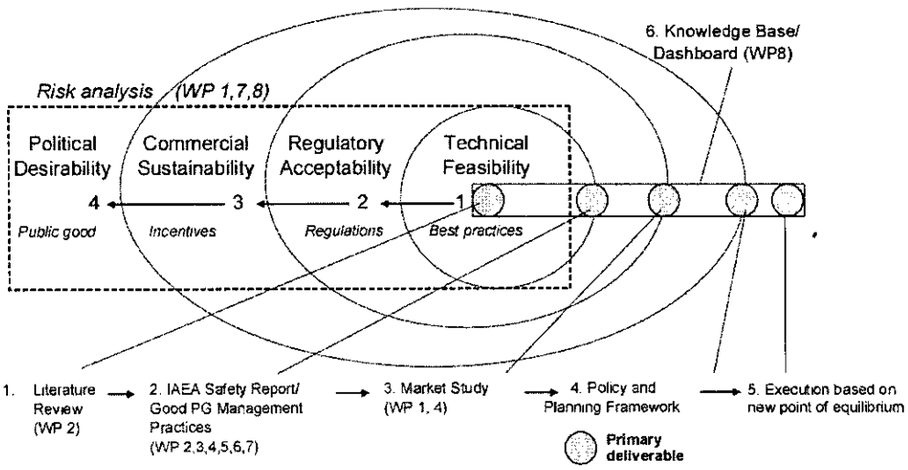
Challenges faced by countries in Phosphogypsum consumption: A Case Study*
**Reference: Towards a Management and Regulatory Strategy for Phosphoric Acid and Phosphogypsum as Co-Products, Work performed partly within the remit of the project Stack free by '53? Beneficial Uses of Phosphogypsum, supported inter alia by the Florida Institute for Phosphate Research and the Aleff Group.*

The **project Stack Free by '53?** Beneficial Uses of Phosphogypsum, supported Inter alliance by the Florida Institute for Phosphate Research and the Aleff Group. A world by 2053 in which stacks, or piles, of Phosphogypsum (PG) no longer exist, other than as holding piles for future use – whether in road building, construction, agriculture or the potentially hundreds of other applications that continue to be proposed for PG use. It then "reverse engineers" a pathway to achieve that goal, taking into account, in sequence, the four main critical success factors for arriving at the end point. These are:

1. Technical feasibility
2. Regulatory acceptability
3. Commercial sustainability
4. Political will.

But in India, we are stuck between the progressive paths of technical feasibility to regulatory acceptability so far.

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STACK FREE BY 53? THE ONION RING METHODOLOGY

Example of the Onion Ring Methodology:

China has Forced Circular Economy of the PG*:

1) Zero Waste Policy
2) Government has put in place rules for phosphate fertilizer companies mandating graduating percentages of PG use
3) Non-compliance will result in steep fines
4) This is not a desirable regulatory approach, but it has resulted in R&D and successful use of PG in a variety of applications.

Reference: AAPFCO -2018, Dr. Brian Birkly

Constructive Regulation:

A five year study of Phosphogypsum use in Huelva - Spain, presents a model of a coherent, evidence-based approach, grounded in sound policy, good science and best practices. The "constructive regulation" approach builds directly on evidence and lessons learned from a long, continuous tradition of PG use in Spain, Brazil and the United States. It supported defining a new sustainable point of equilibrium in which Phosphogypsum production and consumption are in balance.

This will require new modes of collaboration between industry, regulators and independent centers of scientific research. It will set such collaboration in the context of adherence to four core values:

1. Sustainability
2. Coherence
3. Consistency
4. Evidence.

The operational context will be determined by meeting four objectives:

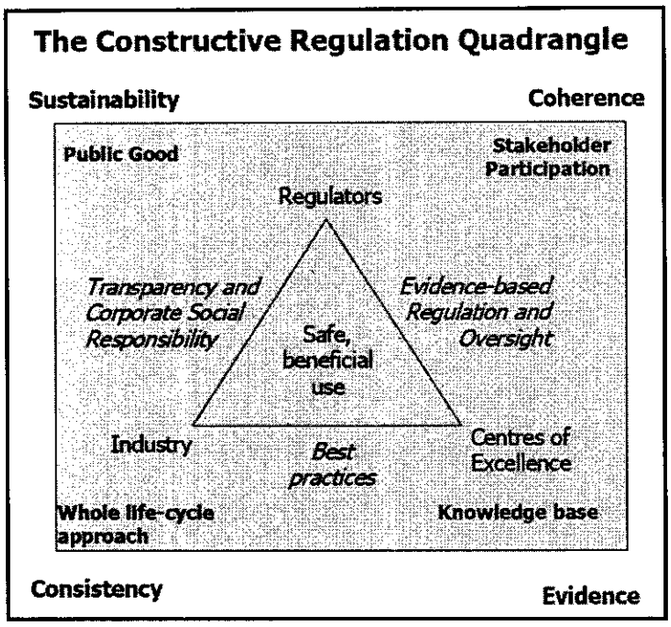
1. Knowledge-based planning and operations
2. A whole life-cycle management approach, from design to end point decommissioning
3. Stakeholder and public participation in consultation and risk communications
4. Pursuit of public good.

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Constructive Regulation:

The desired outcomes flow from applying such principles and objectives and result in:
1. Best practices
2. Transparency and Corporate Social Responsibility
3. Evidence-based Regulation and Oversight.

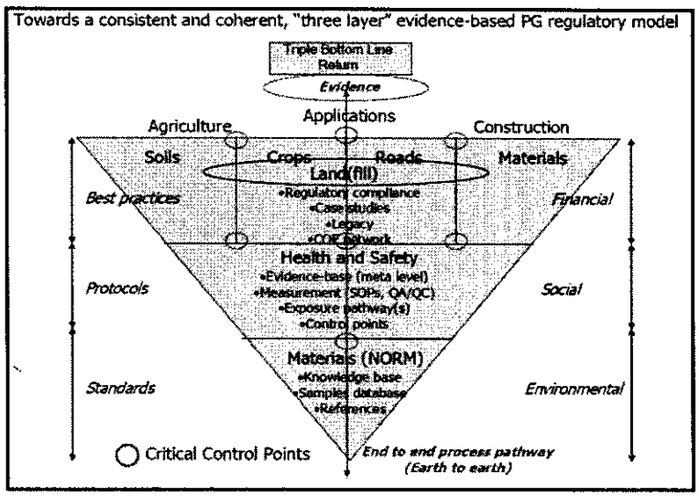


Source: *Hilton, Julian, Birky, Brian, & Johnston, A.E. (2010). The 'constructive regulation' of phosphates and Phosphogypsum A new, evidence-based approach to regulating a NORM industry vital to the global community. International Atomic Energy Agency (IAEA): IAEA*

Triple Bottom Line:

TBL seeks to differentiate, but also to aggregate, returns on major capital investments according to three interlinked criteria:
1. Financial (or Economic)
2. Social
3. Environmental

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Source: *Hilton, Julian, Birky, Brian, & Johnston, A.E. (2010). The 'constructive regulation' of phosphates and Phosphogypsum A new, evidence-based approach to regulating a NORM industry vital to the global community. International Atomic Energy Agency (IAEA): IAEA*

Limitations of Phosphogypsum valorization – need of storage.

Till 2013, the production of Phosphogypsum counts 3 Billion of tones around the world as per International Atomic Energy Agency (IAEA). **Only 15% of the worldwide produced quantity is put into valorization in civil engineering, chemical industry and agriculture fields, the other 85% are either rejected into the sea or stored into embankments in the vicinities of phosphoric acid production plant.**

However, Phosphogypsum valorization is still limited to 15% of the worldwide produced quantity because of the high cost of its purification which makes it less competitive to natural gypsum. Till putting PG valorization in action, its storage into embankments is a temporary alternative to manage it. *(**Reference:** Hajer Maazoun and Mounir Bouassida. "Phosphogypsum Management Perspectives. Massive Valorization or Massive Storage?" Acta Scientific Agriculture 3.8 (2019): 184-189).*

Phospo-gypsum Lining Details:

Phosphogypsum storage yard will be developed strictly as per CPCB Guidelines for Management and handling of phosphor-gypsum.

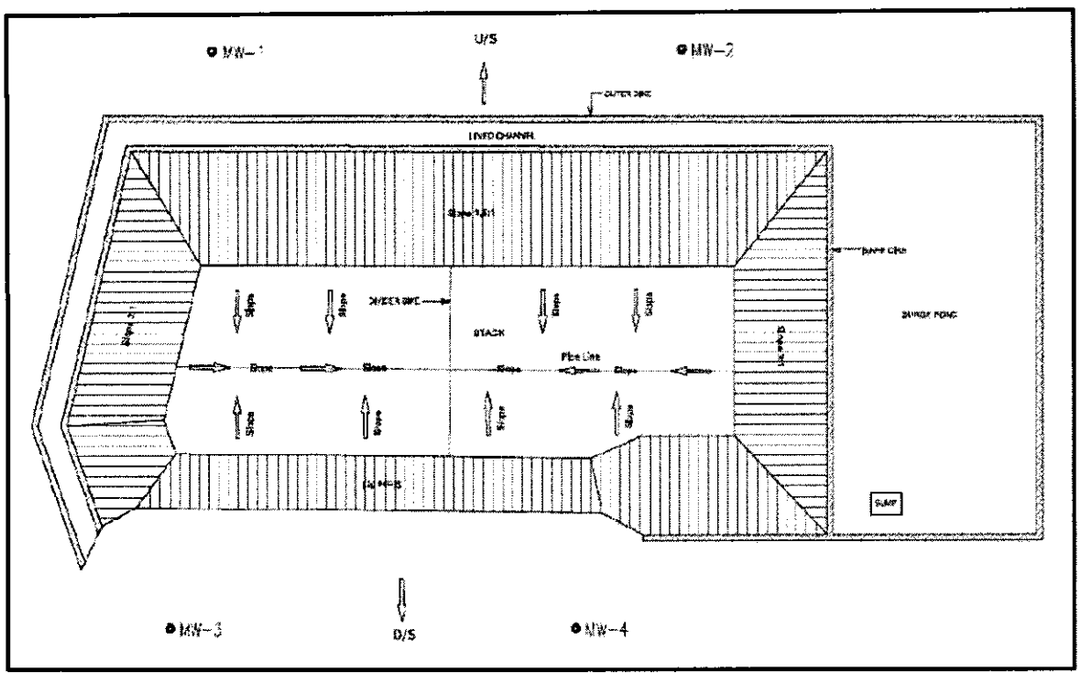
M/s. Garware Technical Fibres Limited (Geosynthetics Division), Pune; has been engaged for preliminary design for construction of gypsum storage yard. Technical report is attached as **Annexure-6(b).**

The thickness of the liner shall be 1.5 mm thick (min) with minimum width of 7.5 m and length of 150 m to reduce the number of joints. Understanding the seriousness of the project Naue –Germany/Equivalent -GSE-Germany make shall be used. HDPE liner make will be laid at the prepared base areas as well as on the dike slopes. A detailed technical specifications has been provided as a part of the technical proposal attached.

Leachate collection system shall be installed and leachate will be recycled back into Phosphoric Acid Plant. Capacity of the leachate collection (Gypsum Return Water Pond) will be ~3000 m^3 per Gypsum storage.

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LEACHATE COLLECTION AND RECYCLING SYSTEM

To collect and convey the leachate to the collection sump and leachate collection system will have the following:

1) Drainage layer.
2) A perforated pipe collector system.
3) Sump collection area.
4) Removal of the leachate.

The leachate drainage is usually achieved using graded under-liner and drains which lead to a collection system/surge pond leading to a sump. From the sump, it is pumped back to phosphoric acid plant for consumption.

A typical layout of the stack area, leachate Channel and surge pond is shown below:

PHOSPHOGYPSUM STORAGE AREA LINER SPECIFICATION

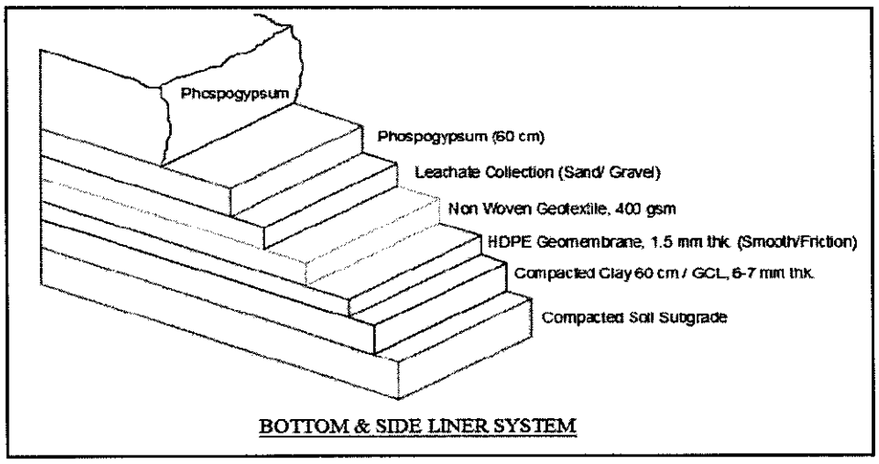
Liner Make: Naue, Germany
Thickness: 1.5 mm-Smooth, Length:150 m, Width:7.5 m

Property	Test Method	Unit	Value
Thickness Nominal	EN-1849-(2)/ASTM D 5199	mm	1.50
Lowest individual value	EN-1849-(2)/ASTM D 5199	mm	1.42
Density	EN ISO 1183/ASTM D 1505	Gm/cc	0.942
Melt Flow Index	EN ISO 1133/ASTM D 1238-190/2.16	Gm/10 min	<1.0

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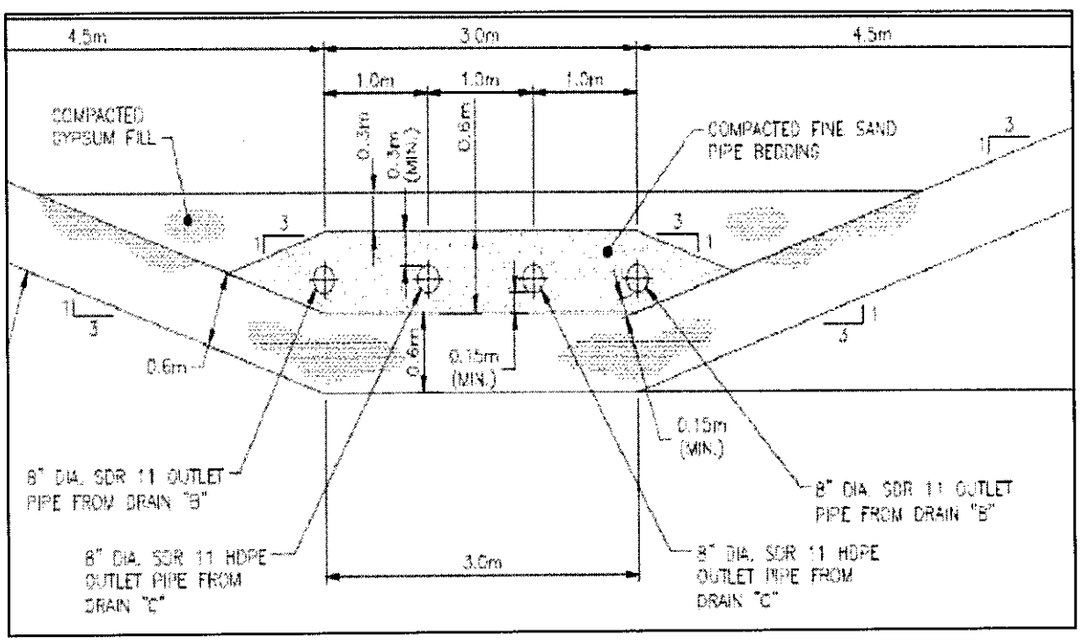
Considering hydrogeology study conducted for this project and solid waste storage locations in the plot layout, piezo well locations have been identified and marked on the plot plan as per **Annexure-6(c).** Additionally, there will be 2 nos. of rainwater collection pond having capacity of 4,000 m^3 from gypsum storage runoff.

Phospho-gypsum will be stacked in the Gypsum storage yard with a dry stacking method. Phospho-gypsum from the plant will be transported to gypsum storage area by a conveyor system and tippers will be used to spread the phospho-gypsum within the storage area. Leachate collected from the gypsum storage area will be pumped to phosphoric acid plant through a piping system for consumption within the process.



BOTTOM & SIDE LINER SYSTEM

PHOSPHO-GYPSUM STORAGE AREA LINER SYSTEM



PHOSPHO-GYPSUM STORAGE LEACHATE DRAIN SYSTEM

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Property	Test Method	Unit	Value
Tensile Strength at Yield	EN ISO 527-3/ASTM D 6693	N/mm	22
Tensile Strength at break	EN ISO 527-3/ASTM D 6693	N/mm	42
Elongation at Yield	EN ISO 527-3/ASTM D 6693	%	12%
Elongation at Break	EN ISO 527-3/ASTM D 6693	%	700
Tear Resistance	ISO 34-1/ASTM D 1004	N	215
Puncture Resistance	ASTM D 4833/EN ISO 12236	N	500
Carbon Black Content	ASTM D 1603	%	>2
Carbon Black Dispersion	ASTM D 5596	Cat	1-2
Dimensional Stability	EN 1107-2/ASTM D 5397	%	+/- 2

Tolerance: 10% on values except thickness, Carbon Black for which a range is given

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ANNEXURE-6(a)

Proposed Utilisation plan for Copper Slag

Description	UOM	Year														
		Plant stabilisation period														
		1th	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th
Slag generation estimated	KT	1,600	1,800	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Slag utilization action plan	KT	80	180	300	400	500	700	1,100	1,700	2,100	2,100	2,100	2,100	2,100	2,100	2,100
Slag stockpile estimated	KT	1,520	3,140	4,840	6,440	7,940	9,240	10,140	10,440	10,340	10,240	10,140	10,040	9,940	9,840	9,740
Stacking period estimated	Years	0.8	1.6	2.4	3.2	4.0	4.6	5.1	5.2	5.2	5.1	5.1	5.0	5.0	4.9	4.9
		Legacy stock									Legacy trend					

Proposed Utilisation plan for Phospho Gypsum

Description	UOM	Year														
		Plant stabilisation period														
		1th	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th
Phospo Gypsum generation estimated	KT	2,000	2,250	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Phospo Gypsum utilization action plan	KT	100	225	375	500	1,000	875	1,500	2,125	2,625	2,625	2,625	2,625	2,625	2,625	2,625
Phospo Gypsum stockpile estimated	KT	1,900	3,925	6,050	8,050	9,550	11,175	12,175	12,550	12,425	12,300	12,175	12,050	11,925	11,800	11,675
Stacking period estimated	Years	0.8	1.6	2.4	3.2	3.8	4.5	4.9	5.0	5.0	4.9	4.9	4.8	4.8	4.7	4.7
		Legacy stock									Legacy trend					

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ANNEXURE-6(b)

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Brief Note

on

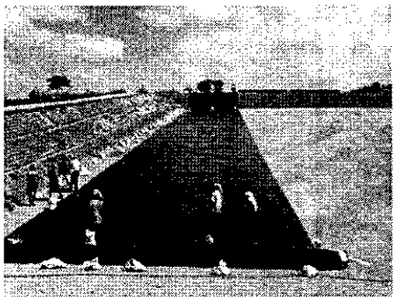
Technical Elements of

Phosphogypsum Stack Project

at

Adani Copper Refinery

Mundra, Gujarat, India





Submitted by

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ANNEXURE-6(b)

Elements of Phospogypsum Stack at Adani Copper Refinery-Mundra

1 Cover Note

With reference to the subject cited above, it give us pleasure to receive the enquiry and would like to place on record our desire to associate in the subject project for the construction of the Geosynthetic Lined Gypsum Stack construction. Sir, we at Garware Technical Fibres Ltd (GTFL)-Geosynthetics Divn have been striving tirelessly to Design, supply, install and commission the best Environmental protection Structures for the Waste/Process residue management for the industries as well as municipal corporations. We are also working in many diverse areas of Ground/Geotechnical/Geo-environmental engineering with prime focus on environmental protection, resource Conservation. In specific to the complexity of the project which Adani Enterprises Ltd is planning to undertake, we would like to put forth the following points

GTFL has been associated with similar Phosphogymsum Stack projects in the past for Coramnadal Fertilizers, Paradeep Phosphate and IFFCO (2006-2010).We are also executing Phosphogymsum Stack expansion for Paradeep Phosphate Ltd and IFFCO as per CPCB Guidelines-2014. GTFL has also been involved in design, engineering and execution of large number of Secure Landfill Projects for its customers including Indian Oil, Sterlite Industries, Cairn Energy, HZL, Vedanta Aluminium Ltd, Pimpri Chinchwad Municipal Corporation, KMML-Kerala to name a few.

We have also knowledge of the legal and statutory requirements of the project of such nature and have been associated with various Pollution Control Boards on behalf of the industry and thereby handling and holding hand in explaining the technicalities and compliance related issues.

Above all, our experience of past **20 years in Geosynthetic Lining and related construction with cutting edge technology** has always given industry the confidence to associate with us.

We would be pleased to associate with you to deliver the best available design, products and services for your project

We are also sure that your company will be equally interested to give us an opportunity to demonstrate our Supply/Service capability for the subject project.

2 Brief about Phosphogypsum Stack

The following pages gives only brief outline of key elements of the Phosphogypsum Stack for explanation purpose which Adani Copper Refinery is proposing. Adani Copper Refinery is proposing to construct at its upcoming Copper Refinery located at Mundra, Gujarat. At a later stage, detailed engineering, planning including drawing, material specifications shall be made and the same shall be submitted for approval before starting of the construction of the facility.

2.1 Phosphogymsum Stack Layout

The construction of Phospo Gypsum Stack facility at Adani Copper Refinery site is proposed to be executed with detailed planning and engineering, design of the facility. Broadly it shall consist of Access Road, Perimeter Road, Electrical Lighting, outer/perimeter embankment, inner embankment for disposal of the gypsum, installation of various Geosynthetics materials. drainage trench, outlet and lined channels around the gypsum stack, installation of the Geosynthetic materials, air vent system on the prepared base areas, installation of a 1.5 mm thick smooth & friction high density polyethylene (HDPE) liner-Naue Germany make and as per European standards on the inboard perimeter dike slopes and prepared base areas and construction of the under drains and outlets.

2.2 Site Investigation Criteria

2.2.1 Preliminary Boreholes and Geophysical Investigation:

At each site, as a part of preliminary data collection, one to two boreholes will be drilled and samples collected at every 1.5m interval to a depth of 20m below the ground surface. The following information will be obtained:

(a) soil type and stratification;

(b) permeability of each strata;

(c) strength and compressibility parameters (optional);

(d) ground water level & quality and depth to bedrock.

In addition to preliminary boreholes, geophysical investigations (electrical resistivity/seismic refraction/others) will be undertaken to assess the quality of bedrock at different sites.

A detailed site investigation program will comprise of

(a) subsoil investigation,

(b) ground water/hydrogeological investigation.

(c) hydrological investigation,

(d) topographical investigation and

(e) geological investigation.

The output expected from each investigation is listed below:

a) **Subsoil Investigation:** A detailed investigation plan may be drawn up in consultation with a geotechnical engineer The output from such an investigation should yield the following:

   (i) Stratification of subsoil -type of soil and depth

   (ii) Depth to ground water table and bedrock (if located within 15m of base of landfill)

   (iii) Permeability of various strata beneath the landfill.

   (iv) Strength and compressibility properties of subsoil

(v) Extent of availability of liner material, drainage material, top soil and protective soil in adjacent borrow areas.

(vi) Subsoil properties along approach road.

A minimum of 3 boreholes per hectare of landfill area upto 15m beneath the base of the landfill shall be drilled and in-situ tests as well as laboratory tests shall be performed for permeability, strength, compressibility and classification of soils.

In addition, test pits and boreholes shall be drilled at borrow area for liner and cover materials as well as along approach road.

b) **Ground Water/ Hydrogeological Investigation:** A detailed investigation plan may be drawn up in consultation with a ground water specialist or a hydrogeologist. The output from such an investigation should yield the following:

(i) Depth to groundwater table and its seasonal variations.

(ii) Ground water flow direction

(iii) Baseline ground water quality parameters -all drinking water quality parameters.

c) **Topographical Investigation:** Construction of a landfill involves a large quantity of earthwork. It is essential to have an accurate topographical map of the landfill site to compute earthwork quantities precisely. A map of 0.3m contour interval is considered desirable.

d) **Hydrological Investigation:** The objective of a hydrological investigation is to estimate the quantity of surface runoff that may be generated within the landfill to enable appropriate design of drainage facilities. If additional run off from areas external to the landfill is likely to enter the landfill, this quantity should also be estimated to design interception ditches and diversion channels. Such an investigation shall yield estimates of peak flows if seasonal rivers or streams run close to the site hydrological investigation should indicate the possibility of flooding of the site under one in 100 year flood flows. Surface water samples for water quality analysis may be collected from dUring hydrological studies.

e) **Geological Investigation and Seismic Investigation:** Geological investigations shall delineate the bedrock profile beneath the landfill base, if not confirmed by subsoil investigations. Geophysical surveys may be designed in consultation with a geologist. In hilly areas or in quarried rocks. Geological investigations should indicate the quality of surficial rock, depth to sound rock and the possibility of interconnected aquifers beneath the landfill base In the rock mass. Detailed seismic data may be obtained as a part of geological investigations.

2.2.2 Base Stability, Slope Stability and Seismic Aspects:

For landfills construction on the soil, the base will be checked for stability against bearing failure or excessive settlements.

The stability of side slopes of a landfill shall be checked for the following cases (Fig. 9).

(a) stability of excavated slopes

(b) stability of liner system along excavated slopes

(c) stability of temporary waste slopes constructed to their full height (usually at the end of a phase)

(d) stability of slopes of above-ground portion of completed landfills

(e) stability of cover systems in above ground landfills.

The stability analysis shall be conducted using the following soil mechanics methods depending upon the shape of the failure surface

(a) failure surface parallel to slope;

(b) wedge method of analysis;

(c) method of slices for circular failure surface and

(d) special methods for stability of anchored geomembranes along slopes.

In preliminary design of a landfill section, the following slopes will be adopted.

(a) Excavated soil slopes (2.5 horizontal : 1 vertical)

(b) Temporary waste slopes (3.0 horizontal : 1 vertical)

(c) Final cover slopes (4.0 horizontal : 1 vertical)

Slopes can be made steeper, if found stable by stability analysis results. Acceptable factors of safety may be taken as 1.3 for temporary slopes and 1.5 for permanent slopes.

In earthquake prone areas, the stability of all landfill slopes shall be conducted taking into account seismic coefficients as recommended by BIS codes.

2.3 Lining System

2.3.1 Bottom Liner System

The lining system is additional to the separation or unsaturated zone comprising soil or sand between the wet season high elevation of the ground water and the stack yard. These liner consist of native clayey soil/amended soil/ad-mixture soil. The permeability of the soil / amended soil should be less than or equal to 1×10-7 cm/sec. As an alternative to clay Geosynthetic Clay Liner made from Natural Sodium Bentonite sandwitched between two layer of Geotextile known as Bentofix made by Naue-Germany meeting the regulatory requirement may be used.

A schematic cross section of the bottom Liner system is given in **Figure 1**.

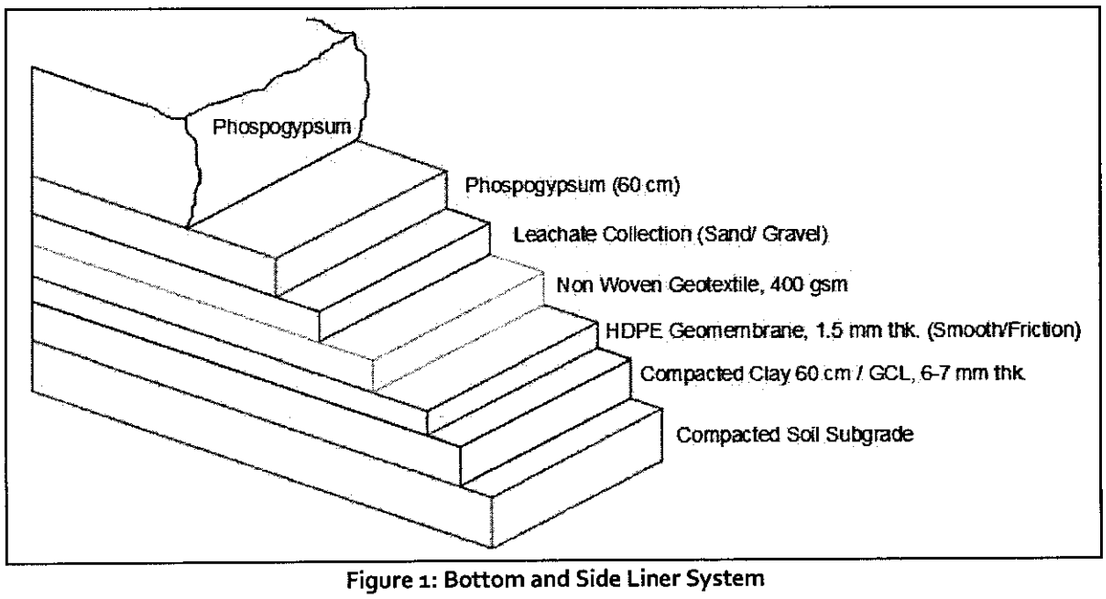


Figure 1: Bottom and Side Liner System

2.3.1.1 Geomembranes

These are flexible sheets made from various plastic materials. The recommended liner along the side as well as the bottom of the facility is HDPE Liner. HDPE lining is effected by overlapping the strips and joining them with a special welding technique.

The thickness of the liner shall be 1.5 mm thick (min) made through flat cast extrusion technology to keep the thickness variation across the rolls to less than 5% and the minimum width of the membrane shall not be less than 7.5 m and length shall not be less than 150 m to reduce the number of joints. Understanding the seriousness of the project Naue –Germany / Equivalent -GSE-Germany make has been recommended for use. Detailed Material Specifications are given in the annexure. Equivalent product's details must be shown to the Technical Engineer for review of its properties/performance.

2.3.1.2 Protection Layer (Non Woven geotextile)

To protect the geo membrane against the mechanical stress and failure thereby, non-woven needle punched Geo textile manufactured through mechanically bonding and made from continuous fibres/filaments and made of 100% UV stabilized Polypropylene is to be used on the HDPE Liner on the bed as well as the slopes. For the protection purpose, 400 gsm overlay Non-Woven Geotextile has been recommended. Equivalent product's details must be shown to the Technical Engineer for review of its properties/performance. The minimum width of the Non Woven Geotextile shall be 4 m and minimum length shall be 90.0m.

2.3.1.3 Drainage Layer

The Gypsum Stack facility essentially generates significant quantity of leachate due to inherent moisture present in the waste body and the rain water precipitation. This leachate is impregnated with harmful chemicals and pollutants. This is to be collected, removed from the facility and treated. In order to collect the leachate from the waste body a Drainage layer of 30 cm granular material of permeability>1*10-2 cm/sec is put over the protective layer of Geotextiles.

Looking at the following aspects of the Gypsum Stack the following drainage medium has been recommended:

(a) Structural profile and geometry

(b) Bottom and side slope pattern

(c) Performance of various geological and synthetic material for drainage function

Hence for the side slope geocomposite drainage net and for the bottom slopes, Sand/gravel as a drainage medium for the primary and secondary layer of desired specification has been recommended.

2.3.2 Side liner system of Gypsum Stack

The side liner system is on the inner side of soil bunds with slope 1:3 (V: H).The construction procedure of each layer of sideliner system is shown in Figure No: 02.

GCL-Bentofix-Naue Germany make of minimum 6-7mm thickness with powdered bentonite to be used instead of compacted clay as the slope is not so gentle and it is difficult to compact the clay on steep slope.

Moreover on the Non-Woven Geotextile, Geocomposite Drainage Net shall be used as a Drainage Medium instead of Sand/ Gravel. **A schematic sketch of the side liner system anchoring with gas venting system is shown in Figure 2.**

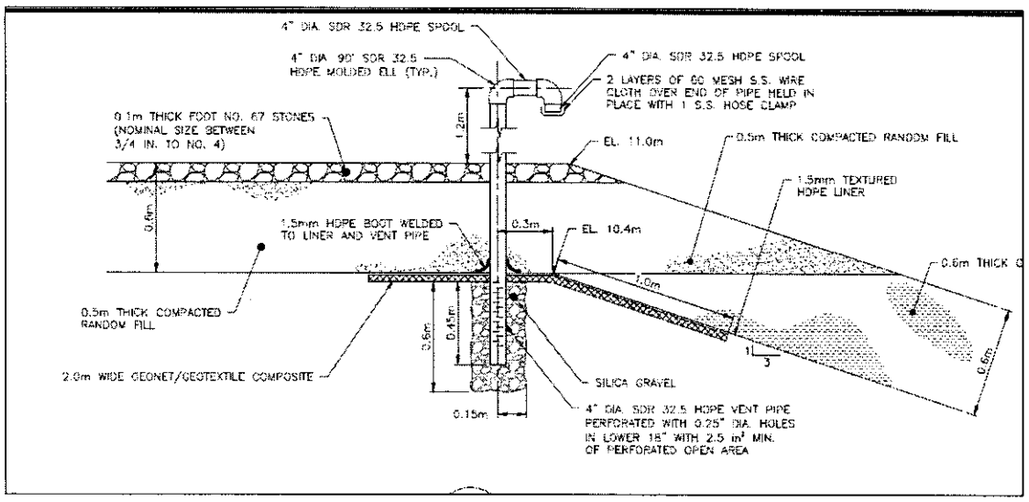


Figure 2: Side Liner System

2.4 Leachate Drainage, Collection & Removal System

In order to collect and convey the leachate generated to the collection sump, a Leachate collection System has been designed. It comprises of the following:

(a) Drainage Layer.

(b) A Perforated Pipe Collector System.

(c) Sump Collection Area.

(d) Removal of the leachate.

The leachate drainage is usually achieved using graded under-liner and drains which lead to a collection system/ Surge Pond leading to a sump. A typical layout of the stack area, leachate Channel and surge pond is shown in **Figure 3**.

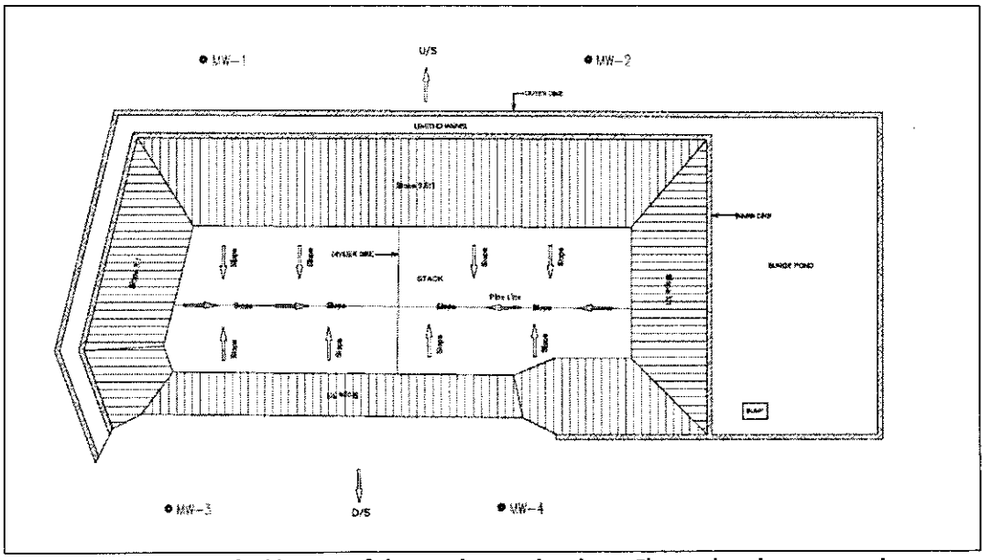


Figure 3: Typical layout of the stack area, leachate Channel and surge pond

horizontal layers will be done using standard compaction equipment or in inclined layers using slope compactors/appropriate method.

2.6 Inspection Test

Control tests shall be carried out in laboratory from time to time to determine whether the earth produced by methods employed satisfies the requirements of the specifications and documented for verification by the Officer- in –Charge of the regulatory authority and the work shall be inspected periodically.

Complete documentation of all quality control records and their submission to the GPPCB along with showing satisfactory achievement of acceptance criteria.

The quality control tests for compacted clay layer (or amended soils) as well as the leachate collection/drainage layer will include

(a) In-situ density tests.
(b) in-situ moisture content tests.
(c) Compaction tests.
(d) Permeability tests,
(e) Grain size distribution tests and
(f) Atterberg's limits tests
(g) Others as defined by GPCB.

The quality control tests for geomembrane liners shall be carried at as per QA/QC protocol and shall include the following:

(a) Thickness tests,
(b) Density tests,
(c) Strength tests,
(d) Field seam strength & leak tests

The Officer- in -Charge shall determine whether the desired results are being obtained.

Dressing and Trimming of the slopes

The outer slopes of the embankment shall be neatly dressed to line. Compaction shall extend over the full width of the embankment and the material in the slopes shall be compacted as for the rest of structure. To ensure proper compaction at the outer edge, the fill shall be constructed for a minimum of 0.5 m/1.0m extra width on either edges or the outer edge dressed to true width and slope after compaction. No earth slope shall be left without trimming to design slope.

2.7 Design of Storm Water Drain:

The catchment includes the top or cap of the Gypsum Stack facility as well as the outer slope of embankment and site upto fencing. Hence to divert the incoming water at the surface level as well as the slope and terraces of the Gypsum Stack facility, adequate storm water drainage channels need to be designed, constructed. The channel has to ultimately carry water to the storm water pond for storage or evaporation purpose in case not discharged outside.

2.8 Surface Water Drainage System

Surface water management shall be designed to ensure that rainwater run-off does not drain into the waste from surrounding areas and that there is no waterlogging/ponding on covers of landfills. A schematic surface water drainage system comprising of channels, drains, culverts and basins (Fig8) shall be designed to ensure the following:

The technical details of the leachate drainage are as under:

Thickness of the Drainage Layer should be designed in such a way so that, the leachate can be evacuated quickly. Broadly, 150 mm for arterial pipes for collecting and 200 mm main header line for transporting the leachate from the body of Gypsum stack would be able to carry the leachate to the sump. Gravel/Sand to be used for the smooth drainage of the leachate from the stack area to the piping system. A typical drain section is shown in **Figure 4**.

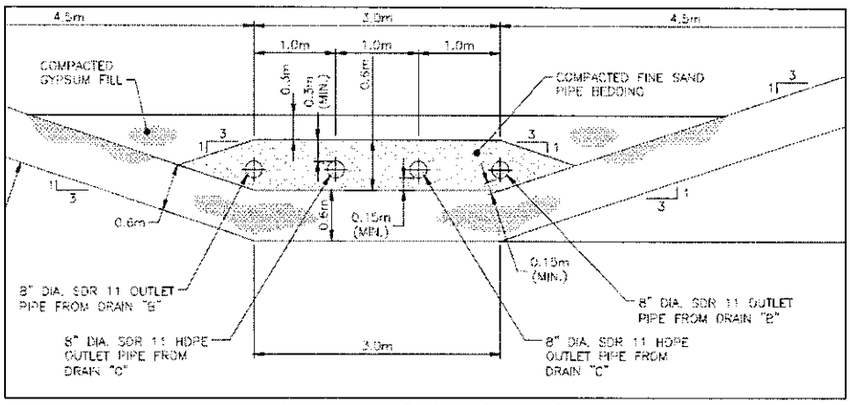


Figure 4: Typical Drain Section

2.5 Construction of Embankment

Embankment shall be designed based on sound engineering practices and also shall be checked for slope stability analysis considering seismic factors of Mundra-Gujarat region.

The embankment shall be constructed to the lines and grades shown on the drawings. Placement of fill shall be performed in an orderly way and in an efficient and workman like manner, so as to produce fills having such quantities of density, strength and permeability as will ensure the highest practicable degree of stability and performance of the embankment.

The slopes of embankment shall be maintained as per specific structures drawing.

2.5.1 Fill Materials

The materials for embankment shall be obtained from the available excavated material. Some earth material available from the excavation in the pond area if found suitable will also be used for the embankment construction. Morrum / Yellow soil or soil which satisfy the accepted civil engineering property of the bund construction shall be accepted.

2.5.2 Placing the fill material Compaction of the Embankment and Base: (IS: 2720)

The combined excavation and placing operations shall be such that the materials when compacted in the fill will be blended sufficiently to produce the specified degree of compaction and stability. The earth obtained from a particular borrow area as far as possible shall be used in forming the complete cross-section of the fill for a particular stretch.

No stones cobbles or rock fragments, having maximum dimensions of more than 5 cm shall be placed in the fill. Such stones and cobbles shall be removed either at the borrow pit or after being transported to the site but before the materials in the fill are rolled and compacted. Such stones or cobbles shall be placed in other portions of embankment if found suitable or rejected as directed. The materials shall be placed in the fill in continuous horizontal layers, stretching right across the whole section, not more than 0.4 m in compacted thickness

Vibratory rollers/static roller shall be used for compacting cohesive materials and pneumatic rollers and vibratory rollers shall be used for compacting cohesion less materials. The compaction in

(a) Rainwater running off slopes above and outside the landfill area shall be intercepted and channelled to water courses without entering the operational area of the site. This diversion channel may require a low permeability lining to prevent leakage into the landfill
(b) Rain falling on active tipping areas shall be collected separately and managed as leachate, via the leachate collection drain and leachate collection sumps to the leachate treatment and disposal system.
(c) Rainfall on areas within the landfill site, but on final covers of phases which have been completed and are not actively being used for waste disposal shall be diverted in drainage channels away from active tipping areas, and directed through a settling pond to remove suspended silt, prior to discharge.
(d) Any drainage channels or drains constructed on the restored landfill surface shall be able to accommodate settlement, resist erosion and cope with localised storm conditions.
(e) The horizontal surface of the final cover shall be provided a slope of 3 to 5% for proper surface water drainage. The slope of the cover on the sides will be higher and governed by slope stability considerations
(f) All Interceptor channels, drainage channels and settling ponds (storm water basins) shall be designed by a hydrologist using hydrometerological data.
(g) It shall be ensured that water collected by surface water drainage system and leachate collected by the leachate collection system do not get intermixed at any stage of collection or storage This shall apply to the 'active' and 'post closure' periods of the landfill

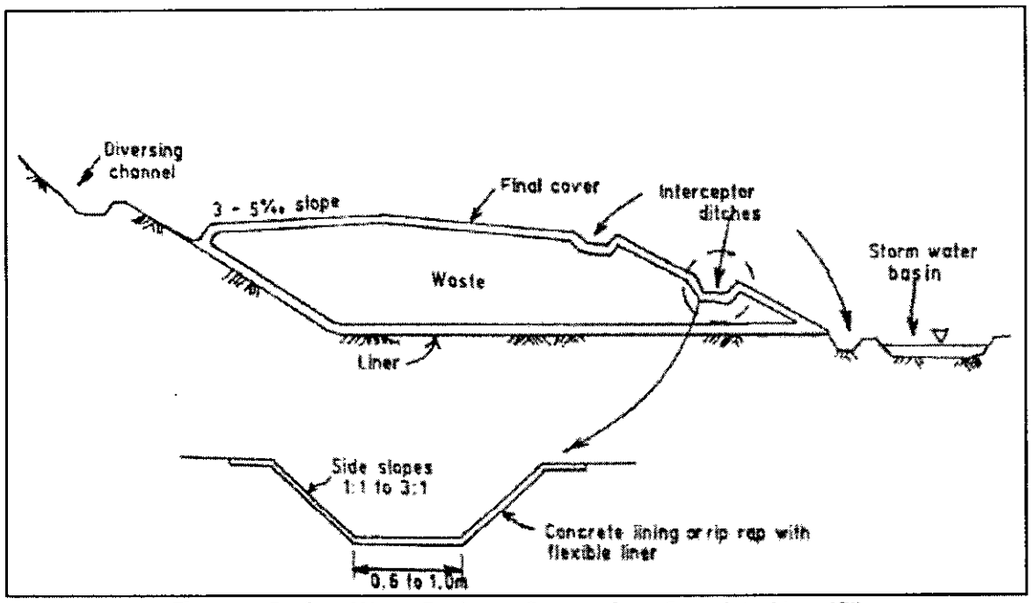


Figure 5: Surface Water Drainage System for a Completed Landfill

The design of following components will be undertaken:

(a) storm water drains, diversion channel
(b) storm water basin
(c) culverts if required

2.9 Piezometric Well

Piezometer shall be constructed to monitor the quality of groundwater. Two piezometers shall be installed on the downstream side of the SLF. Two piezometers shall be installed on the upstream side of the Gypsum Stack. At present, possible locations have been shown where the installation cane be done. But, exact location of the monitoring well shall be finalized in consultation with Gujarat State Pollution Control Board. The piezometer consist of a stand pipe made up of stainless steel/PVC which shall be screened along the entire aquifer depth i.e. the standpipe shall be- screened from a depth of 1 m to 10m or depending on ground water depth. The screened interval shall be encased in a filter zone made up of gravel and sand layer. The function of the filter zone is to allow free flow of groundwater into and out of standpipe and prevent fines from entering the standpipe. Immediately above the screened interval, a clay and bentonite seal shall be placed. The thickness of clay seal shall be 0.5 m. Above the clay and bentonite seal, a grout seal consisting of cement and bentonite shall be constructed which provides a barrier for preventing surface water and ground water from elsewhere from migrating into the screened interval. At the ground level, a steel casing embedded in concrete pad shall be employed. A cap shall be placed on the top of steel casing to prevent rainwater and surface water from entering into the standpipe. The piezometer shall be constructed at a minimum distance of 7 m from outside edge of the embankment. A schematic sketch of a Piezometer is shown in **Figure 6**. The location is shown in figure no 4.

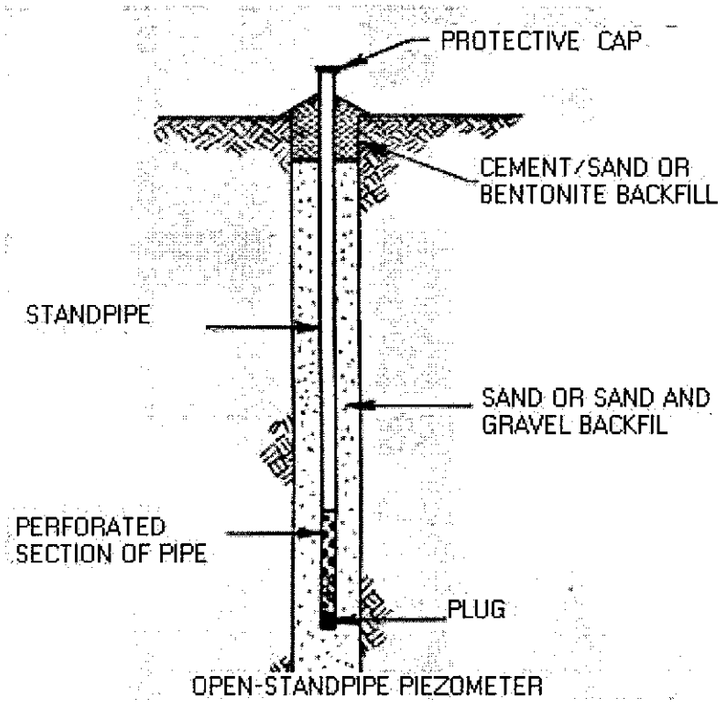


Figure 6: Piezometer

ANNEXURE-6(b)

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2.10 Annexure

Liner Make: Naue, Germany, Thickness: 1.5 mm-Smooth

Length:150m, Width:7,5m

Property	Test Method	Unit	Value
Thickness Nominal	EN-1849-(2)/ASTM D 5199	mm	1.50
Lowest individual value	EN-1849-(2))/ASTM D 5199	mm	1.42
Density	EN ISO 1183/ASTM D 1505	Gm/cc	0.942
Melt Flow Index	EN ISO 1133/ASTM D 1238-190/2.16	Gm/10 min	<1.0
Tensile Strength at Yield	EN ISO 527-3/ASTM D 6693	N/mm	22
Tensile Strength at break	EN ISO 527-3/ASTM D 6693	N/mm	42
Elongation at Yield	EN ISO 527-3/ASTM D 6693	%	12%
Elongation at Break	EN ISO 527-3/ASTM D 6693	%	700
Tear Resistance	ISO 34-1/ASTM D 1004	N	215
Puncture Resistance	ASTM D 4833/EN ISO 12236	N	500
Carbon Black Content	ASTM D 1603	%	>2
Carbon Black Dispersion	ASTM D 5596	Cat	1-2
Dimensional Stability	EN 1107-2/ASTM D 5397	%	+/- 2

Tolerance: 10% on values except thickness, Carbon Black for which a range is given.

44'43

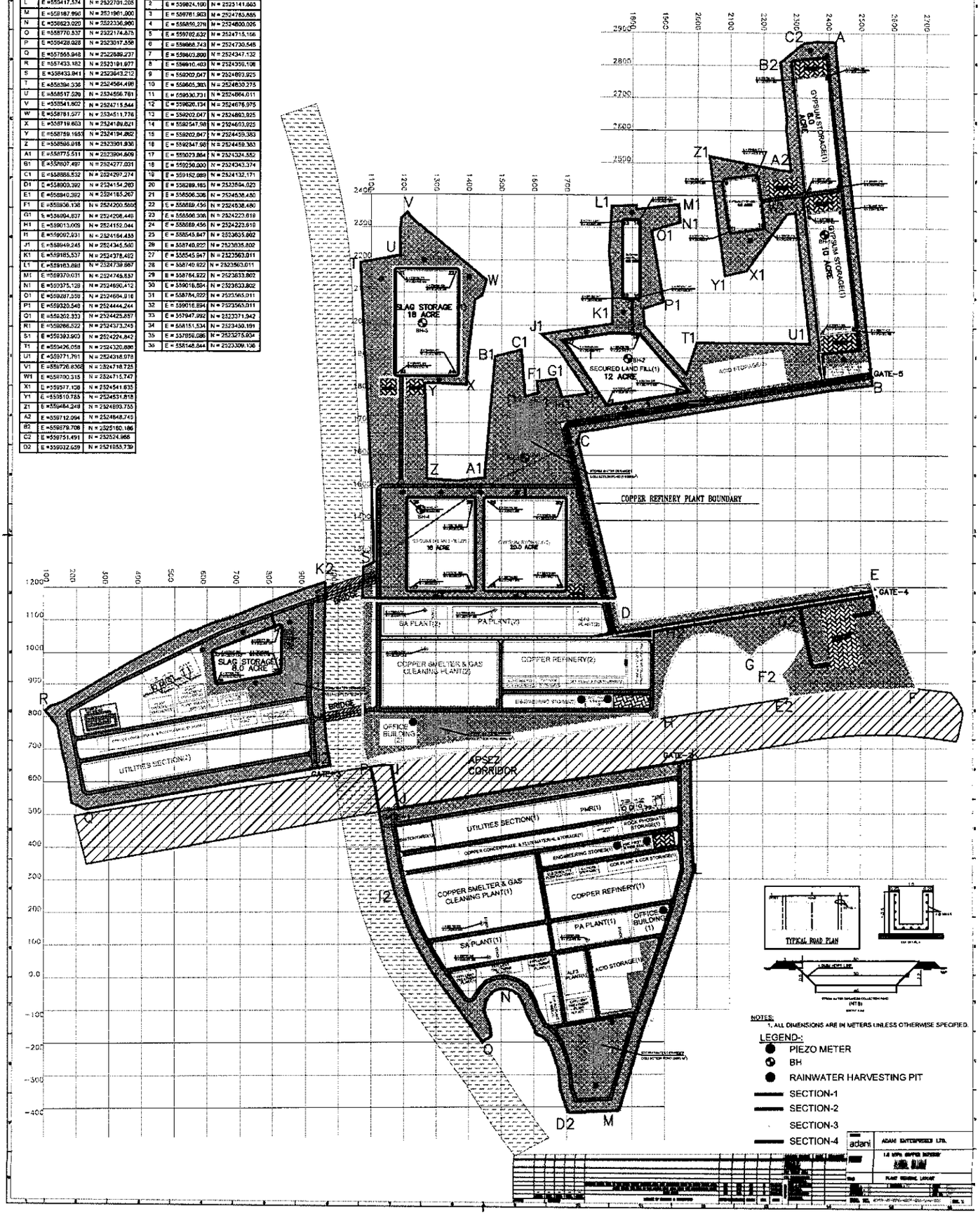
ANNEXURE 3(c)

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SR.	EASTING	NORTHING
A	E =559046.328	N = 2525743.183
B	E =559063.374	N = 2524190.580
C	E =558071.249	N = 2524044.333
D	E =559194.182	N = 2523457.268
E	E =558980.721	N = 2523386.315
F	E =558010.242	N = 2523257.270
G	E = 559594.1248	N = 2523353.9571
H	E =558623.020	N = 2522336.960
I	E =558492.118	N = 2523029.111
J	E =558513.643	N = 2522690.177
K	E =559407.330	N = 2523057.284
L	E =555417.574	N = 2522701.205
M	E =558187.998	N = 2521961.000
N	E =558623.020	N = 2522336.960
O	E =558770.537	N = 2522174.875
P	E =558428.928	N = 2523017.558
Q	E =557555.948	N = 2522689.237
R	E =557433.182	N = 2523191.977
S	E =558433.941	N = 2523643.212
T	E =558394.336	N = 2524564.498
U	E =558517.520	N = 2524556.761
V	E =558541.802	N = 2524715.844
W	E =558761.577	N = 2524511.776
X	E =558719.603	N = 2524189.821
Y	E =558759.1653	N = 2524194.862
Z	E =558598.018	N = 2523901.936
A1	E =558775.511	N = 2523904.609
B1	E =558807.497	N = 2524277.031
C1	E =558868.532	N = 2524297.274
D1	E =558900.392	N = 2524154.269
E1	E =558940.382	N = 2524165.267
F1	E =558936.138	N = 2524200.585
G1	E =559094.837	N = 2524208.449
H1	E =559013.009	N = 2524152.044
I1	E =559092.931	N = 2524164.455
J1	E =558949.245	N = 2524345.560
K1	E =559185.537	N = 2524378.492
L1	E =559163.868	N = 2524738.667
M1	E =559370.031	N = 2524746.837
N1	E =559375.128	N = 2524690.412
O1	E =559297.559	N = 2524694.916
P1	E =559320.540	N = 2524444.244
Q1	E =559262.333	N = 2524425.887
R1	E =559266.522	N = 2524373.245
S1	E =559393.903	N = 2524224.842
T1	E =559426.058	N = 2524320.886
U1	E =559771.761	N = 2524316.978
V1	E =559726.836	N = 2524718.725
W1	E =559700.315	N = 2524715.747
X1	E =559577.108	N = 2524541.635
Y1	E =559510.785	N = 2524531.818
Z1	E =559484.249	N = 2524899.755
A2	E =559712.094	N = 2524848.749
B2	E =559879.708	N = 2525160.186
C2	E =559751.491	N = 2525524.966
D2	E =559932.659	N = 2521955.739

SR.	EASTING	NORTHING
E2	E =559705.686	N = 2523228.702
F2	E =559634.8685	N=2523301.4207
G2	E=559743.8650	N=2523422.4579
H2	E=559418.3173	N=2523418.2137
I2	E = 558513.781	N = 2522601.441
J2	E = 558304.785	N = 2523022.272
K2	E = 558288.185	N = 2523594.023

SR.	EASTING	NORTHING
1	E = 559726.440	N = 2525131.464
2	E = 559824.190	N = 2525141.665
3	E = 559761.963	N = 2524765.585
4	E = 559859.276	N = 2524800.026
5	E = 559702.632	N = 2524715.166
6	E = 559668.743	N = 2524730.548
7	E = 559803.890	N = 2524347.132
8	E = 559910.403	N = 2524359.108
9	E = 559702.047	N = 2524693.925
10	E = 559605.393	N = 2524630.275
11	E = 559530.731	N = 2524664.011
12	E = 559626.134	N = 2524676.975
13	E = 559202.047	N = 2524693.925
14	E = 559247.98	N = 2524693.925
15	E = 559202.047	N = 2524459.383
16	E = 559247.98	N = 2524459.383
17	E = 559023.864	N = 2524324.582
18	E = 559230.000	N = 2524343.374
19	E = 559182.089	N = 2524132.171
20	E = 558289.185	N = 2523894.020
21	E = 558506.306	N = 2524538.480
22	E = 558689.456	N = 2524538.480
23	E = 558506.306	N = 2524223.619
24	E = 558689.456	N = 2524223.619
25	E = 558545.847	N = 2523635.802
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33	E = 557947.992	N = 2523371.942
34	E = 558151.534	N = 2523450.191
35	E = 557956.086	N = 2523275.804
36	E = 558148.844	N = 2523309.158



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EAC OBSERVATION NO.-7

EAC OBSERVATION:

Provide various stream characteristics being treated in ETP and treatment process.

REPLY:

The preliminary quantitative & qualitative characteristics of waste streams generated from the various sources from the proposed copper refinery plant are as below:

Preliminary effluent waste stream input to ETP:

PRELIMINARY EFFLUENT STREAM CHARACTERISTICS						
Parameter	UOM	SOURCE				
		Sulphuric Acid Plant - GCP	Copper Refinery	Precious Metal Recovery	Regenerable Amine based SO_2 Scrubber	Lime Slurry based SO_2 Scrubber
Flow	m^3/day	1,800-2,000	350 - 400	50 - 60	1,000 - 1,100	450 - 500
H_2SO_4	gpl	60 - 80	25 - 30	-	< 2	-
As	gpl	9.5 - 10	< 1	< 3	-	-
Cu	gpl	0.5 - 0.7	< 1	0.001 - 0.02	-	-
Pb	gpl	15 - 17	-	0.01 - 0.03	-	-
Se	gpl	6 - 7	-	0.001 - 0.1	-	-
F	gpl	5.5 - 6.5	-	-	-	-
Na	gpl	15 - 17	-	21.2 - 36.0	-	-
Ca	gpl	-	-	< 2	-	-
Cl	gpl	3 - 4	-	25.8	-	-
Na_2SO_3	gpl	-	-	-	< 3	-
Na_2SO_4	gpl	-	-	-	< 15	-
PH	-	-	-	9 - 10	4 -6	10 - 12
TSS	%	< 1	0.5	-	-	10 - 15
ETP treatment	-	ETP#1	ETP#1	ETP#2	ETP#3	ETP#3

Treated Effluent Quality:

The proposed ETP will provide following quality of the treated effluent. The same will be recycled to the plant based on its requirement and rest will be fed to the proposed reverse Osmosis Plant and MEE/MVR system as a part of Zero Liquid Discharge (ZLD).

Sr. No.	Parameter	UOM	Value (Max)
1	Suspended Solids	mg/l	200
2	pH		5.5 – 9.0
3	Oil & grease	mg/l	20
4	Total residual chlorine	mg/l	1.0
5	Ammonical Nitrogen (as N)	mg/l	50.0
6	Biochemical Oxygen Demand (3 days at 27^0C	mg/l	100
7	Chemical Oxygen Demand	mg/l	250
8	Arsenic (as As)	mg/l	0.2
9	Mercury (as Hg)	mg/l	0.01
10	Lead (as Pb)	mg/l	2.0
11	Cadmium (as Cd)	mg/l	2.0
12	Hexavalent Chromium (as Cr+6)	mg/l	1.0
13	Total Chromium (as Cr)	mg/l	2.0
14	Copper (as Cu)	mg/l	3.0
15	Zinc (as Zn)	mg/l	15.0
16	Selenium (as Se)	mg/l	0.05
17	Nickel (as Ni)	mg/l	5.0
18	Fluoride (as F)	mg/l	15.0
19	Sulphide (as S)	mg/l	5.0
20	Manganese (as Mn)	mg/l	2.0
21	Iron (as Fe)	mg/l	3.0

EAC OBSERVATION NO.-7

Wastewater Treatment process for the effluent generated from the Sulphuric acid Plant - GCP and the Copper Refinery: ETP 1

Effluents from the gas cleaning plant of Sulphuric Acid, Copper Refinery, wet scrubber water from the smelter secondary gas cleaning and bleed from slag granulation pond will be treated in a state of art Effluent Treatment Plant (ETP) facility with tertiary treatment to remove arsenic as arsenic bearing sludge which will be stored in Secured Land Fill (SLF) designed, constructed & maintained as per CPCB Guidelines and segregation of clean chemical gypsum, which will be sold to cement industries.

Processing the combined stream in a central multistage chemical water treatment plant consisting of three stages:

- Clean gypsum precipitation (treatment with milk of lime (MOL), pH 1–1.4, flocculant, precipitation of clean gypsum), clean gypsum is produced in a vacuum filter with > 96 % CaSO4.2H2O;

- Metal precipitation (treatment with lime milk, $FeSO_4.7H_2O$, H_2O_2, flocculant and increase of pH to 10–11; capture of metals by precipitation). At this stage, the pH of the solution increases to near 11 and, in order to precipitate more metals, the necessary reagents for oxidation and precipitation of arsenic and metals are also fed in, including ferric chloride. During the precipitation and decantation of the solid phase in a thickener, a sludge is produced that is sent to a filter press to produce a neutralization cake and sent to secured land fill for storage; The precipitation is accelerated with polyelectrolytes (coagulants and flocculants); and

- Arsenic removal (treatment with lime milk, $FeSO_4.7H_2O$, $FeCl_3$ and H_2O_2 to capture the remaining arsenic, pH 6–8). In this stage, the arsenic that is left in the solution is removed and the pH of the final solution of the treated waters is kept between 7 and 8. Necessary reagents, including ferric chloride, are fed into the solution for the fine cleaning to remove the remaining arsenic and metals in two tanks and a clarifier. Slimes from this precipitation step are sent to the metal precipitation.

The inlet water composition varies depending on the concentrate quality, the off-gas properties and the operation of the wet gas cleaning systems.

Environmental Benefits:

1. Production of Chemical gypsum, suitable to cement industries.
2. Reduction in Hazardous waste generation.
3. Better quality of treated water for recycling for plant process.

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EAC OBSERVATION NO.-7

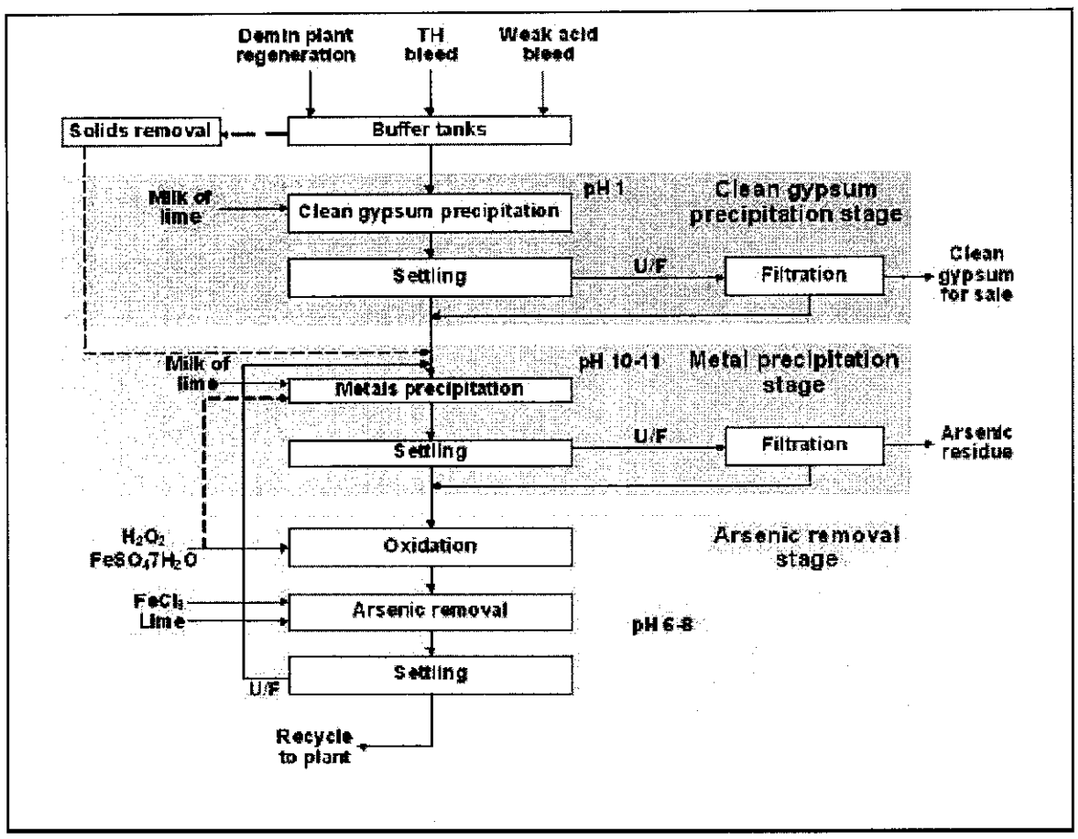


FIGURE-1:
WASTEWATER TREATMENT PROCESS FOR THE EFFLUENT GENERATED FROM THE GCP AND THE COPPER REFINERY

EAC OBSERVATION NO.-7

Wastewater Treatment process for the effluent generated from the Precious Metal Recovery Plant: ETP 2

After recovery of gold and silver from anode slime which is generated from electro-refining of copper; effluent collected from Precious Metal Recovery Plant are treated to meet the Zero Liquid Discharge plant. For that; effluent collected from Silver and Gold refinery will be treated with sodium carbonate (Na_2CO_3) and sodium hydroxide (NaOH).

Sodium hydroxide will react with dissolved metals to make a solid precipitate. Solid precipitates will be filtered from a solution and dissolved copper in effluent reacts with sodium hydroxide to make solid Copper (II) hydroxide and sodium ions.

The process chemistry for the same as mentioned below:

$$Cu^{+2} + 2NaOH \rightarrow Cu(OH)_2 + 2Na^+$$

Once the process is complete, the solid precipitated $Cu(OH)_2$ is removed from solution by filtration. After filtration, the precipitate will be recycled to the Copper Smelter. A filtrate will be sent to the effluent treatment plant of the smelter.

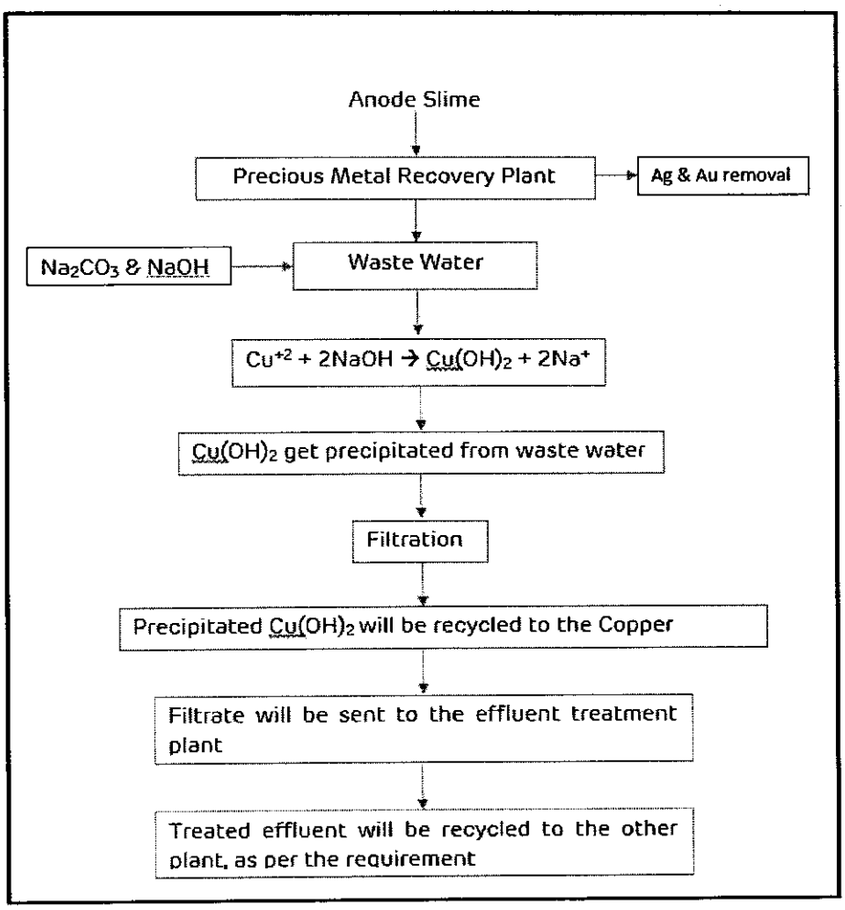


FIGURE-2:
WASTEWATER TREATMENT PROCESS FOR THE EFFLUENT GENERATED FROM THE PRECIOUS METAL RECOVERY PLANT

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EAC OBSERVATION NO.-7

Wastewater Treatment process for the effluent generated from the Preliminary FGD-2 (Lime Slurry based scrubber): ETP 3

FGD bleed from limestone slurry based forced oxidation (LSFO) sent to the thickener. In the thickener, flocculants will be added in order to removal of a portion of the liquid from slurry made up of a mixture of finely divided solids and liquids. The thickener overflow liquid will be sent to the MOL preparation and the thickening slurry will go to the horizontal belt filter where the gypsum will be filtered, and the filtrate from the horizontal belt filter will be recycled to the MOL preparation. The gypsum will be sold to the cement industries.

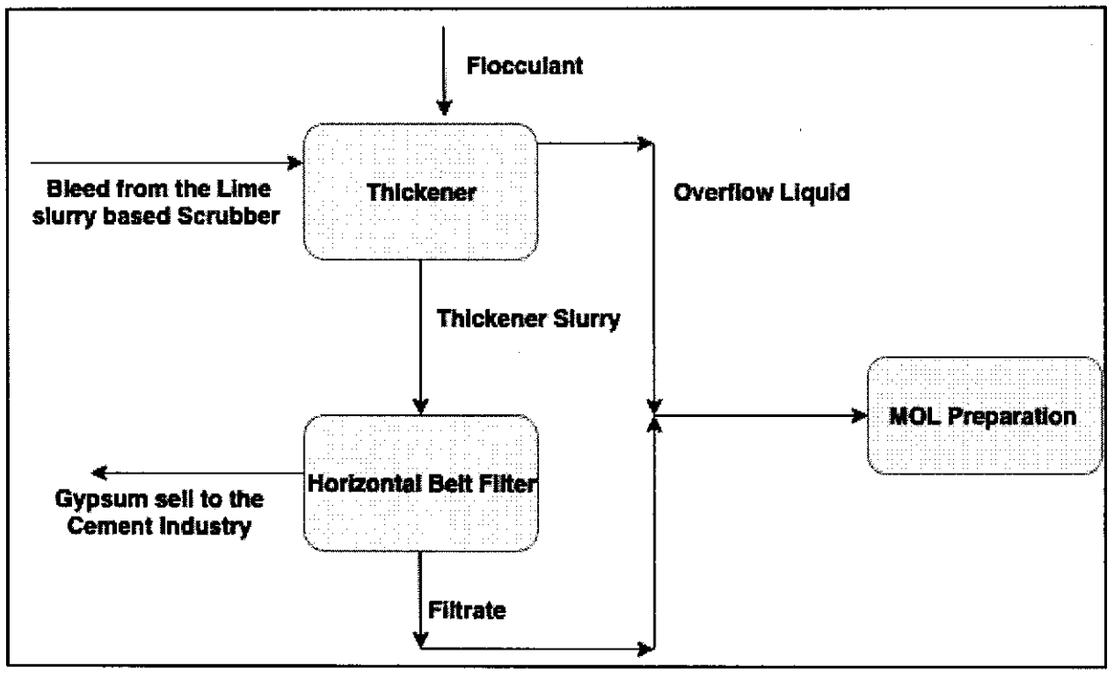


FIGURE-3:
WASTEWATER TREATMENT PROCESS FOR THE EFFLUENT GENERATED FROM THE PRELIMINARY FGD-2 (LIME SLURRY BASED SCRUBBER)

EAC OBSERVATION:

Environment Management Plan to be revised and updated with intervention for wildlife management, mangrove conservation, active mud flats and post project monitoring around solid waste storages.

REPLY:

a) CONSTRUCTION PHASE:

IFC EHS guidelines for construction will be followed:

1) Management Measures for Soil Quality:

- Top soil at construction site shall be stored separately, conserved and shall be used for greenbelt/ green cover development at later stage;
- The construction material & diesel/oil to be used for various construction activities shall be stored in designated storage yards to reduce the spills into unwarranted areas. Segregation, collection, storage and disposal of waste material generated during construction phase to minimise its impact on soil quality; and
- Use an identified area for undertaking any repair and maintenance of vehicles/equipment.

2) Management Measures for Air Quality:

- Enforce deployment of good condition vehicles with speed restrictions inside the project boundary;
- Deploy mobile water tankers to moist the vehicle movement paths to suppress dust; and
- Enforce no use of firewood for cooking and also no open air burning of any kind of wastes.

3) Management Measures for Water Quality:

- A dedicated area for repair and maintenance of construction equipment with adequate spill prevention systems;
- Proper sanitation facility for construction workers during work at site;
- Proper storm water drainage system to the construction site; and
- The existing natural drainage will not be disturbed during construction activities.

4) Management Measures for Noise Levels:

- All noise generating equipment will be provided with noise attenuation arrangements like silencers, mufflers, insulators etc., to reduce the noise levels below 85 dB(A) as far as technically feasible;
- All machineries and moving equipment will be periodically tested for their physical stability to ensure minimum noise during operation;
- Awareness will be imparted to labours employed in the project and shall be encouraged to commute through mass/public transport to reduce traffic and minimum use of horns while travel; and
- All the construction labour will be made to wear the personal protection equipment such as helmets, ear muffs etc.

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EAC OBSERVATION NO.-8

b) OPERATIONAL PHASE WITHIN THE PLANT:

ISO 14001:2015 Environmental Management System (EMS) will be implemented for regular control over environmental aspects and continual improvement.

1) Management Measures for Soil Quality:

- All stack emission sources will be provided with appropriate high efficiency air pollution control equipment like bag filter, scrubber etc.;
- Dust suppression arrangement at raw material storage yard;
- Closed container collection, storage and transportation of all hazardous wastes within the plant and outside;
- Regular road sweeping for recovery of dust from the spilled areas within the plant boundary;
- The top soil will be suitably collected, stacked separately and used for greenbelt/green cover during subsequent stages; and
- Periodical soil quality monitoring.

2) Management Measures for Air Quality:

a) Secondary emissions:

- Tube and closed conveyor will be provided at raw material handling area;
- High efficiency collecting hood system for fugitive emissions from originating source such as tapping port of smelting furnaces, transfer ladles, furnace openings etc.;
- Hood system at converter to capture secondary gases while transferring;
- Ventilation system with bag filter, scrubber and stack arrangement to handle smelting furnace/SF/converter/anode furnace secondary gas emissions; and
- Minimum 15 m wide greenbelt with native species will be maintained all around the plant boundary. Total of greenbelt & green cover will be 89.84 ha (~35%) within in the Plant boundary.

b) Management Plan and Abatement Technologies:

- **Sulphur Dioxide (SO_2):** High efficiency collection and scrubbing system with lime and caustic;
- **Fluorine (F):** High efficiency collection and scrubbing system with water to produce hydro fluro silicic acid, which will be input to aluminum fluoride plant;
- **Particulate Matter:** Wet scrubbers, cyclones, electrostatic precipitators, bag filters, vacuum trucks, road vacuum sweepers, etc.; based on the application; and
- The final gaseous emissions from the copper refinery project would be well within the permissible limits as prescribed by GPCB/CPCB/MoEF&CC.

- The following monitoring and controlling mechanism will be provided to make a fool-proof system:

  - Provision of online SO_2 analyzer with interlock system & process-trip for all the process stacks;
  - Periodic online calibration of SO_2 stack analyzer will be carried out at 90 % of the analyzer range with prior intimation to state pollution control board; and
  - Online stack SO_2 analyzers will be connected with state pollution control board for real time monitoring of SO_2 emission.

3) Management Measures for Water Quality:

- No ground water will be used in this project.
- No surface water will be used in this project and only desalinated water will be used.
- No effluent will be discharged outside the plant premises and plant will operate on Zero Liquid Discharge (ZLD).
- Storm water from plant operations, storage areas, landfill and other pollution prone areas will be separated and diverted to ETP for treatment and reused for plantation and other non-potable uses.
- Storm water drainage system will be provided along the side of plant roads with required gradient. Intermediate sumps with gate valve arrangements, sump pumps and piping network will be provided to pump collected water to two collection sumps of 5500 m^3 each.
- All the solid waste storages will be constructed as per CPCB guideline with garland drains. Garland drains around respective solid waste facilities will be connected to the intermediate sumps. Water collected in these intermediate sumps will be pumped through pipeline network to two collection sumps of 8,000 m^3 and 15,000 m^3.
- Maximum recycling of treated wastewater into process;
- Utilization of treated domestic wastewater in greenbelt development and dust suppression;
- Stabilized arsenic bearing sludge, scrubber cake, spent catalyst and spent resins (from DM, RO & Refinery) will be stored in secured land fill as per guidelines of CPCB.
- SLF with double HDPE Liner of 2 mm thick and gypsum storage with single HDPE liner of 1.5 mm thickness will be constructed.
- Ground water level monitoring system and ground water quality will be established by installing 24 piezometric borewells within the plant premises based on the geological condition of the land use.
- Rainwater harvesting pits will be provided at about 6 locations near office building & canteen, HSE building & Engineering stores.

4) Management Measures for Noise Level:

- High noise generating sources shall be insulated adequately by providing suitable enclosures;
- The air compressor, process air blower, pneumatic valves shall be provided with acoustic enclosure;
- All the design/installation precautions as specified by the manufacturers with respect to noise control shall be strictly adhered to;
- Design and layout of building to minimize transmission of noise, segregation of particular items of plant and to avoid reverberant areas;
- Use of lagging with attenuation properties on plant components / installation of sound attenuation panels around the equipment;
- The noise control system shall be designed to form an integral part of the plant;
- Other than the regular maintenance of the various equipment, ear plugs/muffs shall be recommended for the personnel working close to the noise generating units;
- The oxygen plant shall be installed in double wall building and no operator shall be working within the building;
- All the openings like covers, partitions shall be designed properly;
- Inlet and outlet mufflers shall be provided which are easy to design and construct;
- Sign boards for speed limits and horns in restricted area;

EAC OBSERVATION NO.-8

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- Minimum 15 m wide greenbelt with native species will be maintained all around the plant boundary. Total of greenbelt & green cover will be 89.84 ha (~35%) within in the Plant boundary;
- Mass plantation will be done using native forest plant species along the roads within 10 km radius area and community lands of panchayat offices and schools in the nearby villages; and
- Ambient and industrial noise monitoring.

5) Monitoring around Solid Waste Storages:

- All the solid waste storages will be constructed as per CPCB guideline with garland drains. Garland drains around respective solid waste facilities will be connected to the intermediate sumps. Water collected in these intermediate sumps will be pumped through pipeline network to two collection sumps of 8,000 m^3 and 15,000 m^3;
- The arsenic bearing sludge will be stored in SLF designed, operated and maintained as per CPCB guidelines for storage of hazardous waste;
- Periodical analysis of the solid waste will be carried out and records will be maintained;
- Ground water level monitoring system and ground water quality will be established by installing 24 piezometric borewells within the plant premises;
- The piezometric borewell will be located in the upstream and downstream of secured landfill, slag storage and phosphor-gypsum storage areas;
- Storm water from storage areas, landfill and other pollution prone areas will be separated and diverted to ETP for treatment and reused for plantation and other non-potable uses;
- Soil quality will be periodically monitored near the solid waste storages areas and also at secured landfills; and
- Comprehensive Waste Management Plan will be in place and available for inspection on-site.

c) <u>OPERATIONAL PHASE OUTSIDE THE PLANT:</u>

1) Management Measures for Air Quality:

- Mass plantation will be done using native forest plant species within 10 km radius area and community lands of panchayat offices and schools in the nearby villages; and
- Ambient air quality monitoring.

2) Management Measures for Water Quality:

- Installation of Piezo-metric well within nearby villages for ground water levels monitoring based on hydrogeology study.
- Surface and ground water quality monitoring

3) Management Measures for Wildlife Conservation:

- Since project deals with heavy metals, acids and hazardous materials, it is recommended that strict control on fugitive emission, dust pollution shall be

carried out using state of the art methods and technologies. Maximum area under intensive use shall be made of hard floor. Professional dust suction system from the area under intensive use shall be placed.

- Ambient noise pollution and vibrations during construction and operation phases of copper refinery plant shall be within limits of the standards mentioned.
- Plantation of thick green belt on periphery of the project site shall be created using native and hardy tree species.
- Ensure no movement of vehicles or people through Forest Areas located immediate north (Siracha) and east (Navinal) of proposed copper refinery plant area.
- Ensure zero discharge of waste water from the project site into surrounding area.
- Ensure safe passage of runoff through drainages located within and nearby the project area. It is recommended that a seasonal drainage/river (Dhaneshwari River) should be trained in such a way so that it does not carry pollutants from the project site into mangrove ecosystem located immediate south of the project boundary. Ensure no dust, fly ash, sediments, or any raw materials spill out from project areas and flow into nearby drainage, forest areas during the operation phase of the project.
- AEL shall ensure that their construction workers and other staff during construction or operational phase shall not be involved in poaching and hunting of birds, reptiles or mammals around the project site.
- Implement state of the art technologies to control pollution caused form the proposed project.
- No trespassing or vehicle or people shall be allowed through, surrounding forest area or the mangrove eco-system. This shall be instructed to the workers and staff in advance.
- No workers camps shall be established within the surrounding forest area. This shall be instructed to the workers and staff in advance.
- No resources (i.e. fuel wood, stones, sand, soil etc.) from the surrounding forest area shall be collected by staff or workers. This shall be instructed to the workers and staff in advance.
- No workers or staff members shall be involved in poaching or killing of any wild animals throughout the project life cycle. This shall be instructed to the workers and staff in advance and sign boards to this effect within project area.
- Install state of the art technologies so that pollution from the project area remains within applicable standards.
- Thick green belts shall be created using native species of plants in the periphery of project site.
- Monitoring of biodiversity including these species and take corrective measures if needed.
- Carryout biophysical monitoring of intertidal zone located south of project area at every 6 months.

4485 **EAC OBSERVATION NO.-8**

- Take up mangrove restoration and afforestation activities in consultation with Kutch East forest division.
- Project is required to be Zero Liquid Discharge (ZLD) plant.
- Project proponent shall ensure zero pollution discharge into surrounding areas particularly the intertidal areas which may include mudflats.
- Take up mudflat conservation activities in consultation with Kutch East forest division.

5) Environmental Budget at Plant:

The total project cost for the proposed project is about Rs. 10,000 Crores, which may further escalate depending upon the project execution period. Out of this, about Rs. 1044 Crores will be spent on environmental protection. The break-up of the investment is given in **Table-1.**

TABLE-1
COST PROVISION FOR ENVIRONMENTAL MEASURES

Sr. No.	Pollution control and Management Measures	Capital Cost within 5 years project development (Rs. in Crores)	Recurring Cost during Operational Phase (Rs. in Crores)
A	**Within the Project Site**		
1	Air & water pollution control measures within the project site	999.00	50.00
2	Environmental management system within the Project site including solid waste management system & monitoring	38.00	2.00
3	Post project monitoring for ground water quality within the plant for storage areas including SLF and 10 km radius study area	-	0.25
4	Greenbelt & green cover development	7.00	0.50
Sub-Total (A)		**1044.00**	**52.75**
B	**Outside the Project Site & within Study Area**		
1	Community Environment development as part of CER implementation by project proponent	2.39	The CSR cost and reporting in operational phase under CSR Rules under 2013
2	Wildlife management, Mangrove & mudflat conservation plan implementation by Forest Department	3.72	This budget of Rs. 3.72 Cr for Wildlife management plan shall cover implementation of proposed activities for 10 years
Sub-Total (B)		**6.11**	
GRAND TOTAL (A+B)		**1050.11**	

- Monitoring of biodiversity including these species and take corrective measures if needed. noise is controlled within the applicable standards at the boundary of the project.
- Adjust lightings in the core area so minimum illumination spread outside core area.
- Cary out tree plantations in surrounding villages to augment habitat for Indian Peafowl and other schedule-I birds species.
- Monitor biodiversity including bird species and take corrective measures accordingly.
- Carryout habitat improvement activities through forest department in surrounding reserve forest areas, which would ensure their long term survival in the region.
- Maintain machinery so minimum vibrations and noise is generated.

4) Management Measures for Mangrove Conservation & Mudflats Conservation:

Most of the mangroves are located on high-tidal mudflats and on the banks of creeks. Major creeks present in 10 km buffer zone study area are Kotdi-I, Kotdi-II, Baradimata-I and Baradimata-II. It is observed that mangrove growth and mudflats are an integrated eco-system in the study area.

- No ground water usage will be ensured.
- The plant will be operated strictly on the ZLD system.
- It is recommended that a tall wall around the project boundary be constructed so that dusting is controlled during construction and operation phases.
- Thick green belt around the project boundary shall be created so that particulate matters are arrested.
- State of the art technology for arresting dust pollution shall be implemented for controlling different types of pollutions from various sources in the plant areas.
- State of the art water pollution control measures shall be in place including treating industrial effluents with heavy metals.
- Train Dhaneshwari river/drainage in such a way so that it does not carry spilled out pollutants from the project area to the mangrove eco-system of Kotdi creek.
- Do not release untreated sewage or effluents in to the creek areas having mangroves.
- It is recommended that Dhaneshwari River should be trained in such a way so that it does not carry pollutants with runoff from the project area.
- Ensure that strict pollution control measures are implemented in the project.
- Check health of mangrove eco-system at regular intervals.
- Prepare a comprehensive mangrove conservation plan for Kotdi and Baradimata creek system's mangroves located in the study area.

ANNEXURE-8

4487

adani

Ref: AEL/Copper/Forest Department/2020/Jan -1

Date: 21/1/2020

To
Deputy Conservator of Forest,
Kutch East Forest Department,
Behind Jilla Udyog Kendra, Opp. General Hospital,
Kutch (East) Division, Bhuj-370001

Subject: Submission of Wildlife and Mangrove conservation plan for Greenfield Copper Refinery Plant (1.0 MTPA) Project of M/s Adani Enterprise Limited (AEL) located at APSEZ land, Taluka-Mundra, District-Kutch, Gujarat for approval.

Ref:

1. Letter number: - WPS/32/B/3029/2019-20 dated 5/8/2019 of PCCF to CCF (Attached)
2. Letter number:- K/JMN/T.9/502/2018-19 dated 19/10/2019 of DCF to AEL (Attached)

Dear Sir,

This is with reference to the above Letters. Kindly find our reply to your queries as below.

Point-1 of the letter (WPS/32/B/3029/2019-20 dated 5/8/2019): - Compliance of TOR Condition no 5 Dated 21st June 2016.

a) TOR has been issued by MOEF&CC vide letter reference number F.No.J-11011/113/2016-IA.II(I) dated 21st June 2016 (Annexure-1).
b) Compliance of Point no. 5 of ToR is mentioned in Wildlife Management and Mangrove Conservation Plan on Page no 1.
c) Stage-1 Forest clearance is obtained by APSEZ vide letter no. F.No. 8-04/2016-FC dated 16th November 2018. As per MoU between project Proponent and APSEZ, the required land for the proposed project would be provided by the APSEZ after seeking all the clearances. No construction would be carried out by Project Proponent before completion of Forest Diversion Process by APSEZ.

Point-2 of the letter (WPS/32/B/3029/2019-20 dated 5/8/2019):-

a) As per the information from Kutch East Forest Department there are total 71 number of Chinkara present in study area with other schedule-I species as mentioned in Conservation Plan. (Refer page no.:- 53)
b) As per the information from Kutch East forest department there are zero depredation and crime registered for the any Schedule-I species for last two years as mentioned in Conservation Plan page no 53

22/1/2020

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adani

Point-3 of the letter (WPS/32/B/3029/2019-20 dated 5/8/2019): - Authentication of the map enclosed with the application – From DCF /KEWD

The map showing distances of Sanctuaries, National Park, Biosphere Reserves and Migratory Corridors of Wild Animals from the copper refinery plant is available as Annexure-III of Conservation Plan. **Your authentication on this same map is requested as per the letter from CCF.**

Point-4 of the letter (WPS/32/B/3029/2019-20 dated 5/8/2019): - All the conditions as recommended by the chief wildlife warden shall be complied with the user agency.

Company undertakes to comply with all the conditions that will be imposed by Chief Wildlife Warden in approval of conservation plan.

Point-5 of the letter (WPS/32/B/3029/2019-20 dated 5/8/2019):-

a) As per guidelines issued by the Principle Chief Conservator of Forests and Wildlife, Dated: 13th August 2018, user agency is required to allocate up to 5% of the total cost of conservation plan as third party monitoring cost.
b) In Wildlife Management and Mangrove Conservation Plan for proposed Copper Refinery Project, total budget for conservation is Rs 323.5 Lakh which includes Rs 16.2 Lakh (5% of total budget) for third party monitoring and Rs 32.4 Lakh (10% of total budget) for Contingency to satisfy the requirement of guidance of Principle Chief Conservator of Forests and Wildlife dated 13th August 2018.

Point-6 of the letter (WPS/32/B/3029/2019-20 dated 5/8/2019):- Annual planning with site selection for 10 years shall be provided- DCF.

The year wise break up cost for implementation of various activities by forest department is attached in Wildlife Management and Mangrove Conservation plan Report on page no.:-83.

Details on above is incorporated in the Wildlife Management and Mangrove Conservation Plan.

We are resubmitting the conservation plan including map showing distance of protected areas from project site for approval by your good self and by Chief Wildlife Warden of the state.

Thanking You,
For, Adani Enterprise Limited

Authorised Signatory

Enclosures: As above Referred

CC: Chief Conservator of Forest, Kutch Forest Department, Gujarat
CC: Principle Chief Conservator of Forest and Chief Wildlife Warden, Forest Department, Gujarat

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ANNEXURE-8

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કચ્છ વન્યજીવ રક્ષકશ્રીની કચેરી
અરણ્ય ભવન, બ્લોક બી/૬
રૂમ નં. ૧૦/એ, ચ-૩ સર્કલ
ફોકસ નંબર ૦૭૯-૨૩૨૫૪૭૯૯
ગુજરાત રાજ્ય, ગાંધીનગર
તા. ૬/૦૮/૨૦૧૯

વિષય: Submittion of Wildlife and Mangrove Conservation Plan for approval please.

સંદર્ભ: આપના પત્રાંક: અ/જમન/ટે.૧૨/૮૧૬, તા. ૦૮/૦૭/૨૦૧૯

મુખ્ય વન સંરક્ષકશ્રી કચ્છ વન વર્તુળને જણાવવાનુ કે, સંદર્ભ પત્રથી સાદર કરેલ અહેવાલ અનુસંધાને નીચે પ્રમાણેની વિગતો દિન-૦૭માં પુરી પાડવા વિનંતી છે, જેથી પ્રસ્તુત બાબતે ઘટતુ કરી શકાય.

(૧) વાઈલ્ડ લાઈફ કન્ઝરવેશન પ્લાન સાથે સામેલ થઈ આવેલ ભારત સરકારના પત્ર તા. ૨૧/૦૬/૨૦૧૬ના મુદ્દા ૫ ના તમામ પેટા મુદ્દાઓ ઉપર કરેલ/ થયેલ કાર્યવાહીની વિગતો આપવી.

(૨) વાઈલ્ડ લાઈફ કન્ઝરવેશન પ્લાન કયા શેડ્યુલના અને કયા-કયા વન્યજીવ માટે બનાવવામાં આવેલ તથા આ વન્યજીવની છેલ્લી બે વસ્તી ગણતરી પ્રમાણે નોંધાયેલ સંખ્યા તથા છેલ્લા બે વર્ષમાં નોંધાયેલ ગુનાની વિગતો આપવી. દરેક વન્યજીવ માટેના કન્ઝરવેશન પ્લાનની વિગતોનો સમાવેશ થયેલ નથી. વિગતો સાથે રજુ કરવુ.

(૩) દરખાસ્ત સાથે સામેલ નકશાને અધિકૃત કરવો.

(૪) ભારત સરકારના પત્ર તા. ૧૬/૧૧/૨૦૧૮ના મુદ્દા ૨(VIII) પ્રમાણેની નક્કી કરવાની થતી શરતોની વિગતો તથા અમલીકરણ સંબંધે વિગતો જણાવવી.

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(૫) સૂચવેલ કામગીરીમાં ડોક્યુમેન્ટેશનનું સૂચવેલ ૧૦ વર્ષ તથા મોનીટરીંગ માટે સૂચવેલ રકમ ૩ વર્ષ બાદની પુન: સમીક્ષા કરી સુધારેલ વિગતો રજુ કરવી.

(૬) સૂચવેલ ૧૦ વર્ષ કામગીરીનું વર્ષવાર વિભાજન આપી તથા વાવેતરની કામગીરી માટેના સ્થળો નક્કી કરી દર્શાવવા.

(શ્યામલ ટીકાદર) 6/18
અગ્ર મુખ્ય વન સંરક્ષક
વન્યજીવ
ગુજરાત રાજ્ય, ગાંધીનગર

seen
PCCF (WLC)

O/C
6/18

પ્રતિ,
મુખ્ય વન સંરક્ષકશ્રી,
કચ્છ વન વર્તુળ
કચ્છ

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નાયબ વન સંરક્ષકશ્રીની કચેરી

કચ્છ પૂર્વ વન વિભાગ, ફોરેસ્ટ કોમ્પલેક્ષ,
જીલ્લા ઉદ્યોગ કેન્દ્રની પાછળ,
ભુજ-કચ્છ ૩૭૦૦૦૧
Email: d.eastbhuj@yahoo.co.in ફોન નં. ૦૨૮૩૨-૨૫૦૨૨૭ ફેક્ષ નં. ૦૨૮૩૨-૨૨૯૯૩૦

ક્રમાંક:- ક/જમીન/ટે.૯/૫૦૨૪ /૨૦૧૮-૧૯ તા. ૨૯/૦૫/૨૦૧૯

પ્રતિ,
અદાણી એન્ટરપ્રાઈઝ લી.,
અદાણી હાઉસ, શાંતિગ્રામ,
એસ.જી. હાઈવે, અમદાવાદ.

વિષય:-Submission of Wildlife and Mangrove Conservation plan approval Please.

સંદર્ભ:- (૧)આપના તા.૨૫/૦૩/૨૦૧૯ પત્ર.
(૨) અત્રેના પત્રાંક:-ક/જમીન/ટે.૯/૧૬૬૩,તા.૨૯/૦૩/૨૦૧૯
(૩) મુખ્ય વન સંરક્ષકશ્રી,કચ્છ વન વર્તુળ,ભુજ-કચ્છના પત્રાંક:-
એ/જમીન/ટે.૧૨/૫૦૧,તા.૧૧/૦૪/૨૦૧૯
(૪) અત્રેના પત્રાંક:-ક/જમીન/ટે.૯/૧૯૧,તા.૦૪/૦૫/૨૦૧૯
(૫) અગ્ર મુખ્ય વન સંરક્ષકશ્રી,વન્યજીવ,ગુ.રા.ગાંધીનગરના પત્રાંક:-
વપસ/૩૨/બ/૩૦૨૯/૨૦૧૯-૨૦,તા.૦૬/૦૮/૨૦૧૯

ઉપરોક્ત વિષયે જણાવવાનું કે,અદાણી પોર્ટ સ્પેશ્યલ ઈકોનોમીક ઝોન,તા.મુંદરા જી.કચ્છમાં APSEZની વન સંરક્ષણ ધારા-૧૯૮૦ની ૧૫૭૬.૮૧ હેક્ટ.ની દરખાસ્તને MoEF નાપત્ર 8-04/2016-FC Dt.16/11/2018 થી ફોરેસ્ટ ક્લીયરન્સ આપવામા આવેલ સ્ટેજ-૧ છે.સદરહુ પત્રની શરત ૫(V) મુજબ સદરહુ વિસ્તારનો શિડયુલ-૧ના ફાનાનો સ્ટડી રીપોર્ટ કરાવી,"વાઈલ્ડ એન્ડ મેન્ગ્રુવ કન્ઝર્વેશન પ્લાન" તૈયાર કરી,ચીફ વાઈલ્ડ લાઈફ વોર્ડન,સ્ટેટ,ગુજરાત રાજ્યને રજુ કરવા જણાવેલ છે.

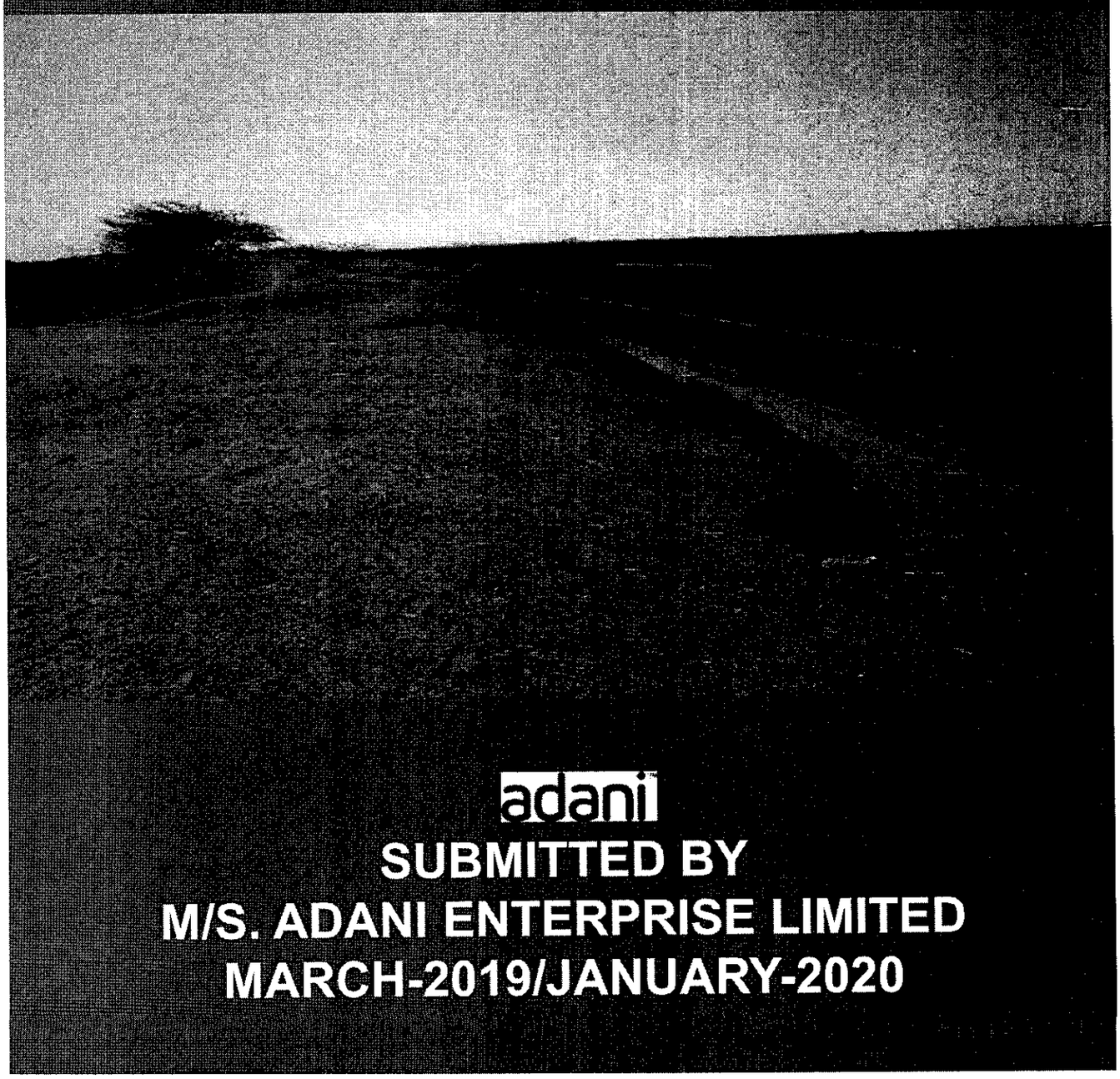
મોજે શીરાચા તથા નવીનાળ વિસ્તારમા ગ્રીનફીલ્ડ ક્રોપર રીફાઈનરી પ્રોજેક્ટ ૧.૦ MTPA કેપેસીટીના પ્લાન સ્થાપના અર્થે કોર્પોરેટીય મંજરી લેવા યુઝર એજન્સી દ્વારા NABET નામની સંસ્થા પાસે બેઝીક પ્રાથમિક માહિતી તથા સ્થળ પરના ફ્લેશ ફીલ્ડસર્વે તથા મેન્ગ્રુવનો સર્વે કરી,વાઈલ્ડ લાઈફ તથા મેન્ગ્રુવ કન્ઝરવેશન પ્લાન તૈયાર કરાવી રજુ કરવામાં આવેલ છે તેને અત્રેના સદર્ભ(૨)વાળાથી સાદર કરવામા આવેલ હતા પરતુ સદર્ભ(૫)થી અપુરાસથી પરત કરવામાં આવેલ,જેની નકલ આ સાથે સામેલ છે.પ્રસ્તુત બાબતે મુદ્દાસર પુર્તતા કરી,ફેર ચાર(૪) નકલ મોકલી આપવા વિનંતી.

બિડાણ:- ઉપર મુજબ.

(પી.એ.વિહોલ)
નાયબ વન સંરક્ષક
કચ્છ પૂર્વ વન વિભાગ,ભુજ

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Wildlife Conservation Plan & Mangrove Conservation Plan for Proposed Greenfield Copper Refinery Project (1.0 MTPA) at Adani Port Special Economic Zone in Siracha and Navinal Villages of Taluka Mundra, District Kutch, Gujarat



adani

SUBMITTED BY

M/S. ADANI ENTERPRISE LIMITED

MARCH-2019/JANUARY-2020

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ANNEXURE-8

Wildlife Conservation Plan & Mangrove Conservation Plan for Proposed Greenfield Copper Refinery Project (1.0 MTPA) at Adani Port Special Economic Zone in Siracha and Navinal Villages of Taluka Mundra, District Kutch, Gujarat

Submitted by

M/s. Adani Enterprise Limited

Study by
Dr. Bharat Jethva
NABET Accredited FAE
Cat-I, Ecology & Biodiversity
Bhagwati Enviro Care Pvt. Ltd.
March-2019

ANNEXURE-8

CERTIFICATE

This report "Wildlife Conservation Plan and Mangrove Conservation Plan for Proposed Greenfield Copper Refinery Project (1.0 MTPA) at Adani Port Special Economic Zone in Siracha and Navinal Villages of Taluka Mundra, District Kutch, Gujarat" has been prepared by us based on extensive field visits and data collected, review of published literature, information and maps furnished by M/s Adani Enterprise Limited, and data available in public domain. The study was restricted to project area and its 10 km periphery from the project area.

Dr. Bharat Jethva
NABET Accredited FAE
Cat-I, Ecology & Biodiversity
Bhagwati Enviro Care Pvt. Ltd.
Ahmedabad

Study Completion Date: 10th March 2019
Ahmedabad

Study Revision Date: 5th January, 2020
Ahmedabad

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1. INTRODUCTION

1.1. Background

M/s. Adani Enterprises Limited (AEL) intends to set up a Greenfield copper refinery project of 1.0 MTPA (10 LTPA) capacity in 256.58 ha (634 acres) of area, which includes facilities like copper smelter, sulphuric acid plant, copper refinery, continuous cast copper wire rod plant, precious metal recovery plant, phosphoric acid plant, aluminium fluoride plant, effluent treatment plant, utilities storage of water and fuel, etc. with the state of the art environment friendly technology, which will be located at Adani Port Special Economic Zone (APSEZ) land in villages Siracha and Navinal, Taluka Mundra, district Kutch, Gujarat.

As per Environmental Impact Assessment (EIA) Notification dated 14th September 2006, proposed project falls under category-'A' of project activity 3(a) and requires prior Environmental Clearance (EC) to be obtained from Ministry of Environment, Forest & Climate Change (MoEF&CC) before the commencement of ground activity. The application No: IA/GJ/IND/53004/2016 for prior EC (Form-1 and Pre Feasibility Report) for the proposed project has been submitted to MoEF&CC on 21st April 2016 and same was reviewed by the Expert Appraisal Committee (Industry-I) the meeting held on 4th May 2016 in New Delhi to prescribe Terms of Reference (TORs) for the preparation of EIA/EMP report. TOR has been issued by MoEF&CC vide letter reference F.No.J-11011/113/2016-IA.II(I) dated 21st June 2016 (Annexure-I). EIA for the project has been conducted by the NABET accredited consultant and submitted to MoEF&CC for Environmental Clearance in 2018.

As a part of approved ToR No. 5(v) 'Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area is to be prepared'. Present study is carried out towards preparation of above mentioned plan based on primary data and field surveys. Besides, as on voluntary basis, the Mangrove Conservation Plan has also been

incorporated in this report. Therefore, the present study is carried out to fulfil requirement of the Term of Reference (ToR).The present study is a detailed account of flora, fauna, mangrove and wildlife habitats present in 10 km radius of the proposed project area based on literature survey and primary data collection. Additionally 10-15 km radius area was also studied to check if there is any environmental sensitivity present based on the secondary information and published literature. Compliance of point no.:- 5 of ToR is mentioned below(Table-1.1).

Table-1.1: Compliance of point no.:- 5 of ToR.

No	Condition	Compliance/Response
i	Permission and approval for the use of forest land (forestry clearance), if any and recommendations of the state forest department	• Stage-1 clearance is obtained by APSEZ FCA vide letter no.:-F.No. 8-04/2016-FC dated 16th November 2018. • The required land for the proposed project would be provided by the APSEZ after seeking all clearances including Stage-2 clearance for forest land. • No construction would be carried out by Project Proponent before completion of Forest Diversion Process.
ii	Land use map based on high resolution satellite imagery (GPS) of the proposed site delineating the forest land (in case of project involving forest land more than 40 ha.)	• Land use map is available in the Wildlife Management and Mangrove Conservation Plan (Map-no 4.2 on page no -20) submitted by Project Proponent.
iii	Status of application for obtaining Stage-I Forestry clearance with latest status shall be submitted.	• Stage-1 clearance is obtained by APSEZ vide letter no.:- F.No. 8-04/2016-FC dated 16th November 2018.
iv	The project to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-a-vis the project location and the	• A map showing distances of Sanctuaries, National Park, Biosphere Reserves and Migratory Corridors of Wild Animals in Kutch district from project site is attached herewith in Wildlife Management and Mangrove conservation Plan as Annexure-III in the report for the authentication. • The proposed project does not fall within 10 km distance of the National Parks, Sanctuaries and Biosphere Reserves. No notified Migratory Corridors of Wild

June 2016. The present study is to fulfil the requirements of studies mentioned under ToR No. 5(v) issued to AEL.

1.3. Scope of Work

Scope of work for this study is in line with the ToR No. 5(v) issued to AEL which include preparation of Wildlife Conservation Plan and Mangrove conservation plan as part of this report. The preparation of the wildlife and mangrove consecration plan required the study of habitat types and quality, species, diversity, rarity, fragmentation, ecological linkage, age, abundance, etc. in case of schedule fauna, conservation measures should be proposed, And a detailed study to assess the wildlife habitats, their migration route, etc. and measures to mitigate impacts of the proposed activities.

The present study has carried out identification of ecologically sensitive receptors (species, habitats& eco-systems) based on field investigations and literature survey along with their mitigation with conservation action plan. The study was carried out in core area (project site) and in buffer area i.e. 10.0 km periphery from the project site. The study was carried out systematically and scientifically using primary and secondary data in order to bring out factual information on the ecological conditions of the project site and its surroundings.

The study involved assessment of general habitat type, vegetation pattern, preparation of inventory flora and fauna of terrestrial ecosystem in 10 km radius from the boundary of proposed project site. Biological assessment of the site was done to identify whether there are any Rare, Endemic or Threatened (RET) species of flora or fauna in the core area as well its buffer zone and to identify whether there are any ecologically sensitive area within buffer zone that is likely to be impacted. The study also designed to suggest suitable mitigation measures if necessary for conservation of important species and their habitats etc.

	recommendations or comments of the Chief Wildlife Warden thereon	Animals are located within 10 km. radius of the proposed project site.
v	Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for the conservation of Schedule-I fauna, if any exists in the study area.	• Evidence of total 8 species classified as Schedule-I under the Wildlife Protection Act 1972 are found to be present within the 10 km radius of the proposed project site.
vi	Copy of application submitted for clearance under the Wildlife Protection Act 1972, to the standing committee of the National Board for Wildlife	• Clearance under Wildlife Protection Act is not required as project area do not involve diversion of any protected area under Wildlife Protection Act 1972. Neither the project falls within any Eco-system zone notified around any protected area.

1.2. Legal Framework

M/s. Adani Enterprises Limited (AEL) intends to set up a Greenfield copper refinery project of 1.0 MTPA (10 LTPA) capacity in 256.58 ha (634 acres) of area, which includes facilities like copper smelter, sulphuric acid plant, copper refinery, continuous cast copper wire rod plant, precious metal recovery plant, phosphoric acid plant, aluminium fluoride plant, effluent treatment plant, utilities storage of water and fuel, etc. with the state of the art environment friendly technology, which will be located at Adani Port Special Economic Zone (APSEZ) land in villages Siracha and Navinal, Taluka Mundra, district Kutch, Gujarat.

The proposed project falls under category-'A' of project activity 3(a) and requires prior Environmental Clearance (EC) to be obtained from Ministry of Environment, Forest & Climate Change (MoEF&CC) before the commencement of ground activity. The application No: IA/GJ/IND/53004/2016 for prior EC (Form-1 and Pre Feasibility Report) for the proposed project has been submitted to MoEF&CC on 21st April 2016 and same was reviewed by the Expert Appraisal Committee (Industry-I) the meeting held on 4th May 2016 in New Delhi to prescribe Terms of Reference (TORs) for the preparation of EIA/EMP report. TOR has been issued by MoEF&CC vide letter reference F.No.J-11011/113/2016-IA.II(I) dated 21st

1.4. Objectives of the Study

The major aim of the present study is to avoid any impact of proposed project activity on important natural habitats or species in the study area. Therefore, the study is carried out with following objectives.

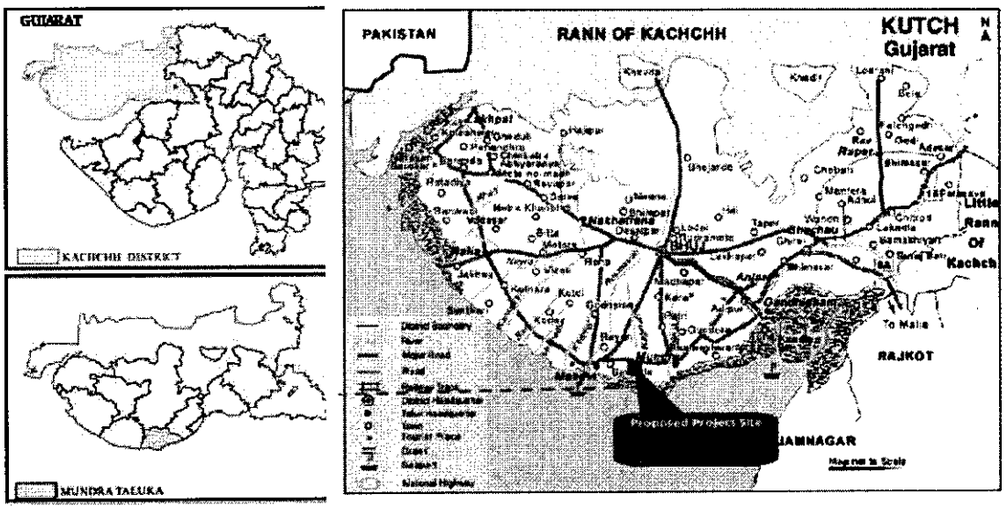
- To evaluate the ecological status of the study area with respect to important flora, fauna and ecologically sensitive habitats etc.
- Assessment of any impacts of the project activities on ecologically sensitive habitats and species.
- Recommend mitigation measures in the form of wildlife conservation plan with an in-built monitoring mechanism and schedule of implementation along with financial budget.

2. STUDY AREA

2.1. Project Location

The proposed project site is located in villages Siracha and Navinal at APSEZ Taluka Mundra, district Kutch in the state of Gujarat (Map-2.1).

Map- 2.1: Proposed project location in Siracha village of Kutch district in Gujarat.



2.2. Study Area:

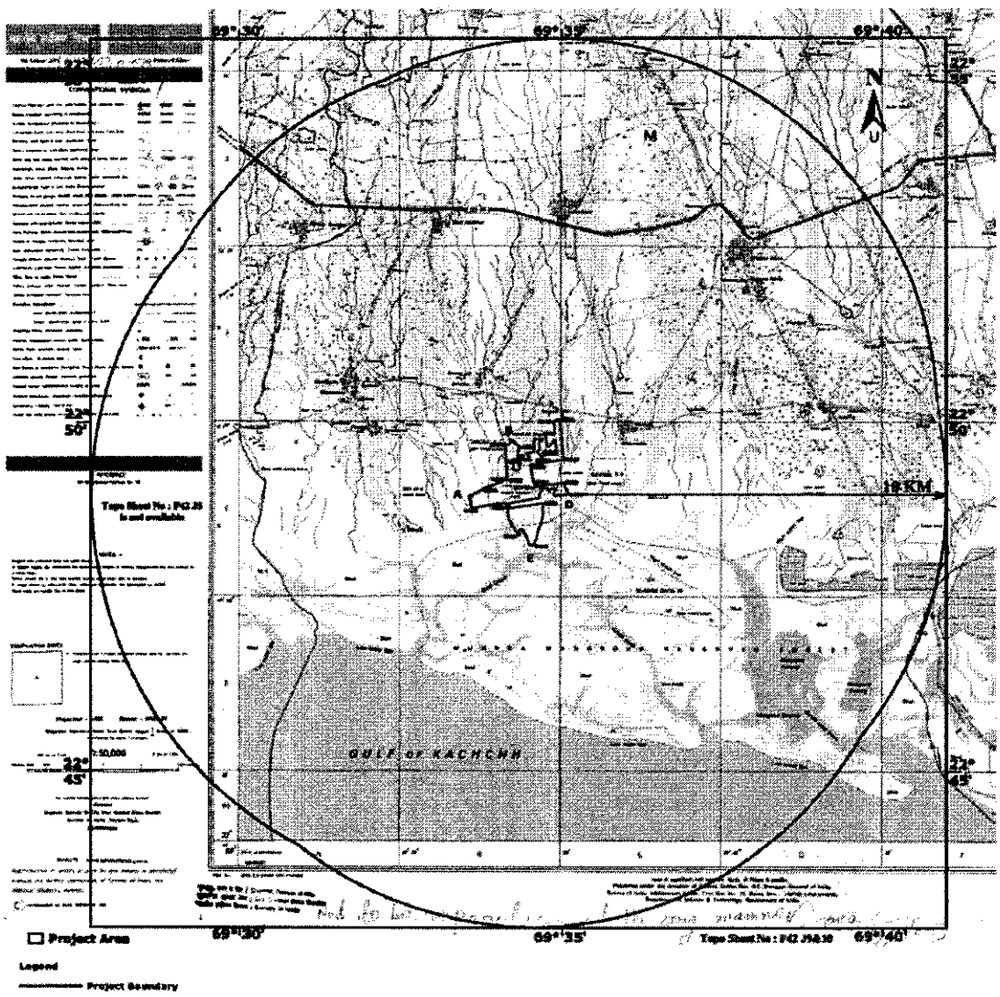
For the convenience of the study and the user agencies, the study area was divided in two major parts i.e. 1) Core area/project area and 2) Buffer area i.e. 10.0 km periphery of the project boundary (Map-2.3).

2.2.1. Core Area:

Core area is proposed project area of Greenfield Copper Refinery plant at Mundra (Map-2.2) The total area earmarked for the proposed project is 256.58 ha (634 acres), in which 154.19 ha (381 acres) of land belongs to APSEZ area and 102.39 ha (253 acres) of land belongs to forest area for promoting industrial development. The Gulf of Kutch sea coast is located at 3.9 km south from the proposed project site. The area is located 5.0 km south of National Highway NH- 8A and 0.3 km from State Highway SH-6. No

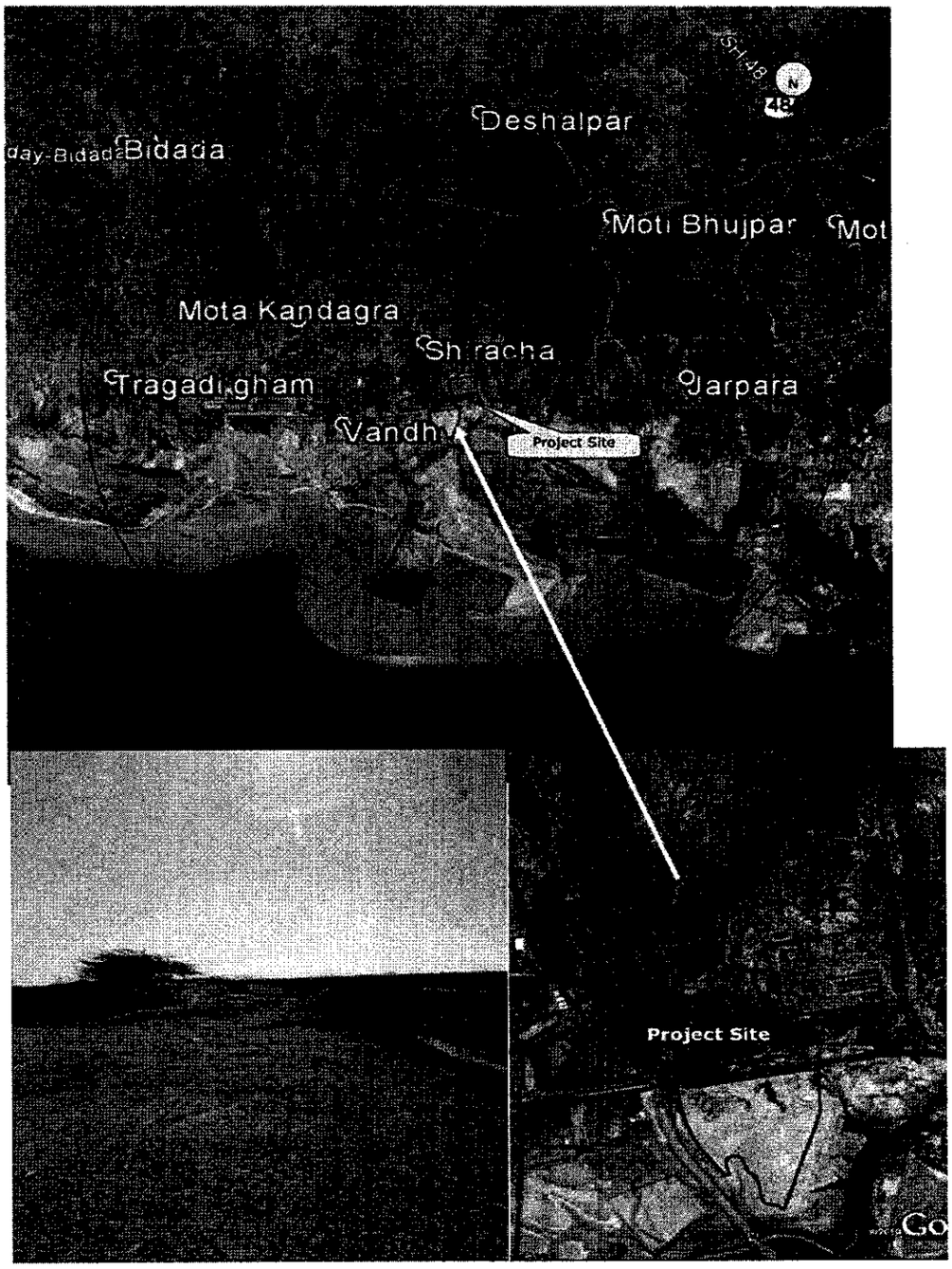
major vegetation or any human settlements present in the core area, therefore, there is no need for rehabilitation of any human settlements from the project site. Most importantly the project site does not fall in 10.0 km periphery of any National Park or Sanctuary or their eco-sensitive zones. Site is located outside the Coastal Regulatory Zone areas of Gulf of Kutch sea coast therefore, does not attract CRZ clearance.

Map-2.2: Proposed project location on Toposheet.



Corner Point	Latitude	Longitude
A	22°48'55.40"N	69°33'34.74"E
B	22°49'44.92"N	69°34'13.74"E
C	22°50'01.88"N	69°34'59.78"E
D	22°48'57.23"N	69°35'08.42"E
E	22°48'13.26"N	69°34'35.43"E

Map-2.3: Project location (core area) with 10.0 km buffer (study area) in Gujarat



2.2.2. Buffer Area

The buffer area mainly consists of revenue areas 18 villages that fall in 10.0 km periphery of the project site (Map-2.2). The list of villages is given in Table-2.1.

Table-2.1: List of villages falling in 10 km buffer area.

No	Village	No	Village	No	Village
1	Tunda	7	Mota Bhadiya	13	Khakhar Moti
2	Shiracha	8	Kandagara Mota	14	Deshalpar
3	Navinal	9	Bhujpar Nani	15	Sukhapar
4	Jarpara	10	Bhujpar Moti	16	Nani Khakhar
5	Bidada	11	Depa	17	Gelda
6	Tragadi	12	Nana Bhadiya	18	Dhrab

Majority of the land of the buffer area is occupied by the agriculture fields, forest area, industries (Saltpans, Ports, and Power plants), open scrub vegetation, mangrove, mudflats, pond/ reservoir, roads & railway network & built up areas etc. Most importantly there are no Wildlife Sanctuaries or National Parks located in the 10.0 Km periphery of the proposed project area. The proposed project land is located outside the Coastal Regulatory Zone of Gulf of Kutch coast.

3. METHODOLOGY

3.1. Basic frame work of data collection

The prediction of impacts of industries on flora and fauna depends on understanding of the proposed activities, its magnitude/extent, scale and ecological conditions in the surrounding area. Collection of comprehensive baseline information on flora and fauna is therefore a prerequisite for assessment of impacts of development activities. It would also help in advance planning and mitigate the impacts and ultimately managing the natural habitats and resources. The approach to achieve the stated objectives within defined scope of work, include field surveys, interviews, and reviews of literature. Following was the basic fame work of the data collection and analysis for the present study.

3.2. Field Surveys

Several field visits were carried out between month of February-March 2019 and September 2019 to understand and assess the impacts of proposed project activities on flora and fauna and natural habitats. We evaluated the distribution and abundance of flora and fauna and mangroves in project area and in buffer area separately.

3.3. Identification of Important Ecological Habitats

The important ecological habitats and features were identified based on our field visits and also mapping of landuse types in the study area. We identified ecologically important habitats through primary survey, literature survey and consulting local naturalists etc. These important ecological habitats and features were then identified on landuse map that is prepared for the study area. Land use map of 10 km radius of the proposed project site is prepared by Vimta Labs Limited is used for the present study. Prominent landuse features such as, roads, rivers/waterbody/drainages, agriculture, sea, sandy beach, mangrove, mudflats, industrial and built up areas, forest area, scrubland etc. were digitized using open source software such as QGIS and their areas were calculated. There may be acceptable

margin of errors in the final map however, locations and important features are identified and shown on map.

3.4. Study of Flora

In order to study the flora we laid 10X10 m^2 size 37 quadrates in buffer and 10 quadrates in core area (Map-3.1 & 3.2). Quadrates were laid separately for detailed analysis of vegetation in the core area (project site area) and buffer areas (10 km periphery). In order to study herbs and grass species, we laid a 1X1m^2 quadrate within the above mentioned quadrates. Details of Geographic Coordinates of each of the quadrates laid are given in Map-3.1 and Annexure-II. Information on geographic coordinate, occurrence of plants, their species names, numbers and floral phenotypes, life forms etc. were collected from each quadrate we laid. Direct visual enumeration of plant species was carried out to generate data on flora. The collected data was then systematically and scientifically analyzed to produce information on following biodiversity parameters of flora. The encountered vegetation of the study area was analyzed to calculate density, frequency & abundance (Curtis and McIntosh, 1950). Total abundance, density and frequency in respect to individual species were calculated in order to understand the vegetation structure and relative importance of the sampled areas. We used Shannon Weaver Index (Shannon & Weiner, 1949) for Species diversity and Simpson dominance index (Simpson, 1949) for species dominance. Species enumeration (inventory), richness, total abundance, density, and evenness provide systematic baseline information of the vegetation community.

3.5. Study of Fauna

We mainly studied the fauna of higher trophic levels which acts as indicator of the type and health of the environment.

Reptiles: Majority of the reptile species are fossorial in habit therefore the assessment of reptiles and their diversity etc. holds special significance for any development projects. It is difficult to conduct quantitative study on reptiles within a short period of time. Therefore, we relied on qualitative observations only. We carried out study based on interview survey,

secondary literature as well as direct observation on road killed reptiles. We randomly looked for various reptiles and their presence i.e. lizards, snakes etc. in the study areas. Therefore, only a check list of reptiles observed during the study period was prepared.

Birds: Birds, occupying higher trophic levels in the ecosystems, respond quickly to the changes in the habitats and therefore serve as one of the best indicators for evaluating the status of the area. Therefore, we created baseline data on birds by systematically and collected data on their occurrence i.e. presence absence in the buffer and core areas in the study area.

Map-3.1: Sampling locations for flora and fauna study in the core area.



Map-3.2: Sampling locations for flora and fauna study in the buffer area.



For creating baseline data on birds we randomly walked in the study area during early morning i.e. 6:00 AM to 9AM and at evening 5:00PM to 7:00 PM. These time periods of the day are when maximum bird movements are expected. We walked randomly in the study area carried out sightings of birds ad libitum and recorded species based on their identification. Special reference books for bird species identification were used. Apart from walking randomly, we also relied on specific habitat search for different species i.e. dense bushes, wetland, ponds, big trees, agriculture areas etc. In order to accomplish the inventorization of the bird species found in the study area. All the bird species are classified based on their conservation status, their schedule under Wildlife Protection Act 1972, their migratory status, habitats and their feeding guilds. This was further used for finding out important bird

species in the study area i.e. rare, endangered or species of high conservation significance.

Mammals: Like birds, mammals are also occupying higher trophic levels in many ecosystems and respond quickly to the changes in their habitats therefore, serves as best indicators of the ecosystem health. We therefore, chose to create qualitative baseline information on presence and absence of mammals in the study area. Since the presence of mammalian species is low affecting probability of their sightings, in the study area, it was difficult to estimate their population using line transect method. More importantly, it was difficult to accommodate the sightings of nocturnal and diurnal animals in the study. Therefore, we prepared a qualitative check list of mammals based on their presences and absence using indirect evidences and signs such as footprints, dens, droppings, diggings, scrap marks, etc. in the project area.

Apart from these, search efforts were also made for various signs of important wildlife species in the study area which includes looking for wildlife signs such as dens, diggings, scrap marks, droppings etc. The sites where likelihood of animals is higher such as shady trees, waterholes, dense and undisturbed bushes etc. were surveyed intensively during the survey in the study area. This survey has helped us in identifying various species of mammals in the study area. For mammal inventory, both direct sightings and indirect evidences (like dung, scats, pellets, foot prints, nests, dens etc.) were accounted.

3.6. Important Wildlife Habitats and Protected Areas

We assessed the presence and distances of important wildlife habitats and hotspots such as protected areas, mangroves, breeding and nesting habitats, coastal habitats, important wetlands, and grassland area from core area. These important areas such as Protected areas (National Park, Wildlife Sanctuaries, Conservation Reserves etc.), Wetlands of national importance, Ramsar sites, Important Bird Areas (IBAs), classified by the Bombay Natural History Society etc.

3.7. Rare, Threatened & Endemic Wildlife Species and Their Corridors

We also assessed the presence of rare, endangered, endemic and threatened wildlife species in the project area/core area and buffer area. Special search efforts were made during the field visits to identify any such sensitive species or their corridors etc. in the project area and buffer area. Apart from field visits we relied on interview surveys of local people, consultation with local biologists and naturalists etc.

3.8. Literature Review

Considering the time limitation to undertake statistically rigorous data gathering system, study also relied on existing knowledge about the ecology and biodiversity of the region. Importantly, there are quite a few studies undertaken in the past dealing with the impacts of copper refinery plants on flora and fauna and other concerns of biodiversity conservation. Literature on copper refinery projects and associated environmental issues were downloaded and collated through internet. Various relevant literatures were surveyed during the study for collection of baseline information. Maps, reports and documents collected from the project proponent were also reviewed and used in the present study. Books on flora, fauna and wildlife were also studied in order to understand the biology of several species. Other wildlife and mangrove conservation plans submitted for the surrounding area are also referred.

3.9. Consultations

During the study, series of consultations were made with both technical and non technical stakeholders to get precise information on the project area/core area and buffer zone habitats. In order to know more about the seasonal presence of several faunal species and their movement, study team informally consulted and discussed with local naturalists and local people, from the villages, herders and farmers who inhabit close to the proposed project area.

3.10. Supplementary Information

Other than the above, for the purpose of this study, relevant information was also collected from following sources:

Research papers on flora and fauna and mangroves

Google imageries/Google Maps

Project related Maps provided by Adani Enterprise Limited

Communications with subject experts

3.11. Analysis to Evaluate the Potential Impacts

The information collected on status of flora and fauna and, their spatio-temporal distributions, hotspots, and potential impacts of proposed project development were logically analyzed and conclusions were extracted for preparation of conservation plan for the project proponent to implement.

3.12. Preparation of Wildlife Conservation Action Plan:

After identification of key impacts of the project, on flora, fauna or any key habitats of any important species or their corridors, a comprehensive wildlife conservation action plan was prepared with monitoring mechanism and financial projections.

3.13. Limitations of the Study

The study undertaken is structured around the project information as provided by the project proponent, any change in the proposed activities may result in variation of outcome. The study is based on field visits, literature survey, consultation with local people etc. Professional judgment and subjective interpretation of facts has been applied for this study. All information's and inferences presented herein are based on the specifics currently available within the limits of the scope of work, information provided by the client or its representative, existing secondary data and schedule.

4. Ecological Assessment

The observations and assessment of overall ecological scenario presented in this chapter include details of flora, fauna, natural habitats, protected areas, wildlife species and their migration corridors etc. Such baseline information provides better understanding of the situation and overall ecological importance of the area. This baseline information viewed against proposed project activities help in predicting their impacts on the wildlife and their habitats in the region. Data collected and information gathered from secondary literature on flora, fauna, protected area, natural habitats, wildlife species etc., were analyzed and results are presented as follow.

4.1. Biogeographic Zone

The region falls in Indo-Malay Realam (IM 1303) and Deserts and Xeric Shrublands Biome as defined by WWF. The North-western Thorn Scrub Forests [IM1303] ecoregion represents a large expanse of degraded dry forest surrounding the Thar Desert. Neither exceptionally species-rich nor high in endemism, the ecoregion nevertheless harbours viable populations of antelopes.

As per classification of Indian Biogeographic zones by Rodgers et al. (2000), Kutch district falls under Biogeographic Zone 3 - the Indian Desert and the Biogeographic Province Kutch Desert- 3B.

4.2. Protected Areas

As per our information and survey there is no Sanctuary, National Park, or notified wildlife corridors within the core area and buffer area (10 km) of the project site. Marine National Park is located at 33.0 km distance in south-west direction, Marine Sanctuary is located in same direction at 35.0 km distance, where as Narayan Sarovar Sanctuary is located at 103.0 km in North-West direction, Kutch Desert Wildlife Sanctuary is situated in the Great Rann of Kutch at 70.0 km North East direction. The Wild Ass Sanctuary is located in the Little Rann of Kutch at distance of 77.0 km, Kutch Bustard

Sanctuary at 92.0 km in North direction and Chari-Dhand Wetland Conservation Reserve is located at 82.0 Km north. Majority of the protected areas and their eco-sensitive zones are located beyond 30 km distance from the project site (Table-4.1, Map-4.1, Annexure-III).

Table-4.1: Protected area and their distances from proposed project site.

No	Protected Areas	Distance	Direction
1	Marine National Park	33 Km	South-West
2	Marine Sanctuary	35 Km	South-West
3	Narayan Sarovar Sanctuary	103 Km	North-West
4	Kutch Bustard Sanctuary	92 Km	North-West
5	Wild Ass Sanctuary	77 Km	East
6	Kutch Desert Sanctuary	70 Km	North-East
7	Chhari Dhandh Conservation Reserve	82 Km	North
8	Banni Grassland Important Bird Area	69 Km	North

4.3. Landuse Types in the Study Area

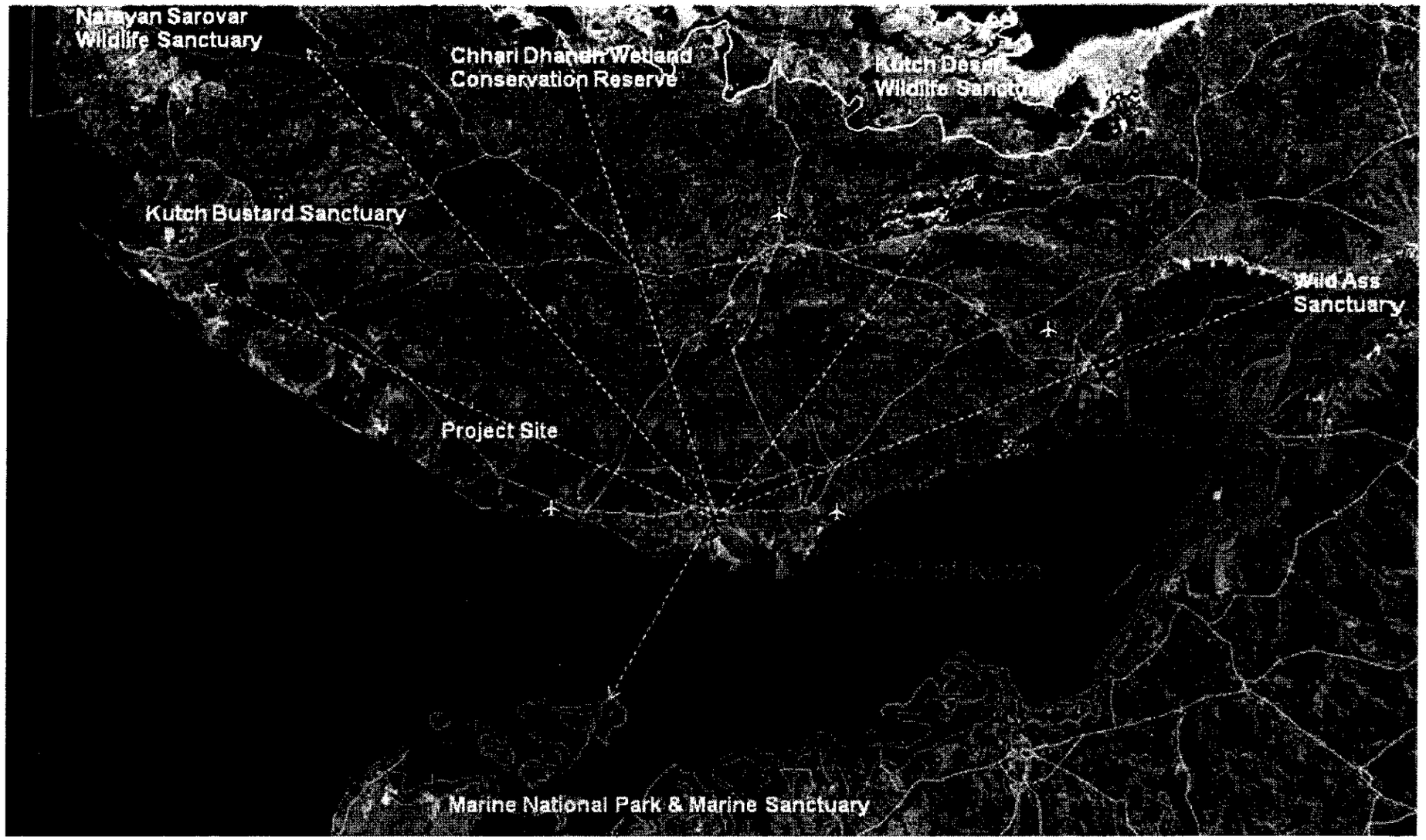
We mapped various landuse types of the study area using field surveys and various references available online. The major landuse features are agriculture, sea, open scrubland, sparse wasteland, mangroves etc (Table-4.2 & Figure-4.1, Plate-4.1).

Table-4.2: Area & percentages of various landuse types in the study area.

No	Landuse Type	Area (ha.)	% of Area
1	Built up Area	2103.27	5.08
2	Forests	837.62	2.02
3	Agriculture	15484.69	37.41
4	Wasteland	5620.36	13.58
5	Waterbody	9366.3	22.63
6	Wetlands	4469.36	10.80
7	Others	3512.17	8.48
	Total	41.393.77	100.0

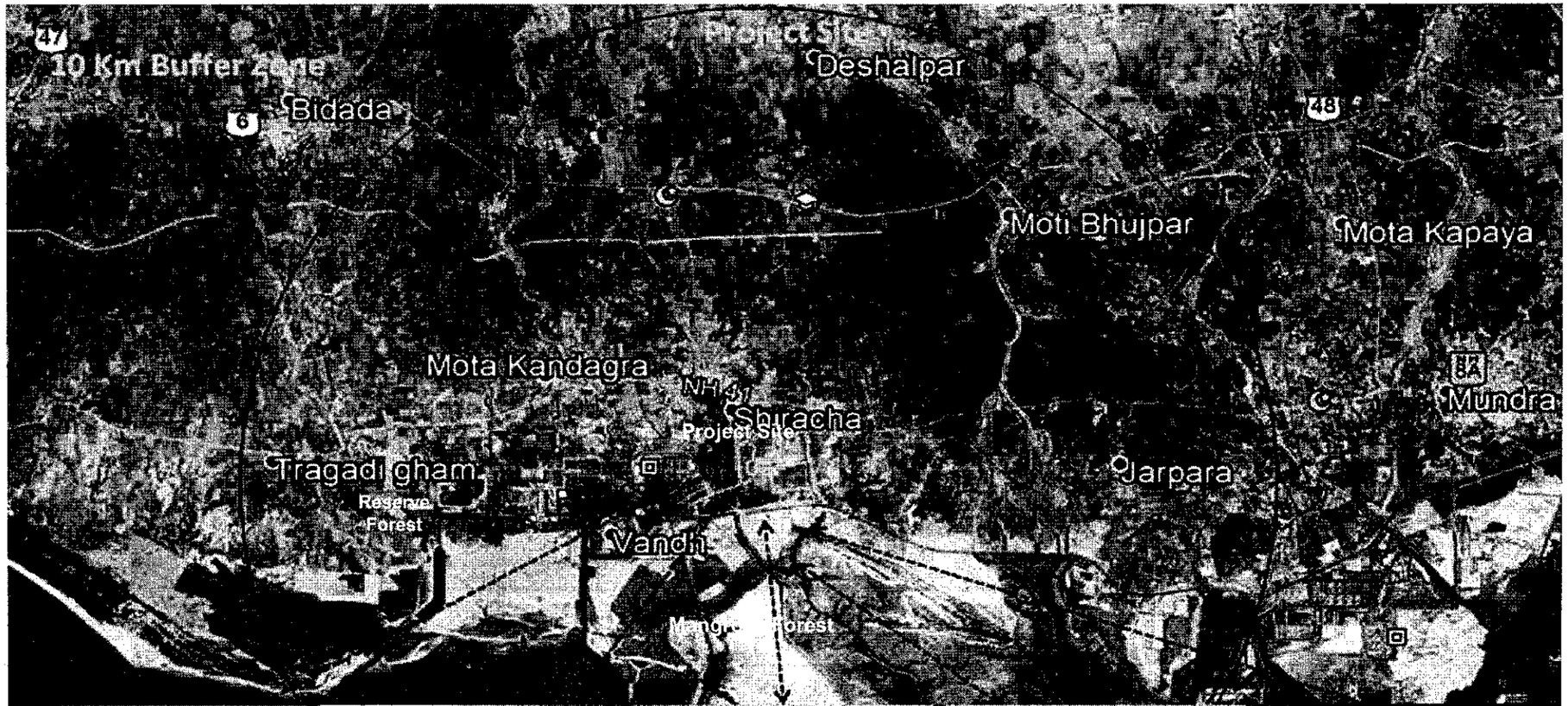
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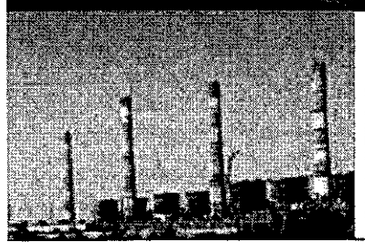
Map-4.1: Project site location vs. protected areas in Kutch district.



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Plate-4.1: Project site location and habitat types in the 10 km buffer study area.





Adani Power Plant



Project Site



Open Saline land



Kotdi Creek



Creek Mangrove

Map-4.2: Landuse pattern in the study area.

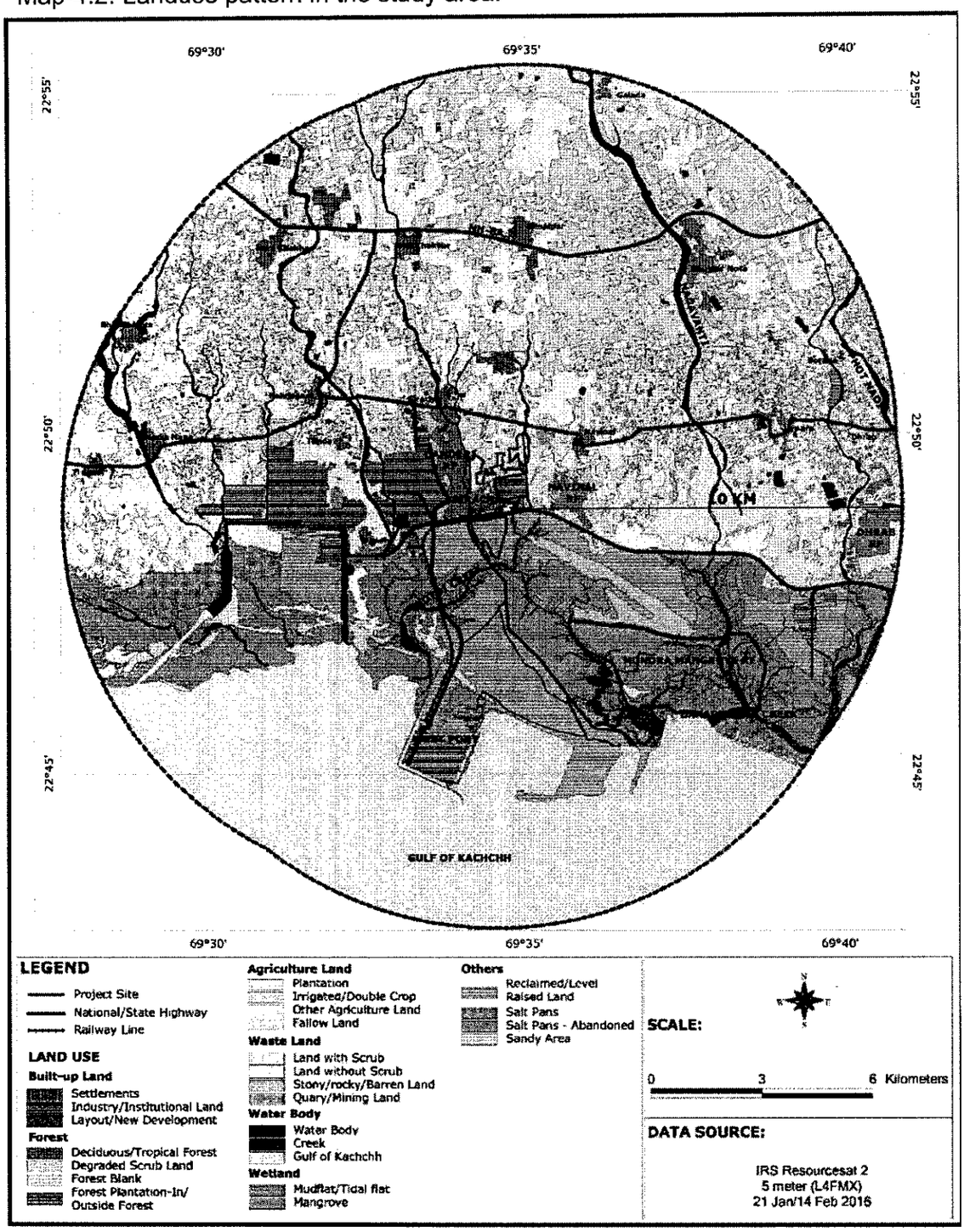
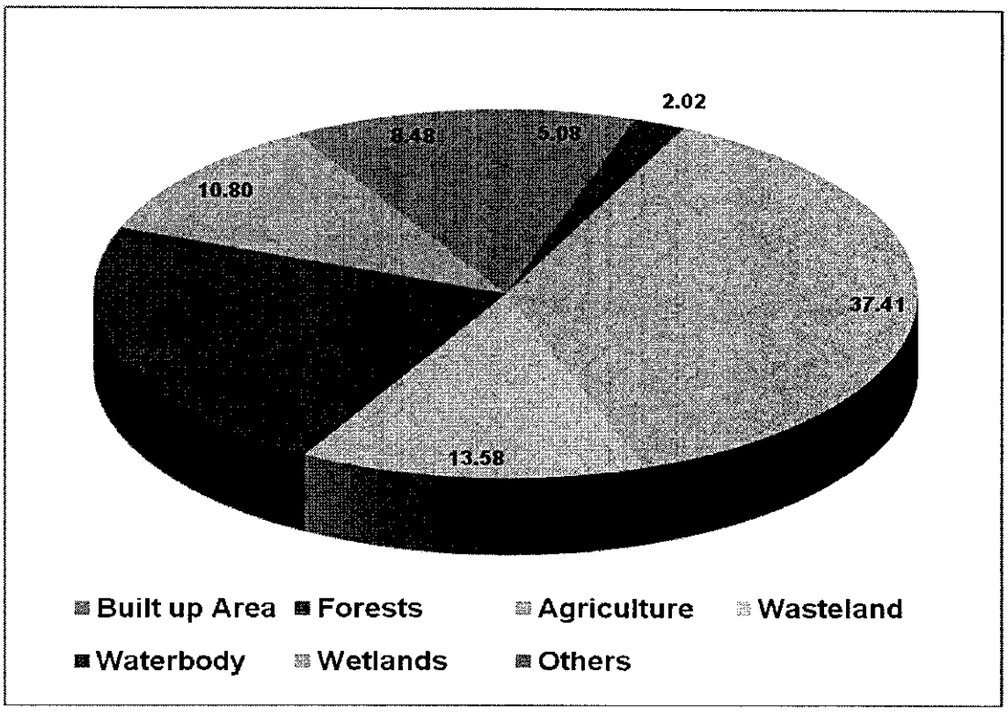


Figure-4.1: Percentage of various landuse classless in the study area.



4.4. Important Ecological Habitats

Based on our field visits and literature survey we identified two important and ecologically sensitive habitats that are located within 10km buffer zone. These habitats are listed below

i. *Forest Area*
ii. *Mangrove ecosystem*
iii. *Waterbodies*
iv. *Intertidal mudflats*
v. *Important birdwatching site*

4.4.1. Forest Area & Forest Type

As per information received from project proponent, the Land requirement for the project is 256.58 ha. (634 acres), in which 154.19 ha is APSEZ area and 102.39 ha. (253 acres) of land belongs to forest area for promoting industrial development. Therefore, core project area does include forest area. Forest Clearance for this land is under process and stage-I clearance is already received for the same. MoEF&CC (forest conservation division) has granted

Stage-I approval for diversion of 1576.81 ha. of reserved forest land in favour of Adani Ports & Special Economic Zone Limited (APSEZL) vide letter F.No.8-04/2016-FC dated 16th November 2018 (Annexure-IV). Part of the diverted forest land area (253 acres) will be utilized for the proposed copper refinery project after all approvals.

As per the forest classification of Champion and Seth (1968), forest of Kutch district classified under the "Northern Tropical Thorn Forest". The forest area in the proposed project area consists of mostly Prosopis juliflora with scattered trees of *Anogeissus pendula, Acacia leucophloea, Zizyphus mauritiana, Prosopis cineraria, Salvadora persica* and *Salvadora oliodes etc.*

Apart from forest areas involved in the core area, there are forests areas present in the buffer zone which are under the jurisdiction of Kutch West Forest Division of Gujarat Forest Department (Table-4.3). These forest areas are well marked with a boundary wall indicating its possession by the forest department. These forest areas are of two vegetation types 1) Open scrub forest and 2) Mangroves. Total 6419.25 ha. of Reserved Forests area is present in the study area (Table-4.3). Most part of the reserve forest areas (83.0%) is in the form of mangrove forest falling in the creek systems on the coast. Remaining 17.0% falls in the open thorny scrubland forests.

The inland open scrub forests are dominated with dense patches of *Prosopis juliflora* along with scattered plants of *Acacia nilotica, Prosopis cineraria, Zizyphus numularia, Salvadora persica, Salvadora oliodes, Capparis decidua, Calotropis procera, Balanites aegyptica, Butea monosperma, Acacia leucophloea, Casia auriculata etc.* The vegetation type of these forest areas are representative of desert eco-system. The details of the forest areas are given in Table-4.3.

The other kind of forest reserve are situated in costal area for example on high tidal mudflats which are harbouring inadequate patches of mangroves and coastal vegetation details of the region is given in the section on mangroves.

Table-4.3: Details of Forest area and forest types in study area.

No	Village	Survey No	Area	Type
1	Deepa	220/p	17.36	RF Section-20
2	Borana	20/p	26.62	RF Section-20
3	Dhrab	169/p	23.43	RF Section-20
4	Dhrab	169/p	81.59	RF Section-20
5	Jarpara	169/p	26.61	RF Section-20
6	Mundra Mangrove Range	2	5333.73	RF Section-20
7	Mundra Rakhal Dhuvo	2	334.34	Reserve Forest
8	Navinal	223/p	21.85	RF Section-4
9	Navinal	223/p	89.52	RF Section-20
10	Siracha	295/p	125.00	RF Section-20
11	Siracha	295/p	209.20	RF Section-20
12	Siracha	517/p	130.00	RF Section-4

4.4.2. Mangroves Ecosystem

Kutch mangroves distributed in the arid to semi-arid coastal belts are traditionally considered as the low dense mangroves which are mostly degraded. Structural attributes of Kutch mangrove are not comparable with other luxuriant mangrove formations on other coasts of India (Sawale and Thivakaran, 2013). The semi-arid coastal belt of Kutch is known for its harsh environmental conditions like hyper-salinity (36-47 ppt), wider ambient temperature fluctuations (11.2 to 48.7oC), high evopo-transpiration (R/ETP-0.03−0.20) and frequent natural disasters like cyclones and earthquakes (Sawale and Thivakaran, 2013). Added, the recent spurt in inland watershed development schemes deprive the meagre seasonal run-off to neretic waters, rendering it singly conspecific formations of *Avicennia, marina*; a hardy species capable of tolerating high physiological stresses (Sawale and Thivakaran, 2013). Though eight true mangrove species were reported earlier from the Gulf of Kutch, *A. marina* was the only species recorded on the coast of Mundra with sporadic occurrence of *Rhizophora mucronata* and *Ceriops tagal* (Sawale and Thivakaran, 2013). Majority of the mangrove areas are represented by only one species i.e. *Avicennia marina*. Few other species such as *Rhizophora mucronata* and *Ceriops tagal* are planted by forest department as part of their mangrove conservation schemes. National Centre for Sustainable Coastal Management, Chennai, carried out a status

survey ('Comprehensive and Integrated plan for preservation and conservation of mangroves and associated creeks in and around the Adani Ports and Special Economic Zone Ltd., Mundra, Gujarat') of the mangroves along the creeks and adjoining land/island as of 2016-17. The total mangrove cover of the area was estimated to be 2340 ha. There has been an increase of mangrove cover by 246 ha (~10%) compared to the mangrove area of 2011 (using aerial photo of 2011, NCSCM has estimated it to be 2094 ha). In 2016-17, out of 2340 ha, the dense mangroves were 629 ha contributing to 27% of total mangrove cover.

Most of the mangrove areas (83.0%) are located in the notified reserve Mangrove Forest areas of Navinal, Shiracha and Jarpara village coasts (Survey no-2 Mangrove Forests). The coastal area of Tunda, Navinal, Shiracha, Jarpara and Tragdi villages have patches of scattered, sparse and dense mangroves. Most of the mangroves are located on high-tidal mudflats and on the banks of creeks. Major creeks present in 10 km buffer zone study area are Kotdi-I, Kotdi-II, Baradimata-I and Baradimata-II. A sizable patch of dense mangrove is also located at 170 meters (on bank of kotdi- II creek) from Southern most boundary of the proposed project site (Map-4.1, & Map-4.2, Plate-4.1). Dense mangrove formations are common on banks of creeks from 0 to 75 meters where tidal water reaches everyday. Rest of the mangroves are in the form of sparse stunted which are grown on the tertiary branches of tidal creeks.

Kotdi and Baradimata are shallow creeks compared to Bocha, Navinal and Khari creeks. Kotdi I exhibited least depth, and significant areas of the creek are exposed during low tide. In case of Kotdi II creek, though part of mouth is exposed during low tide, considerable sections of the inner parts of the creek have water at MLWS levels. The mouth regions of both main branches of Baradimata creek were covered with water during high tide. Due to the presence of water covered areas during high tide, Kotdi I & Kotdi II and branches of Baradimata-I and Baradimata-II have conditions conducive for growth of mangroves.

4.4.3. Waterbodies

Our observation and literature review suggests that there are no major inland wetlands present within the study area i.e. 10.0 km buffer zone of the project site. Drainage pattern of the study area and project site are drained by several rivers and small tributaries, which are of dendritic pattern which remains dry in almost all the season. The Dhaneswari River (Danesri Nadi) a seasonal river (rain fed) flows in the western part of the project site. The water bodies flows through study area are Kotdi creek (0.5 km, S), Khari Nadi (1.9 km, W), Gulf of Kutch (3.9 km, S), Nagavanti Nadi (4.7 km, E) and Phot Nadi (8.7 km, ENE) from the project site. Natural drainage passing through the site will be suitably trained and maintained. These drainages have small check dams built on them which are known to accumulate overflowing runoff water for a short period. Apart from being important hydrological features in the semi-arid area, these check dams provide important habitat for many bird species and water source for wildlife in the region. One such drain is Khari River which flows from North-to South in western side of proposed project site. There is no check dam on this river in the vicinity of project site. However, all such drainages are seasonal in nature and flows only during rainy days. These drainages flows water from main land to Gulf of Kutch. Most of the stagnant water sources i.e. check-dams are located at substantial distances i.e. more than 2.5 km distance from the proposed project site. There will not be any diversion of rivers. Further, conveyer for copper concentrate and rock phosphate and acid pipeline will cross over the existing water intake channel available for power plant. Suitable culverts will be built as required.

4.4.4. Intertidal mudflats

Mudflats refer to land forms near a waterbody that is regularly flooded by tides and is usually barren (without any vegetation). Also known as tidal flats, mudflats are formed upon the deposition of mud by tides or rivers. This coastal landform usually occurs in sheltered areas of the coast like bays, coves, lagoons, estuaries, etc. Since most of the sedimented area of a

mudflat is within the intertidal zone, the mudflat experiences submersion under water and exposure twice daily. Mudflats, mangroves, and salt marshes together constitute an important ecosystem. Mudflats attract a large number of migratory shorebirds. These intertidal areas also house a number of species of crabs, fish, and mollusks which form the food base for the migratory birds. Thus, mudflats are often significant bird-watching spots.

Though, mudflats are important ecological habitats, their extent on Kutch district coast is yet to be identified officially on Coastal Zone Maps of Gujarat. Therefore, their distances and directions from the proposed project site are not yet known. For the conservation of mudflats budget of Rs. 25 lakhs has been provided which will be given to forest department by the Project Proponent.

4.4.5. Important Birdwatching Site

Majority of the waterbird species reported in the present study are found at Modhva mudflats located beyond 11.0 km south-west outside the study area. It is located adjacent to Sea water outfall of CGPL. Modhva area is a mix of sandy beach, saltpans, coastal mudflats with scattered mangroves and thorny bushes on the coast which provides a suitable mix of wetland habitat to attract large populations of migratory and resident birds. Most importantly this area provides much needed staging and stop over sites for the migratory birds flying on Central Asian Migratory bird Flyway.

The Modhva coastal area is known amongst the birdwatcher as it is one of the important and prominent birdwatching and bird photography sites of Kutch. The national and international birdwatching tour agencies bring their keen birdwatching and bird photography clients to this birdwatching site of Kutch. The site is known for shore birds such as Crab plover, Oystercatcher and waterbirds such as flamingos etc. The site is therefore one of the important eco-tourism sites of Kutch. Therefore in view of its ecological and economical value, Modhva coastal area is considered as important site for conservation. Since it lies outside the study area i.e. 10.0km, there are negligible chances of impacts on this area by the proposed project.

4.5. Floral Diversity and Vegetation Type in Core & Buffer Area

We evaluated biodiversity and abundance parameters of vegetation/plant species in the core area and in the buffer area of the project site.

4.5.1. Vegetation Type & Community in Core Area & Buffer Area:

Core area: The proposed project site falls in the arid-semi arid climatic condition. Our field survey and literature review suggest that the vegetation types and community in the project area is that of semi arid-arid regions. It is represented by sparse thorny scrub vegetation in two industrial areas i.e. thermal power plants. The major part of the project area is devoid of large trees and mainly consists of dense and sparse shrubs i.e. *Prosopis juliflora, Prosopis cineraria, Acacia nilotica, Casia auriculata* and *Zizyphus numularia, caparis deciduas etc.* the major grasses include several species of *Cyperus* and herbs *Indigofera*. Details of vegetation survey results are discussed in forth coming sections.

Buffer area: The buffer area (10.0 km periphery) comprises mainly of agriculture fields, wastelands, forest plantation patches by forest department, scattered bushes of *Prosopis juliflora, Prosopis cineraria, Acacia nilotica, Salvadora persica, Salvadora oliodes, Azadirachta indica. Prosopis juliflora* and *Zizyphus numularia* among the wild plants and cotton, coconut, dates, pomegranate, among the cultivated crops are the most dominant plants in the buffer area.

Except for highly scattered and small plants of *Commiphora wightii*, there were no rare, endangered or conservation concern species present in the close vicinity of the project area in the buffer zone. Major part of the buffer area is agriculture fields particularly on the Eastern side of the project area. Since ground water is saline up to 15 km from the coast and highly saline up to 4 km from the coast. Thus, dry land farming is practiced near the coast and irrigated farming is practiced in the farms that are 5-6 km away from the coast. Cotton, Jowar, Bajra are the main crops grown here. Some villages, especially in the central corridor are endowed with good surface water

facilities, and irrigated agriculture is possible in these villages. Being semi-arid, arid zone, this region support low plant growth and therefore, not many large trees with sizable canopies are present in the buffer zone. However, at every village local people have managed to grow trees for shade, aesthetic and religious values.

Though, we could not report presence of some of the important species plant species (probably due to lack of rain species did not occur), according to literature survey, Navinal area at Mundra has representation of native vegetation of Kutch. Some of the important threatened plant species reported from the region include *Dipcadi erythraeum, Helichrysum cutchicum, Ephedra foliata, Heliotropium rariflorum, Tribulus rajasthanensis, Pavonia ceratocarpa, Convolvulus stocksii, Commiphora wightii*. Out of this *Helichrysum cutchicum, Ephedra foliata and Tribulus rajasthanensis* are endemic species. Gujarat State Biodiversity Board earlier proposed to declare the area as biodiversity heritage site. However the proposed development of the "Biodiversity Park at Navinal village, Mundra Taluka" has been shelved by Gujarat State Biodiversity Board, though initially proposed. Hence, it is given to understand that the earlier proposed biodiversity park will not be further developed in the study area.

4.5.2. Floral Abundance, Frequency and Density

Based on our vegetation sampling data we derived various measures of abundance of plants species in the core and buffer area of the project site (Table-4.4). These parameters help understand the vegetation community structure in the project area/core area and buffer area/ surrounding area. We found total 12 species of Grass, 12 herbs, 4 shrubs and 2 tree species in the project core area. Where as we reported total 22 species of grasses, 26 species of herbs, 8 species of shrubs and 7 species of trees during our sampling efforts in the buffer areas. There could be more species of plants in the study area. However, our sampling and analysis of the vegetation data suggests that the abundance and density of plant species are lower in the core and buffer area (Table-4.4). This suggests that the area falls in Arid-

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Table-4.4: Floral Diversity and their relative frequency, abundance density, important value index for core and buffer area.

No	Type/ Class	Species	Abundance		Relative Frequency		Relative Dominance		Relative Density		IVI	
			Buffer	Core	Buffer	Core	Buffer	Core	Buffer	Core	Buffer	Core
1	Grass	*Aeluropus lagopoides*	1.86	1.6	7.45	16.7	7.40	8.3	10.24	22.2	25.09	47.2
2	Grass	*Apluda mutica*	1.60	1	5.32	3.3	3.70	8.3	6.30	2.8	15.32	14.4
3	Grass	*Aristida adscensionis*	1.33		3.19		3.70		3.15		10.04	
4	Grass	*Aristida funiculata*	1.50	1.3	6.38	13.3	3.70	8.3	7.09	13.9	17.17	35.6
5	Grass	*Aristida histricula*	1.00		5.32		3.70		3.94		12.96	
6	Grass	*Cenchrus ciliaris*	1.00	1	4.26	6.7	3.70	8.3	3.15	5.6	11.11	20.6
7	Grass	*Chloris barbata*	1.20		5.32		3.70		4.73		13.75	
8	Grass	*Chloris quinquesetica*	1.00		4.26		3.70		3.15		11.11	
9	Grass	*Chrysopogon fulvus*	1.50		4.26		3.70		4.73		12.68	
10	Grass	*Cymbopogon martinii*	2.00	1.3	6.38	13.3	3.70	8.3	9.45	13.9	19.54	35.6
11	Grass	*Cynodon dactylon*	1.00		4.26		3.70		3.15		11.11	
12	Grass	*Cyperus difformis*	1.00	1	4.26	3.3	3.70	8.3	3.15	2.8	11.11	14.4
13	Grass	*Cyperus flavidus*	1.00	1	6.38	6.7	3.70	8.3	4.73	5.6	14.81	20.6
14	Grass	*Dactyloctenium aegypticum*	1.00		4.26		3.70		3.15		11.11	
15	Grass	*Dactyloctenium sindicum*	1.50		2.13		3.70		2.36		8.19	
16	Grass	*Desmostachya bipinnata*	1.00	1	1.06	10	3.70	8.3	0.79	8.3	5.55	26.7
17	Grass	*Dichanthium annulatum*	1.40	1	5.32	3.3	3.70	8.3	5.51	2.8	14.53	14.4
18	Grass	*Eragrostis cilianensis*	1.50	1	2.13	10	3.70	8.3	2.36	8.3	8.19	26.7
19	Grass	*Heteropogon contortus*	1.25	1	4.26	3.3	3.70	8.3	3.94	2.8	11.90	14.4
20	Grass	*Ischaemum indicum*	1.50		2.13		3.70		2.36		8.19	
21	Grass	*Sporolobus maderaspatenus*	1.20		5.32		3.70		4.73		13.75	
22	Grass	*Urochondra setulosa*	1.67	1.3	6.38	10	18.51	8.3	7.88	11.1	32.77	29.4
23	Herb	*Achyranthus aspera*	1.17	1	3.59	2.4	4.69	0.1	2.64	1.3	10.92	3.8
24	Herb	*Aerva javanica*	1.13	1	4.79	4.8	7.04	0.1	3.40	2.6	15.22	7.5
25	Herb	*Ageratum conezoides*	1.00		1.20		4.69		0.75		6.64	

26	Herb	*Aloe barbandensis*	1.00		0.60		4.69		0.38		5.67	
27	Herb	*Argemone mexicana*	1.00		2.40		0.05		1.51		3.95	
28	Herb	*Casia auriculata*	1.00	1	2.99	9.5	0.05	0.1	1.89	5.3	4.93	14.9
29	Herb	*Censia coromandelica*	1.33		1.80		0.05		1.51		3.35	
30	Herb	*Citrulus colocynthis*	1.00		0.60		0.05		0.38		1.02	
31	Herb	*Coculus hirsutus*	1.00		1.80		0.05		1.13		2.98	
32	Herb	*Cressa cretica*	6.00	1	1.20	4.8	8.44	0.1	4.53	2.6	14.17	7.5
33	Herb	*Crotolaria lutescens*	1.00		1.20		4.69		0.75		6.64	
34	Herb	*Fagonia indica*	1.00	1	0.60	4.8	7.04	0.1	0.38	2.6	8.01	7.5
35	Herb	*Indigofera cordifolia*	1.00	1	1.20	2.4	5.86	0.1	0.75	1.3	7.82	3.8
36	Herb	*Indoneesiella echioides*	1.00		4.79		5.02		3.02		12.83	
37	Herb	*Justicia procumbens*	1.00		2.40		0.05		1.51		3.95	
38	Herb	*Lepidagathis trimerus*	1.00		1.80		0.05		1.13		2.98	
39	Herb	*Leptochloa fusca*	1.00		1.80		0.05		1.13		2.98	
40	Herb	*Metanus emarginatus*	1.00	1	2.99	4.8	0.05	0.1	1.89	2.6	4.93	7.5
41	Herb	*peristrophe bicalyculata*	1.00	1	1.20	2.4	0.09	0.1	0.75	1.3	2.05	3.8
42	Herb	*Plantago ovata*	2.25		2.40		0.05		3.40		5.84	
43	Herb	*Salicarnia brachiata*	1.50	1	1.20	4.8	0.05	0.1	1.13	2.6	2.38	7.5
44	Herb	*Scirpus tuberosus*	2.00	1	1.80	4.8	0.05	0.1	2.26	2.6	4.11	7.5
45	Herb	*Solanum xanthocarpum*	1.00	1	2.99	4.8	0.05	0.1	1.89	2.6	4.93	7.5
46	Herb	*Suaeda meritima*	1.00	2	1.20	7.1	0.05	0.1	0.75	7.9	2.00	15.1
47	Herb	*Tephrosia purpurea*	1.00		1.20		0.05		0.75		2.00	
48	Herb	*Tribulus terrestris*	1.00		1.20		0.05		0.75		2.00	
49	Shrub	*Balanites aegyptica*	1.00		1.80		0.05		1.13		2.98	
50	Shrub	*Calotropis procera*	1.25	1	2.40	2.4	0.05	9.4	1.89	1.3	4.33	13.1
51	Shrub	*Capparis decidua*	1.00	1	1.20	4.8	0.05	9.4	0.75	2.6	2.00	16.8
52	Shrub	*Commiphora wightii,*	1.00		1.20		0.05		0.75		2.00	
53	Shrub	*Prosopis juliflora*	1.00	5.3	2.99	16.7	4.69	37.7	1.89	48.7	9.57	103
54	Shrub	*Salvadora oliodes*	3.70		13.77		13.60		32.08		59.45	

55	Shrub	*Salvadora persica*	1.67		3.59		0.09		3.77		7.46	
56	Shrub	*Zizyphus numularia*	1.00	1	2.40	7.1	11.73	4.7	1.51	3.9	15.63	15.8
57	Tree	*Acacia leucophloea*	1.00	1	2.40	4.8	11.73	18.8	1.51	2.6	15.63	26.2
58	Tree	*Acacia nilotica*	1.00	1.3	1.20	7.1	0.05	18.8	0.75	5.3	2.00	31.2
59	Tree	*Acacia senegal*	1.00		2.99		0.05		1.89		4.93	
60	Tree	*Acacia tortilis*	2.00		2.99		0.09		3.77		6.86	
61	Tree	*Avicennia marina*	1.00		1.80		0.05		1.13		2.98	
62	Tree	*Butea monosperma*	1.00		1.20		0.05		0.75		2.00	
63	Tree	*Prosopis cineraria*	1.33		7.19		4.69		6.04		17.91	

semi arid condition. As per classification of biome, biogeographic zone, biogeographic province, this area falls in Indian Desert/Kutch Desert/Northern Thorny Scrub Forest. These classifications of the study area suggest lower abundance, density and diversity of plants in the region is reflected in our floral study of the project area.

4.5.3. Dominant Plant Species

Important Value Index is a parameter for calculating the dominance and diversity indices for vegetation as it is combination of frequency, density and dominance. Based on our survey results we found that *Prosopis juliflora* & *Zizyphus numularia, Salvadora,* in shrubs and *Cymbopogon martini, Aristida, Dichanthium annulatum,* in grasses and *Casia auriculata etc. in herbs* are the most dominant species in the region (Table4-4). This is derived through, the Important Value Index (IVI) that we calculated for various plant species through quadrate sampling (Table-4.4). IVI for *Prosopis juliflora* was 58.7 in buffer and 103.0 in core area. Whereas, *Aeluropus lagopoides (9.5/47.2), Cymbopogon martinii* (*116.7/*35.6*)* were in the buffer and core areas respectively.

4.5.4. Invasive or Exotic Species

Prosopis juliflora is an evergreen tree native to South America, Central America and the Caribbean. In the United States, it is well known as mesquite. It is fast growing, nitrogen-fixing and tolerant to arid conditions and saline soils. *Prosopis julifl*ora is an exotic and invasive widespread, multi-branched shrub/tree species in the India. It has been invading grasslands, native scrubland and forests of Gujarat and India.

Our study showed that the *Prosopis juliflora* is one of the most dominant and wide spread in the core and buffer areas of the project site. Our biodiversity, abundance, density measures suggests *Prosopis juliflora* is fast growing in the area.

4.5.5. Floral Biodiversity in the Study Area

In order to understand the status of vegetation communities in terms of stability, diversity indices such as species dominance, species diversity, similarity index and abundance are derived.

Table-4.5: Biodiversity indices (Averages) for core and buffer areas.

Indices	Buffer Area		Core Area	
	Grass	Other vegetation	Grass	Other vegetation
Species Richness	22	41	12	18
Dominance_D	0.05	0.12	0.12	0.26
Simpson_1-D	0.94	0.88	0.88	0.74
Shannon_H	2.96	2.97	2.26	2.08
Evenness_e^H/S	0.88	0.47	0.80	0.44

Shannon-Wiener Diversity Index: The biodiversity values for core and buffer areas were derived from the quadrate samples laid in the field. The value of the Shannon-Wiener Index (H') usually lies between 1.5 and 3.5 for ecological data and rarely exceeds 4.0. Lower value of Shannon-Wiener Index (H') suggests degraded or arid conditions with low biodiversity values. Our results suggest the H' value to be normal for the dry arid conditions (Table-4.5). There was difference between the core and buffer area in terms of diversity indices. This was because core area mostly consists of Prosopis juliflora dominated bushes and saline land with open wasteland where as in buffer area there is variety of habitats and agriculture lands.

Species Richness (S): It is a count of the number of species found when the observers sample the community. It is represented by "S". Our data analysis for the core and buffer zone suggests that average species richness per sample is lower in core area compared to that of buffer area (Table-4.5). This is because of the difference in the land use types in core and buffer areas.

Simpson's Diversity Index (D): The Simpson index is one of the most meaningful and robust diversity measures available. In essence it captures the variance of the species abundance distribution. It is a diversity index

proposed by Simpson (1949), to describe the probability that a second individual drawn from a population should be of the same species as the first. The value of D varies between 0 and 1. Our data analysis suggests that relatively core area is less diverse than the buffer area as the D value is higher in core area than in the buffer area (Table-4.5).

Evenness: It is a measure of species diversity, which quantifies how equal the community is numerically. The less variation in communities between the species show higher evenness. The value varies between 0 and 1. Our data analysis for core and buffer zone showed higher values of this index suggesting that the communities of vegetation does not vary much within the core and outside in the buffer areas (Table 4-5).

4.5.6. Endangered/Threatened/Protected Species

Our field survey in the project area suggest that there are no endangered, endemic, rare plant species present within the project boundary i.e. core area. However, we found an important species i.e. *Commiphora wightii*, in the buffer area with low abundance and frequency of occurrence (Table-4.4). This plant has high medicinal value and is facing the threats of extinction by overexploitation for commercial purpose (GUIDE, 2009, Joshi et al. 2005) from Kutch.

4.6. Faunal Diversity and Species Inventory

The present study has made assessment of 3 major higher vertebrate classes such as Reptiles, Birds and Mammals. The assessment of fauna representing higher trophic levels in the ecosystem was carried out since their diversity acts as indicators of the health of the ecosystem in which they live. The details of the results/observations are given as following.

4.6.1. Reptiles Species Recorded During the Survey

Majority of the reptile species are fossorial in habit, therefore the assessment of reptiles and their diversity etc. holds special significance for any

development project. In the present study we identified a total of 6 species of reptiles within the core area and 12 species in the buffer area (Table-4.6).

Table-4.6: Checklist of reptiles reported form the core and buffer area.

S. No.	Name of Species		Conservation Status as per IWPA-1972 (Schedule I to VI)	Conserv -ation Status as per IUCN	Observed/ Reported	
	Common Name	Scientific Name			Core Area	Buffer Area
1	Cheakered Keelback	*Natrix piscator*	Schedule-IV	LC		1
2	Common Skink	*Mubuya carinata*	Schedule-IV	LC	1	1
3	Fan Throated Lizard	*Sitana ponticeriana*	Schedule-IV	LC	1	1
4	Flap shell Turtle	*Lissemus punctatea*	Schedule-I	LC		1
5	Garden Lizard	*Calotes versicolor*	Schedule-IV	LC	1	1
6	Indian Fringe Toed Lizard	*Acanthodactylus cantoris*	Schedule-IV	LC	1	1
7	Indian monitor lizard	*Varanus bengalensis*	Schedule-I	LC		1
8	John Sand Boa	*Eryx johni*	Schedule-IV	LC	1	1
9	Rat Snake	*Ptyas mucosus*	Schedule-IV	NT		1
10	Saw scaled Viper	*Echis carinatus*	Schedule-IV	NT		1
11	Short tailed Agama	*Agama minor*	Schedule-IV	LC	1	1
12	Spiny-tailed Lizard	*Uromastix hardwickii*	Schedule-II	LC		1
VU=Vulnerable, EN=Endangered, NT=Near Threatened, LC=Least Concerned						

Of the reported reptiles species in the buffer area, 2 species (Flap shelled turtle and Indian Monitor Lizard) belong to Schedule-I of the Wildlife Protection Act 1972. No threatened species of reptiles as classified by the IUCN are reported from core or buffer area during our survey. The Indian Flap shell turtle was reported from waterbodies in buffer area which is common throughout country is also listed as least concerned by IUCN. However, one species belong to Schedule-II (Spiny tailed Lizard) where as reset of the species belong to Schedule-IV. Majority of the reptile species (except Rat snake and Saw scaled viper) reported from the buffer area fall in 'Least Concerned' category of IUCN. No endangered, rare, threatened or endemic species of reptiles was reported from the project core area.

4.6.2. Birds Species Recorded During the Survey

During the study we observed a total of 95 bird species in the study area. Majority of the species (74) are resident specie, where as only 21 species were found to be migratory (Table-4.7). Of these 95 recorded bird species, 89 belong to 'Least Concerned' category rated by IUCN where as total 6 species are i.e. Painted Stork, Oriental White Ibis, Eurasian Curlew, Lesser Flamingo, Oriental Darter and Black tailed Godwit belong to Near Threatened Species (Table-4.7).

Majority of the birds reported from the core and buffer area belong to the Schedule-IV of Wildlife Protection Act 1972 (Table-4.7). Whereas, total 5 species (Black shoulder kite, Eurasian Spoonbill, Indian Peafowl, Marsh Harrier, Shikra) belong to Schedule-I of IWPA 1972. Whereas House crow belong to Schedule-V.

The birds were recorded mainly from non-forested, degraded areas and in the surrounding agriculture landscape interspersed with scattered trees and drainages. The bird species groups observed in the study area were represented by species of open scrubland such as Passerines, Shrikes, Francolin, etc. and waterbodies birds such as Waders/shorebirds, Waterbirds, Egrets, Herons sandpipers, plovers etc. Majority of the birds observed in the study area represent birds of wetlands, coastal mudflats, wetland and semi arid non-forested landscapes etc. Moreover, many of the bird species reported in the present study are common even in human dominated landscapes such as urban cities, lakes and ponds etc. Majority of the waterbird species reported here are found from adjoining reserve forest areas, mangrove creeks, and mudflats located south-west side in the study area. Intertidal mudflats, saltpan and the coastal creeks provide suitable mix of wetland habitat which attracts large populations of migratory and resident birds. Most importantly this area provides much needed staging and stop over sites for the migratory birds flying on Central Asian Migratory bird Flyway. The Modhva coastal area is well known amongst the birdwatcher as it is one of the most important and prominent birdwatching and bird photography sites of Kutch. However, this site is located beyond 11.0 km

Table-4.7: Inventory of birds reported from the study area with their conservation status.

S. No.	Name of Species		IWPA-1972 Status	IUCN Status	Observation		Migratory
	Common Name	Scientific Name			Core	Buffer	
1	Asian Koel	*Eudynamys scolopacea*	Schedule-IV	LC		1	R
2	Baya Weaver	*Ploceus philippinus*	Schedule-IV	LC		1	R
3	Black drongo	*Dicrurus macrocercus*	Schedule-IV	LC	1	1	R
4	Black Francolin	*Francolinus francolinus*	Schedule-IV	LC	1	1	R
5	Black headed Gull	*Larus ridibundas*	Schedule-IV	LC		1	M
6	**Black shoulder kite**	***Elanus caeruleus***	**Schedule-I**	**LC**		**1**	**R**
7	Black winged stilt	*Himantopus himantopus*	Schedule-IV	LC		1	R
8	Black-tailed Godwit	*Limosa limosa*	Schedule-IV	**NT**		1	M
9	Blue rock pigeon	*Columba livia*	Schedule-IV	LC	1	1	R
10	Brown headed Gull	*Larus brunnicephalus*	Schedule-IV	LC		1	M
11	Cattle egret	*Bulbulcus ibis*	Schedule-IV	LC	1	1	R
12	Chestnut-bellied Sandgrouse	*Pterocles exustus*	Schedule-IV	LC		1	R
13	Comb Duck	*Sarkidiornis melanotos*	Schedule-IV	LC		1	R
14	Common babbler	*Turdoides caudatus*	Schedule-IV	LC	1	1	R
15	Common Coot	*Fulica atra*	Schedule-IV	LC		1	R
16	Common Crane	*Grus grus*	Schedule-IV	LC		1	R
17	Common Crested Lark	*Galerida cristata*	Schedule-IV	LC	1	1	R
18	Common Greenshank	*Tringa nebularia*	Schedule-IV	LC		1	R
19	Common Hoopoe	*Upupa epops*	Schedule-IV	LC	1	1	R
20	Common Iora	*Aegithina tiphia*	Schedule-IV	LC		1	R
21	Common Kingfisher	*Alcedo atthis*	Schedule-IV	LC		1	R
22	Common myna	*Acridotheres tristis*	Schedule-IV	LC	1	1	R
23	Common Redshank	*Tringa totanus*	Schedule-IV	LC	1	1	R
24	Common Sandpiper	*Actitis hypoleucos*	Schedule-IV	LC	1	1	R
25	Common tailor bird	*Orthotomus sutorius*	Schedule-IV	LC		1	R
26	Common Woodshrike	*Tephrodornis pondicerianus*	Schedule-IV	LC	1	1	R
27	Coppersmith Barbet	*Megalaima haemacephala*	Schedule-IV	LC		1	R
28	Crab Plover	*Dromas ardeola*	Schedule-IV	LC		1	M
29	Desert Wheatear	*Oenanthe deserti)*	Schedule-IV	LC	1	1	M
30	Dunlin	*Calidris alpine*	Schedule-IV	LC		1	M

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31	Eurasian collared dove	*Streptopelia decaocto*	Schedule-IV	LC	1	1	R
32	Eurasian Curlew	*Numenius arquata*	Schedule-IV	**NT**		1	M
33	Eurasian Oystercatcher	*Haematopus ostralegus*	Schedule-IV	LC		1	M
34	**Eurasian Spoonbill**	***Platalea leucorodia***	**Schedule-I**	**LC**		1	R
35	European Roller	*Coracias garrulus*	Schedule-IV	LC		1	M
36	Franklin's Prinia	*Prinia hodgsonii*	Schedule-IV	LC	1	1	R
37	Graceful Prinia	*Prinia gracillis*	Schedule-IV	LC		1	R
38	Great Cormorant	*Phalacrocorax carbo*	Schedule-IV	LC		1	R
39	Great White Pelican	*Pelecanus onocrotalus*	Schedule-IV	LC		1	M
40	Greater couckal	*Centropus sinensis*	Schedule-IV	LC	1	1	R
41	Greater Flamingo	*Phoenicopterus roseus*	Schedule-IV	LC		1	R
42	Greater Painted-Snipe	*Rostratula benghalensis*	Schedule-IV	LC		1	R
43	Green bee eater	*Merops orientalis*	Schedule-IV	LC	1	1	R
44	Green Sandpiper	*Tringa ochropus*	Schedule-IV	LC		1	R
45	Grey francolin	*Francolinus pondicerianus*	Schedule-IV	LC	1	1	M
46	Grey heron	*Ardea cinerea*	Schedule-IV	LC		1	M
47	House crow	*Corvus splendens*	Schedule-V	LC		1	R
48	House sparrow	*Passer domesticus*	Schedule-IV	LC		1	R
49	**Indian Peafowl**	***Pavo cristatus***	**Schedule-I**	**LC**		1	R
50	Indian pond heron	*Ardeola grayii*	Schedule-IV	LC		1	R
51	Indian robin	*Saxicoloides fulicata*	Schedule-IV	LC	1	1	R
52	Indian Roller	*Coracias benghalensis*	Schedule-IV	LC	1	1	R
53	Indian silverbill	*Lonchura malabarica*	Schedule-IV	LC	1	1	R
54	Jungle babbler	*Turdoides striatus*	Schedule-IV	LC	1	1	R
55	Jungle Crow	*Corvus macrorhynchos*	Schedule-IV	LC	1	1	R
56	Kentish Plover	*Charadrius alexandrinus*	Schedule-IV	LC		1	M
57	Large Egret	*Casmerodius albus*	Schedule-IV	LC		1	R
58	Laughing dove	*Streptopelia senegalensis*	Schedule-IV	LC	1	1	R
59	Lesser Flamingo	*Phoenicopterus minor*	Schedule-IV	NT		1	R
60	Little cormorant	*Phalacrocorax niger*	Schedule-IV	LC		1	R
61	Little egret	*Egretta garzetta*	Schedule-IV	LC		1	R
62	Little grebe	*Tachybaptus ruficollis*	Schedule-IV	LC		1	R
63	Little Ringed Plover	*Charadrius dubius*	Schedule-IV	LC		1	M

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64	Long tailed shrike	*Lanius schach*	Schedule-IV	LC	1	1	R
65	**Marsh Harrier**	***Circus aeruginosus***	**Schedule-I**	**LC**		1	M
66	Marsh Sandpiper	*Tringa stagnatilis*	Schedule-IV	LC		1	M
67	Median Egret	*Mesophoyx intermedia*	Schedule-IV	LC		1	R
68	**Oriental Darter**	***Anhinga melanogaster***	**Schedule-IV**	**NT**		1	R
69	Oriental magpie robin	*Copsychus saularis*	Schedule-IV	LC	1	1	R
70	Oriental White Ibis	*Threskiornis melanocephalus*	Schedule-IV	**NT**		1	R
71	Oriental White-eye	*Zoosterops palpebrosus*	Schedule-IV	LC		1	R
72	Painted Stork	*Mycteria leucocephala*	Schedule-IV	**NT**		1	R
73	Pied Avocet	*Recurvirostra avosetta*	Schedule-IV	LC		1	M
74	Pied Kingfisher	*Ceryle rudis*	Schedule-IV	LC		1	R
75	Purple Moorhen	*Porphyrio porphyrio*	Schedule-IV	LC		1	R
76	Purple sunbird	*Nectarinia asiatica*	Schedule-IV	LC	1	1	R
77	Red vented bulbul	*Pycnonotus cafer*	Schedule-IV	LC	1	1	R
78	Red wattled lapwing	*Vanellus indicus*	Schedule-IV	LC	1	1	R
79	River Tern	*Sterna aurantia*	Schedule-IV	LC		1	R
80	Rose ringed parakeet	*Psittacula krameri*	Schedule-IV	LC	1	1	R
81	Ruff	*Philomachus pugnax*	Schedule-IV	LC		1	M
82	Rufus tailed lark	*Ammomanes phoenicurus*	Schedule-IV	LC	1	1	R
83	**Shikra**	***Accipiter badius***	**Schedule-I**	**LC**		1	R
84	Singing Bush-Lark	*Mirafra cantillans*	Schedule-IV	LC	1	1	R
85	Southern Grey Shrike	*Lanius meridionalis*	Schedule-IV	LC	1	1	R
86	Stone-Curlew	*Burhinus oedicenemus*	Schedule-IV	LC	1	1	R
87	Sykes's Crested Lark	*Galerida deva*	Schedule-IV	LC	1	1	R
88	Variable Wheatear	*Oenanthe picata*	Schedule-IV	LC	1	1	M
89	Western Reef Egret	*Egretta gularis*	Schedule-IV	LC		1	R
90	White throated kingfisher	*Halcyon smyrnensis*	Schedule-IV	LC		1	M
91	White Wagtail	*Motacilla alba*	Schedule-IV	LC	1	1	R
92	White-eared Bulbul	*Pycnonotus leucotis*	Schedule-IV	LC	1	1	R
93	Wire-tailed Swallow	*Hirundo smithii*	Schedule-IV	LC		1	R
94	Wood Sandpiper	*Tringa glareola*	Schedule-IV	LC	1	1	M
95	Yellow wattled lapwing	*Vanellus malarbaricus*	Schedule-IV	LC		1	R

NT=Near Threatened, LC=Least Concerned; R=Resident, M=Migratory

therefore, lies outside the study area. Majority of the resident species reported in the study area are known to breed in this region as well as in entire Gujarat. No rare, endangered, endemic bird species were found to breed in the core project area.

4.6.3. Mammal Species Recorded During the Survey

We observed a total of 13 mammal species in the buffer area and 6 in the core area of the project site (Table- 4.8). The common mammalian species that were directly observed in the core area include Indian Jackal, Wild Pig, Common Mongoose, Indian Hare, Indian desert gerbil and Five Striped Squirrel etc.

No Threatened or Schedule-I species reported from the core area of the project site (Table-4.8). Indian Jackal, Jungle cat, Indian Fox, Common Mongoose belong to Schedule-II of IWPA 1972. Whereas Nilgai, Wildpig belong to Schedule-III. Rest of the species belong to Schedule-IV of WPA. Majority of the common mammalian species recorded during the survey in the core and buffer area are present throughout semiarid, non-forested and non-protected landscapes especially in Kutch region.

4.6.4. Dominant Faunal Species in the Core & Buffer Area

Based on our observations, interview survey of local people, forest officials and NGOs working in nature conservation activities in Kutch region, we found that Nilgai, Wild Pig are most common and dominant mammal species present in the landscape. Whereas there were several birds species belong to Passerine were most common and dominant group of birds present in the core and buffer area of the project site. Among reptiles, Spiny tailed Lizard, common garden lizard, Indian Monitor Lizard etc. were most common species present in the buffer areas of the project site.

Table-4.8: Inventory and conservation status of mammals reported from study area.

S. No.	Name of Species		Conservation Status as per IWPA-1972	Conservation Status as per IUCN	Observation	
	Common Name	Scientific Name			Core	Buffer
1	Indian Jackal	*Canis aureus*	Schedule-II	LC	1	1
2	Jungle cat	*Felis chaus*	Schedule-II	LC		1
3	Indian Fox	*Vulpes bengalensis*	Schedule-II	LC		1
4	Nilgai	*Boselaphus tragocamelus*	Schedule-III	LC		1
5	**Chinkara**	***Gazella bennettii***	**Schedule-I**	**LC**		**1**
6	Indian Hare	*Lepus nigricollis*	Schedule-IV	LC	1	1
7	Wild Pig	*Sus scrofa*	Schedule-III	LC	**1**	1
8	Common mongoose	*Herpestes edwardsi*	Schedule-II	LC	1	1
9	Indian porcupine	*Hystrix indica*	Schedule-IV	LC		1
10	Palm squirrel	*Funambulus pennanti*	Schedule-IV	LC	1	1
11	Fruit Bat	*Cyanopterus sphynx*	Schedule-V	LC		1
12	Long-eared hedgehog	*Hemiechinus auritus*	Schedule-IV	LC	1	1
13	Indian desert gerbil	*Meriones hurrianae*	Schedule-IV	LC		1

4.6.5. Wildlife Corridors

Our observations suggested that there is no rare, endangered, conservation concern species of fauna present within the proposed project core area. The proposed project area for Copper Refinery Plant is not a part of any special habitat (breeding) for any of the Threatened or Schedule-I important fauna and does not provide any contiguity of habitats between two important habitats or any other protected areas. Moreover, the proposed project area is located in close to already industrialized zone therefore; it does not make part of any wildlife habitats. Apart from this, there are no protected areas located within 30.0 km radius of the proposed project site therefore; the proposed area does not seem to make part of any wildlife corridors.

4.6.6. Identification of Species of High Conservation Significance

Based on our extensive field visits, literature survey, and consultation with experts & local people, we found following 8 species that are of high conservation significance (Table-4.9).

Table-4.9: Species of high conservation significance (Threatened or Schedule-I) present in the study area.

S. No.	Name of Species		IWPA-Status	IUCN Status
	Scientific Name	Common Name		
Reptiles	Flap shell Turtle	*Lissemus punctatea*	Schedule-I	LC
	Indian monitor lizard	*Varanus bengalensis*	Schedule-I	LC
Bird	Black shoulder kite	*Elanus caeruleus*	Schedule-I	LC
	Eurasian Spoonbill	*Platalea leucorodia*	Schedule-I	LC
	Indian Peafowl	*Pavo cristatus*	Schedule-I	LC
	Marsh Harrier	*Circus aeruginosus*	Schedule-I	LC
	Shikra	*Accipiter badius*	Schedule-I	LC
Mammal	Chinkara	*Gazella bennettii*	Schedule-I	LC

We found total 8 faunal species belong to Schedule-I of Wildlife Protection Act 1972. These species include 2 species of reptiles, 5 species of birds and one mammal. These species are present in the buffer zone of 10 km radius i.e. study area.

5. Potential Impacts & Mitigations

Impacts of proposed Copper Refinery Plant on flora and fauna of surrounding area were identified mainly by using baseline ecological information presented in previous Chapter-4. The baseline information was collected through direct field visits and substantiated through secondary information including EIA, consultation with local people etc. We also utilized assessment provided in the EIA particularly Air modelling information. Finally, the baseline ecological information was juxtaposed with the project activities and impacts arising due to its construction and operation phases. The specific impacts were visualized in terms of issues related with the ecology of important species issues related with their habitats.

Following the above mentioned approach, impacts on various components of biodiversity were assessed. The component wise identification of potential impacts is deliberated below.

5.1. Anticipated Ecological Impacts of Proposed Project Activity

M/s. Adani Enterprises Limited (AEL) intends to set up a Greenfield copper refinery project of 1.0 MTPA (10 LTPA) capacity in 256.58 ha. of area, which includes facilities like copper smelter, sulphuric acid plant, copper refinery, continuous cast copper wire rod plant, precious metal recovery plant, phosphoric acid plant, aluminium fluoride plant, effluent treatment plant, utilities storage of water and fuel, etc. with the state of the art environment friendly technology, which will be located at Adani Port Special Economic Zone (APSEZ) land in villages Siracha and Navinal, Taluka Mundra, district Kutch, Gujarat.

The above mentioned project in absence of mitigation measures could have numerous ecological impacts during the construction and operation phases. The impacts during construction phase could be short term, temporary in nature and will be confined to the close boundary of the project site. Following are the general ecological impacts anticipated from the construction and operation phases of the copper refinery plant.

- Irreversible change in landuse/habitat worth the project area. Vegetation would be removed from the project site. Total 154.19 ha of APSEZ land and 102.39 ha. forest land would be converted to industrial use.

- Copper is a metal that occurs naturally in the environment, and also in plants and animals. Low levels of copper are essential for maintaining good health. Elevated levels of copper are toxic in aquatic environments and may adversely affect mangroves, mudflats, fish, invertebrates, plants, and amphibians.

- Chronic fugitive emissions and the material flow through water and air could potentially degrade aquatic (mangrove, mudflats, wetlands) and terrestrial eco-systems (reserve forests, vegetation). Copper refinery is likely to release toxic fumes, pollutants such as compounds of sulphur, fumes of metals like Cd, Zn etc., & impurities like Ni, Fe, As, Sb in surrounding environment and cause irreversible damage to ecology if strict environment control measures are not implemented.

- The major impact on terrestrial ecology could be due to emission of dust which will settle on surrounding area soil and vegetation and it would gradually decrease biomass productivity of the eco-systems.

- During the construction work, the excavation of the soil take place and construction wastes such as oil, grease and debris may pollute the soil and decrease its productivity of surrounding Reserve Forests in absence of proper pollution control measures.

- The impact on the terrestrial ecology could be due to the emission of pollutants such as SO_2 and Particulate Matters (PMs) due to dusting. When sulfur dioxide combines with water and air, it forms sulfuric acid, which is the main component of acid rain. Acid rain can cause deforestation and could potentially acidify waterways to the detriment of aquatic life.

- Project site runoff drains into Kotdi creek system of Gulf of Kutch through minor drainages. Chronic spillage and flow of pollutants and dust sediments from the project site through runoff could have severe impacts on flora and fauna of Kotdi creek system which include mangroves, mudflats, birds, fishes, crabs etc.

5.2. Impacts on Terrestrial Flora

Baseline status of terrestrial vegetation clearly suggests that the project sites falls in semi-arid and coastal biogeographic zone with low floral density and diversity.

Removal of vegetation: The proposed copper refinery plant construction activities may involve removal of vegetation from the project site. Out of total 256.58 ha. 33% i.e. 85.79 ha. area would be used for green belt/green cover. Whereas 170.79 ha. area would be cleared off vegetation. Therefore, standing vegetation from total 170.79 ha. area would be removed permanently. The vegetation in the proposed project site consists of mostly *Prosopis juliflora* which is an invasive species. Therefore, the unavoidable removal of vegetation during construction activity from the core area could not be considered significant. However, it is recommended that minimum vegetation shall be removed from the project site and the important plant and tree species on the periphery of the project site be left as part of green belt development. Apart from this, project proponent would be providing compensatory land to forest department which would compensate the loss of forest land.

Pollution affecting soil, water & plants growth: Suspended particulate matter produced during construction and operational phase of the copper refinery plant would be deposited in the surrounding forest areas and water bodies including river will change habitat quality of aquatic and terrestrial ecosystem. Their direct deposition on vegetation causes loss of chlorophyll content in leaves, arrest of photosynthesis process, leaf injuries resulting in restricted growth and regeneration of plants. There are patches of reserve

forest plantations and mangroves located in the buffer area of the proposed project site.

According to air modelling carried out by EIA agency, it is predicted that the pollutants would travel up to 2.2 km North-East direction. The project area is partly located in the forest area. Also there are reserve forest areas located adjacent to the proposed project site, hence chances of pollutants and dust causing degradation of the forests and vegetation in surrounding area is higher if strict pollution control measures are not implemented. Development of thick green belt would also restrict pollutants spreading outside the premises. It is also recommended that a tall compound wall shall be built on the periphery of the project area premises this would restrict spread of pollutants.

Degradation of vegetation due to acid rain: It is also well known through number of studies that SO_2 emission from copper refinery plant has been a major cause of acid precipitation, commonly known as "acid rain," which can damage vegetation. These pollutants originate from copper plants and nearby thermal power plants would interact with reactants present in the atmosphere and result into acid deposition. Due to the interaction of these acids with other constituents of the atmosphere, protons are released causing increase in the soil acidity, lowering of soil pH mobilizes and leaches away nutrient cations and increases availability of toxic heavy metals. Such changes in the soil chemical characteristics reduce the soil fertility, which ultimately causes the negative impact on growth and productivity of forest trees and crop plants. Strict pollution control using state of the art technology measures would restrict emission of gaseous emissions.

Impacts on Reserve Forests and Important flora: Though, we did not report presence of some of the important plant species (probably due to lack of rain species did not occur), according to literature survey, Navinal area at Mundra has representation of native vegetation of Kutch. Some of the important threatened plant species reported from the region include *Dipcadi*

erythraeum, Helichrysum cutchicum, Ephedra foliata, Heliotropium rariflorum, Tribulus rajasthanensis, Pavonia ceratocarpa, Convolvulus stocksii, Commiphora wightii. Out of this *Helichrysum cutchicum, Ephedra foliata and Tribulus rajasthanensis* are endemic species. Our present survey also reported presence of a 'Critically Endangered' species listed by IUCN i.e. *Commiphora wightii* in the surrounding forests and wasteland areas. If no strict pollution control measures are taken, these species and their habitats could be affected. *Commiphora wightii* is medicinally and economically important plant which has very slow growth rate in semi-arid zones. However, their population is quite small and isolated in the buffer area. Also they are found in quite stunted stage. It is recommended that project proponent shall financially support forest department's activities to conserve these endemic and important species found in this region by way of carrying out plantation activities specifically to conserve these species in reserve forest areas of Navinal, Dhrub and Borana.

Impacts on Mangroves: The baseline information suggests that the coastal area of Tunda, Navinal, Shiracha, Jarpara and Tragdi villages have patches of scattered, sparse and dense mangroves. Most of the mangrove areas are located in the notified reserve Mangrove Forest areas of Navinal, Shiracha and Jarpara village coasts. Closest mangrove distribution is located at 170 meters South form the project areas on the bank of Kotdi creek (Map-4.2). However, a sizable patch of dense mangrove is also located on the coast of Tragdi village.

The closest mangrove distribution is located at 170 meters (on bank of Kotdi –II creek) from South of the proposed project site (Map-4.1, & Map-4.2). Therefore, the chances of damage to mangroves by fugitive emission are high which are located immediate south of the project site. Though the predominant wind direction is from south-west in the region, there are still chances of mangrove being impacted due to its close distance from the project site. It is therefore, recommended that strict pollution control measures shall be implemented so that the mangrove south of the project area are least affected.

Apart from the above mentioned impact, a drainage known as Dhaneshri Nadi flows through the western part of the project site and it drains into Kotdi Creek system. Kotdi creek system has sparse and dense mangrove growth on both sides. Therefore, if the Dhaneshri river/drainage is not trained suitably, it may carry spilled out pollutant load from the project area to the mangrove eco-system of Kotdi creek. This may increase heavy metal toxicity to mangrove and its habitats. Therefore, it is recommended that Dhaneshri River should be trained in such a way so that it does not carry runoff from the project area.

Since mangroves are important plants and constitutes important eco-system in the study area, it is recommended that project proponent shall chalk out a detailed mangrove conservation plan. Aim & Objective of mangrove conservation plan shall be to strictly avoid any damage by the project activities, preserve and add more mangrove areas. The mangrove conservation plan shall include following aspects.

- Identification potential mangrove plantation area in the study area for taking up mangrove plantations.
- Systematic monitoring of mangrove stock at every 5 years for 20 years. Monitoring shall include monitoring of species diversity, tree density, tree height, tree girth (GBH), regeneration classes, recruitment classes etc. in the study area.
- Creating awareness about mangrove and their conservation among local villagers in the study area.
- Review of the actions taken at every 5 years and extend the plan accordingly if necessary.

5.3. Impacts on Mudflats

Mudflats refer to land forms near a waterbody that is regularly flooded by tides and is usually barren (without any vegetation). Also known as tidal flats, mudflats are formed upon the deposition of mud by tides or rivers. According to CRZ notification 2019, Biologically Active Mudflats are classified as CRZ--IA areas. Such areas are ecologically most sensitive and generally no activities shall be permitted to be carried out in the CRZ-I A area, with few

exceptions. Since the CZMP maps for Kutch district are not finalized, the extent and locations of mudflats are not yet known. After finalization of CZMP maps for Kutch district coast, they would be shown on map.

Generally, mudflats and mangrove are associated or sometime even integrated eco-systems. Therefore, conservation and preservation measures for mangroves also take care of mudflats. Pre-empting the presence of mudflats in the study area after finalization of CZMPS for Kutch district and possible impacts due to this project, pollution control and conservation measures are envisaged and interventions are proposed for implementation by the project proponent within project boundary and by the forest department outside project boundary. Chronic spillage and flow of pollutants, dust sediments, untreated effluents, construction debris, oil, grease etc from the project site through runoff into Kotdi creek system to be controlled by the project proponent. Project is required to be Zero Liquid Discharge (ZLD) plant. Project proponent shall ensure zero pollution discharge into surrounding areas particularly the intertidal areas which may include mudflats.

To ensure mudflat conservation, it is proposed that outside the project boundary, Forest Department shall implement monitoring by department officials and also through the third party agency for which budget has been proposed in conservation plan. Project proponent shall support forest department's efforts by submitting the proposed cost of conservation for protection and conservation of mangroves, mudflats on the coast of Kutch district particularly on Mundra cost in the study area.

5.4. Impacts on Fauna

Though, the impacts of proposed plant and related construction activities may be on several faunal taxa, but for the present study we focused mainly on vertebrate classes i.e. reptiles, birds and mammals for identification of impacts and future monitoring purpose. Therefore, in the present study we

identified impacts on the reptiles, birds and mammals particularly important, threatened, endemic and flagship species of the landscape.

5.4.1. Impacts on Reptiles

The baseline study has reported total 12 species of reptiles reported from the study area and 6 species from core area. No rare, endangered or Schedule-I species are reported from the core area i.e project site. However, Flap shell Turtle, and Indian Monitor Lizard are reported from the buffer area which belongs to Schedule-I of Wildlife Protection Act 1972. These species are listed as Least concerned as per IUCN Red list categories. However, a species i.e. *Uromastix hardwickii* belong to Schedule-II which is reported from buffer area. This is a resident and most vulnerable species as it is localized and sedentary unlike other reptiles such as snakes and lizards. This species is often hunted or poached for their oil and meat. Therefore, it is recommended that during construction phase no construction workers shall be involved in poaching of such species. Since no rare or high conservation significance species of reptiles is present in the core and immediate buffer area of the proposed project site, the impact on the reptiles could be low. Moreover, it shall be ensured that no vehicle passes through the reserve forest areas located.

5.4.2. Impacts on Birds

We observed total 95 species of birds in the study area. We identified total 5 species of high conservation significance which are protected as Schedule-I species under Wildlife Protection Act 1972. Most important bird habitat is identified near Modhva coast, is located beyond 11.0 km distance i.e. outside the study area. Intertidal mudflat, sandy beach, mangrove, coastal thorn forest etc. provide favourable and suitable habitats to large number of resident and migratory birds. Since this area is located beyound 10.0 km south west from the project site, the impact of project activities is expected to be negligible due to opposite wind direction most time of the year. However, project proponent shall take utmost care in controlling dust, fugitive emissions and pollutants flowing to this area thorugh water or air. Chronic

spillage and flow of pollutants such as, hazardous chemicals, dust sediments, untreated effluents, construction debris, oil, grease etc. from the project site through runoff into Kotdi creek system could potentially affect mangrove eco-system and mudflats if present in the study area, this inturn affect the birds present in the intertidal zone. Therefore, it is recommended that the pollutoin control measures shall be strictly implemented by project proponent during construction and operation phase.

It is often noticed, that construction workers engage in poaching of wild animals particularly birds which are easy to trap using various methods. It is therefore, recommended that construction workers shall be strictly instructed so that they don't engage in such acts. It is also recommended that project proponent shall monitor the status of this ecologically and economically important birdwatching habitat as part of their periodic comprehensive biodiversity monitoring programme.

5.4.3. Impacts on Mammals

We observed a total of 13 mammal species in the buffer area and 6 in the core area of the project site. No Threatened or Schedule-I species reported from the core area of the project site. Majority of the common mammalian species recorded during the survey in the core and buffer area are present throughout semiarid, non-forested and non-protected landscapes especially in Kutch region.

There are only few most common mammals species present in the core area reported during the study. These species would be displaced during construction phase and operation phase. There is only one schedule-I species, present in the buffer area. Overall habitat degradation due to change in landuse pattern, pollution (dusting, air, and noise), increase human presence, increased illumination, increased traffic etc. in and around proposed project area would displace majority of the mammal species from the project core and surrounding buffer areas. Therefore, project proponent shall control emission and dust pollution which would not affect the forest areas and vegetation in the surrounding area which provides resting and feeding habitats to mammalian species in the study area.

6. Wildlife Conservation Plan

Based on our field observations and literature survey we found several species important plant and animal species as well as Schedule-I wildlife species in the study area (Table-6.1). We reported a plant species and 12 animal species. The faunal wildlife species include 2 species of Reptiles, 9 species of birds and one species of mammal.

Table-6.1: Species of higher conservation significance present in the study area for which mitigation plan is recommended.

Sr. No.	Name of Species		IWPA-1972 Status	IUCN Status
	Common Name	Scientific Name		
Plants	Gugal	*Commiphora wightii*		CR
	Mangroves	*Avicennia marina*	Important	LC
Reptiles	Flap shell Turtle	*Lissemus punctatea*	Schedule-I	LC
	Indian monitor lizard	*Varanus bengalensis*	Schedule-I	LC
Bird	Black shoulder kite	*Elanus caeruleus*	Schedule-I	LC
	Eurasian Spoonbill	*Platalea leucorodia*	Schedule-I	LC
	Indian Peafowl	*Pavo cristatus*	Schedule-I	LC
	Marsh Harrier	*Circus aeruginosus*	Schedule-I	LC
	Shikra	*Accipiter badius*	Schedule-I	LC
Mammal	Chinkara	*Gazella bennettii*	Schedule-I	LC

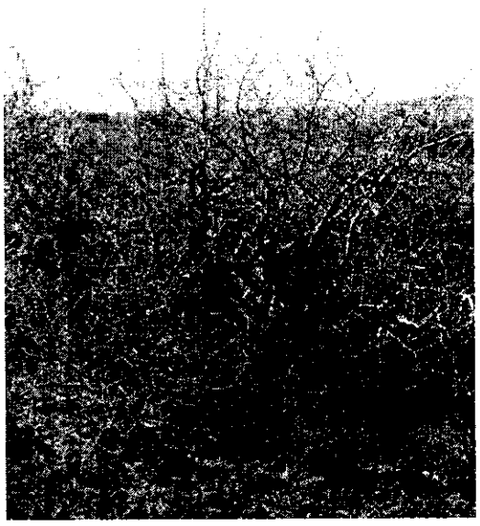
As per the information from Kutch East forest department there are total 71 number of Chinkara and other Schedule-I species present in study area. As per the Information from Kutch East forest department there are zero depredation and crime registered for any Schedule-I species for last two years.

Species wise status, impacts and the mitigation measures are suggested in as follow.

6.1. CRITICALLY ENDANGERED PLANT SPECIES:

Gugal: (*Commiphora wightii*)

Status: Our field survey in the proposed project area revealed that there is a critically endangered plant species present in the buffer areas. However, this plant was found with low density in the buffer area. This plant has high medicinal values and is facing the threats of extinction by over exploitation for commercial purpose (Silori et al., 2004; Joshi, 2002; GUIDE 2009) from Kutch. However, recently Gujarat Forest Department has accomplished a large scale project on plantation of *Commiphora wightii* in Gujarat. Through this project thousands of plants were raised and planted in entire Kutch region. This project has improved the number and density of the species in the region.



Impacts: The construction of copper refinery plant and allied industrial development operations would involve large scale removal or vegetation, excavation, material handling, could result in habitat degradation due to air borne dusting from copper plant, effluent discharge, pollution load, movement of vehicle etc. can potentially affect the density and distribution of this species in the buffer area.

Recommendations: AEL shall put in place all kinds of pollution control measures so that the surrounding vegetation is not degraded and this species along other plants survive normally in the study area. AEL shall carryout comprehensive biodiversity monitoring at regular intervals in order to check impact of their project activities on surrounding area and special emphasis shall be given to this species. It is also recommended that company should take up plantation of *Commiphora wightii* by involving local

forest department, which has vast experience of carrying out plantation of this specialized plant species. Since removal of vegetation would be done in the first year of commencement of the project, it is advised that the plantation shall be carried out in the first year itself. Since the plant is slow growing, it is recommended that a total of 10.0 ha. of *Commiphora wightii* plantation shall be done in the first year itself. Rest of the time Kutch East Forest Division would carry out maintenance of the plants. This plantation shall be carried out in the reserved forests, unclassed forests or roadside areas as found suitable by the Kutch East Forest Division.

6.2. SCHEDULE-I FAUNA

Among the fauna, we reported total 8 animal species. As mentioned above, the faunal wildlife species include 2 species of Reptiles, 5 species of birds and 1 species of mammal.

6.2.1. REPTILE/ INDIAN FLAP SHELL TURTLE/ MONITOR LIZARD

Status: During our study this species of reptile was recorded from the small village ponds in the study area. The species is resident and breeding in the buffer areas. The Indian Flap shell Turtle (*Lissemys punctata*) is a freshwater species of turtles are widespread and common in the South Asian provinces. They are listed as Schedule-I species under Wildlife Protection Act 1972 and as Least Concerned as per IUCN threat categories. Monitor Lizard is also one of the reptile's species which is found in the study area.



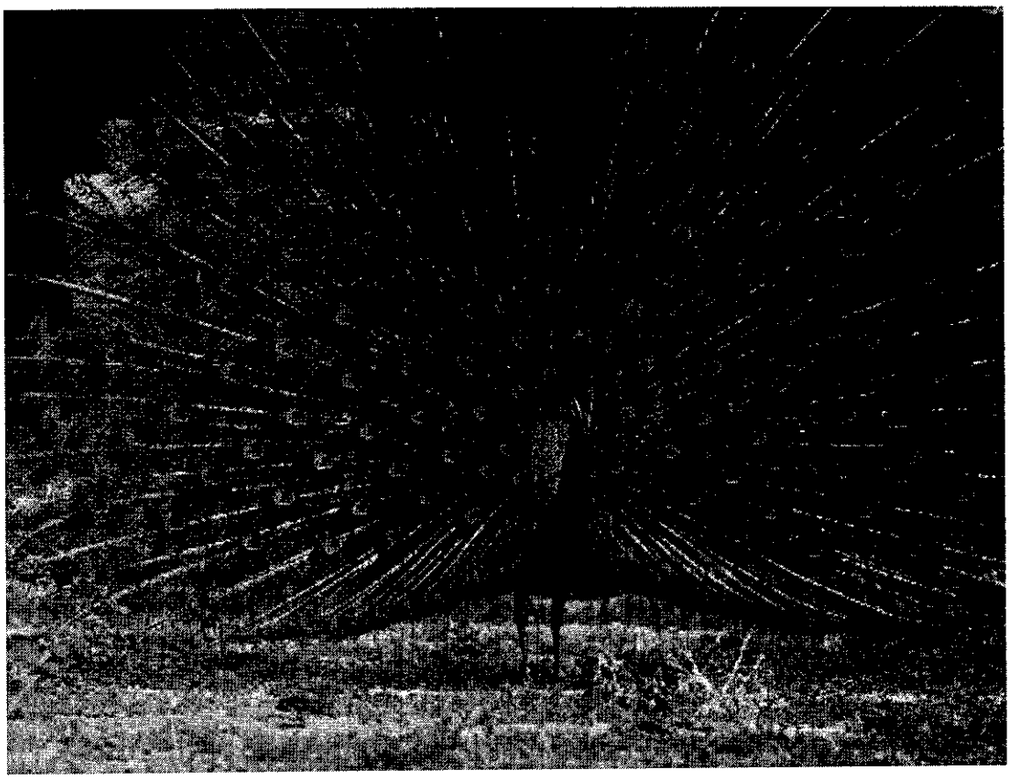
Impacts: Since this species is an aquatic and cold blooded, it may be subjected to impacts related to water pollution and hydrological impacts arising due to project activities. These may include degradation of water sources, soil characteristics, choking of drainages etc. This species is otherwise not hunted or eaten by the people. Therefore, changes of

degradation of overall aquatic habitat qualities in the buffer area are likely to affect these species and their distribution.

Recommendations: AEL shall put all kind of pollution control measures in place so that surrounding area ecological conditions are not degraded. During construction it shall be seen that no drainage, ponds etc. are damaged or altered. AEL shall carryout comprehensive biodiversity monitoring at regular intervals in order to check impact of their project activities on surrounding area and special emphasis shall be given to monitoring of surface (drainage, check dams, ponds) water and wetlands in the buffer area.

6.2.2. BIRDS/ INDIAN PEAFOWL

Status: The Indian Peafowl (*Pavo cristatus*) is a resident breeder in the Indian subcontinent. The bird was justifiably declared as the national bird of India in year 1963 due to its 'flagship' value founded on its glorious position in mythology and its widespread distribution in the country.



The species is found in dry semi-desert grasslands, scrub and deciduous forests. It forages and nests on the ground but roosts on top of trees. It eats seeds, insects, fruits, small mammals and reptiles. The Indian Peafowl is a ground nesting bird and it lays a clutch of 4-8 eggs which take 28 days to hatch. The eggs are light brown and are laid every other day usually in the afternoon. The male does not assist with the rearing, and is illegal. Poaching of peacocks for their feathers and poisoning by feeding on pesticide treated seeds are known threats to wild birds.The collection of tail feathers is only allowed if shed by the bird. The Indian peafowl is under various threats that include the demand for feathers and wild meat, conflict with farmers during cropping season, increased use of chemical fertilizers and pesticides and habitat degradation.

Impacts: Our field study reported presence of Indian Peafowl in the buffer areas of project site. The species was observed in the buffer area of 10 km radius particularly near human habitations, villages and agriculture fields. Since our study reported presence of Indian Peafowl in the buffer area, its possibility of nesting in buffer area could not be ruled out. Since Indian Peafowl is a ground nester, several project activitie can have adverse impacts on their nesting grounds such as pollution, degredation of soil and vegetation from surrounding ara and in the forest areas. Direct disturbance by presence of people, vehicle, their noise, vibrations, lights etc. can potentially disturb most of the bird species.

Recommendations: following actions for the conservation and protection are suggested in wildlife conservation action plan to reduce impacts of project related activities on the species. Based on our field observation on the distribution, behavioral ecology, conservation need, and envisaged impacts of proposed copper refinery project, we identified several species specific actions that would help reduce the impacts of project on Indian Peafowl as under.

i. A rapid survey for the breeding population of Indian Peafowl during their nesting season shall be carried out in pre-monsoon season by

wildlife experts so as to ensure that no nesting of the species is present in and around project or corea area.

ii. Since Indian Peafowl is a ground nesting bird, construction activities could disturb their nesting activities. Therefore if nesting of peafowl is found, in core area, construction activities should not be carried out in that particular block. Construction activities should resume only after egg hatching is completed and the fledglings leave the nest.

iii. Avoid vehicle movement in the area where nesting is found. The movement of vehicles or humans shoul be prohibited in vicinity of the nesting area.

iv. Electric lines within the project area and outside the project area shall be designed to minimize the potential for electrocution of indian peafowl and other such large birds.

v. Lightings within the project area could potentially deter the species presence. Therefore, AEL shall ensure that minimum illumination comes out from the project area. This can be done by adjusting the angles of the light sources and using low intensity focused bulbs inside the project area.

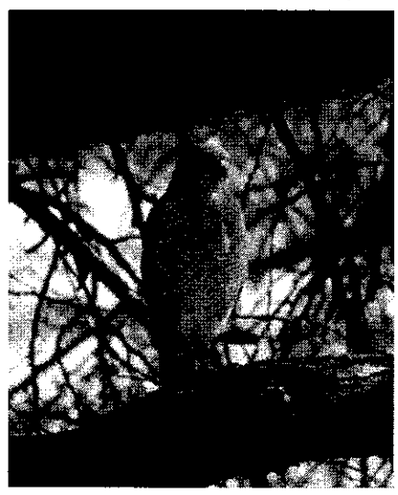
vi. Tree Plantation shall be carried out by AEL in the surrounding villages and schools etc. in the buffer area. This would help the species and provide them much needed roosting place.

vii. Staff involved in construction and operation activities shall be trained and made aware of Indian Peafowl's status as National Bird of India, and Schedule-I species protected under Indian Wildlife Protection Act 1972. This is important because if there any casualties of the species are found then they should report to the project authorities and the local forest department to carryout further necessary actions.

6.2.3. BIRDS/ SCHEDULE-I RAPTORS

Status: Total 3 bird species i.e. terrestrial Raptors belonging to Schedule-I of Wildlife Protection Act 1972 are reported from the study area. These species are Black shoulder kite, Marsh Harrier, Shikra. Of these 3 species of Raptors, none are reported from the core area and all 3 are reported from buffer area. The species of Harriers are migratory bird species whereas, rest of the species are resident species. Most of the raptor species are recently added to Schedule-I list through amendment made in year 2013. Though, only 3 species of Schedule-I raptors reported during the study, there may be more Schedule-I birds/raptors present in the study area. Mitigation measures recommended for Schedule-I birds and raptors would potentially cover other missed out Schedule-I birds/raptors also.

Impacts: These 3 species of terrestrial raptors are predators and occupies tertiary consumers positions in the food chain and ecological pyramids. Therefore, any change in primary productivity would affect their distribution, density and population in the region. Therefore, project activities resulting in air, water and noise pollution, degradation of vegetation would potentially affect the habitat of these bird species and their population in the study area. Moreover, direct disturbance by presence of people, vehicle, their noise, vibrations, lights etc. can potentially displace most of the raptors species from the project area and its immediate surroundings.

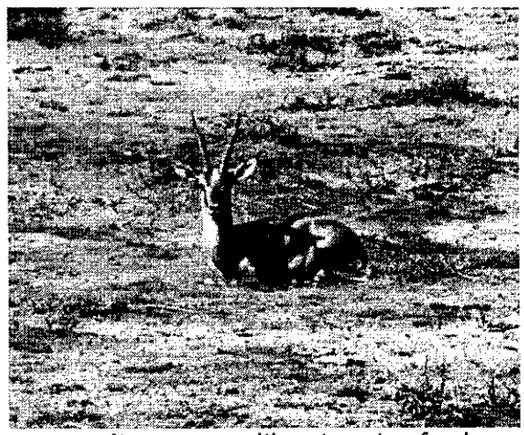


Recommendations: It is recommended that AEL shall take utmost care in controlling dust, fugitive emissions using state of the art technologies and put in place all types of pollution control measures during construction and operation phases which would ensure minimum degradation of surrounding vegetation, forest area vegetation and waterbodies. Minimize vehicle

movements around the project areas. Adjust lightings within core area and ensure minimum illuminations spreads outside the project area. Keep all the machineries maintained so that minimum noise and vibrations are generated in the surrounding area. Since most of the raw materials and products are to be carried through conveyer belts the impact related to vehicle movements would be low.

6.2.4. CHINKARA (*Gazella bennettii*)

Status: The important herbivore present in the buffer area is Chinkara which is protected as Schedule-I species in Wildlife Protection Act 1972. During our survey, we reported presence of Chinkara through direct sightings in the buffer area in the study area. Indian gazelle is a shy animal and avoids human habitation. It stands at 65 centimetres and weighs about 23 kilograms. It can go without water for long periods and can get sufficient fluids from plants and dew. Although most individuals are seen alone, they can sometimes be spotted in groups of up to four animals. It lives in grasslands and desert areas in India. Its population as per latest census report total 71 chinkara are reported from the study area. Narayan Sarovar Wildlife Sanctuary and its surrounding areas are known for Chinkara population. The sanctuary is also known as Narayan Sarovar Chinkara Sanctuary. The species is common in landscape of Kutch and North Gujarat. The species is listed as Schedule-I in Wildlife Protection Act 1972 and as Least Concerned by IUCN. The species needs safe, undisturbed arid semi arid plains with open and sparse vegetation.



Impacts: This mammal species is likely to be using surrounding area for their feeding and breeding. They are also likely to be using waterbodies in the buffer area for their requirement of water. The impacts of copper refinery and allied development activities on herbivore are likely to be direct as they are primary consumers in the eco-system. Degradation of soil, vegetation

and habitat due to chronic pollution loads the species would lose its feeding ground and breeding area. Moreover, the direct loss of habitat worth the core area is also an irreversible loss to the species. Therefore, changes in overall habitat qualities in the buffer area are likely to affect these species. The direct disturbance to these species by vehicle traffic, poaching by workers, and human intrusion in wildlife habitat is also issue of some concern.

Recommendations: It is recommended that AEL shall comply with all the pollution control and other conditions imposed in the environmental clearance by MoEF&CC. Compliance of all the conditions in environment clearance by MoEF&CC would take care of major issue of habitat degradation for the species. AEL shall instruct their own staff members and workers not to indulge in chasing or killing of Chinkara in the study area. AEL shall also support forest department in conducting awareness of local people towards wildlife conservation and law reinforcement and anti poaching activities in the study area. AEL shall support forest department in installing sign boards on roads and strategic locations of villages informing prohibition of killing, poaching etc. under wildlife protection act 1972.

6.3. IMPACT – MITIGATION MATRIX & CONSERVATION PLAN

Based on our observation, literature review and consultation with local people, and NGO, we formulated following impact *vs* mitigation matrix (Table-6.2). The matrix is created using information and data collected during our field visits and the information available in public domain. We calculated distances of **sensitive** ecological receptors such as protected areas, their eco-sensitive zones, biodiversity heritage sites, important bird areas, mangrove, reserve forests, wetlands, rivers etc. from project core areas. Professional judgements and recommendations are made based on our experiences and the parameters used for predicting impacts.

Table-6.2: General Impacts vs. mitigation matrix & Conservation plan.

Issue		Status	Impacts	Mitigation
Ecosystems	Protected Areas	All the protected areas of Kutch are located beyond 70 km from the proposed project area. Marine National Park and Sanctuary areas are located beyond 30 km south of the proposed project in Gulf of Kutch.	No impacts are envisaged, as these areas are located at greater distances.	• Nil
	Eco-sensitive zone	No eco-sensitive zones of any Wildlife Sanctuary or Naitonal park are located within 30 km from the proposed project area.	No impacts are envisaged, as these areas are located at greater distances.	• Nil
	Wetlands & waterbodies	No major inland wetlands are located within study area. Marine wetlands include Kotdi creek (0.5 km, S), Baradimata creek (4.0km SE), Gulf of Kutch (3.9 km, S), Seasonal drainage/rivers are Nagavanti Nadi (4.7 km, E) and Phot Nadi (8.7 km, ENE), Khari Nadi (1.9 km, W), A drainage known as Dhaneshri Nadi flows through the western part of the project site and it drains into Kotdi Creek system. Small check-dams and nallah are present in the study area at distance.	• Kotdi creek system has sparse and dense mangrove growth on both sides. • Dhaneshri river/drainage may carry spilled out pollutant load from the project area to the mangrove eco-system of Kotdi creek. This may increase heavy metal toxicity in mangrove habitats. • If dusting, fugitive emission are not controlled, it could cause major damage to mangroves.	• Therefore, it is recommended that Dhaneshri River should be trained in such a way so that it does not carry pollutants with runoff from the project area. • Install state of the art technologies so that pollution from the project area remains within applicable standards. • Check health of mangrove eco-system at regular intervals. • Prepare a comprehensive mangrove conservation plan for Kotdi and Baradimata creek system's mangroves located in the study area.

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	Important Bird Areas	Banni & Naliya grasslands are two major IBAs of Kutch	No impacts are envisaged, as these IBAs are located far away, 70 km from the project site.	Nil
	Forest Area	Reserve Forest, Unclassed forest areas are located adjacent to proposed project area. In fact part of the project area would be located on diverted Forest land of Siracha village. The south of the proposed project area there are mangroves which are also declared as reserve forest areas by state forest department. Navinal reserve forest area is also located at 500 mtrs distance only from the proposed project area in east direction.	Direct loss of forest land worth 102.39 ha. Pollution loads from project activities could potentially degrade remaining forest land located in Siracha village, Navinal forest area and mangrove reserve forests. As per EIA/air modelling, it is learnt that 2.2 km North-East direction there will be impacts of air pollution. This means it would affect reserve forest area of Navinal. As per literature survey, Navinal area has presence important native species of plants. This forest area would be affected due to chronic air pollution impacts.	• Compensate loss or damage to Forest area due to pollution by taking up plantation of native species. • Construct tall wall around project boundary so that dusting, possibility of fire etc. are minimized. • No roads or trespassing shall be done by staff or workers through Forest area. • No collection of fuel wood from forest land shall be allowed. • No worker camps, dumping of solid waste, over burden inside forest land shall be allowed. • Fire and safety precautions shall be in place during construction and operation phases. • Green belts as per conditions of Environment Clearance shall be created using native species of plants in the periphery of project area. • Install state of the art technologies so that pollution from the project area remains within applicable standards.
	Mangroves	Mangroves are located at 170 mtrs from the project boundary in Kotdi and Baradimata creek systems on the coast of Gulf of Kutch	• Kotdi creek system has sparse and dense mangrove growth on both sides. • Dhaneshri river/drainage may carry spilled out pollutant load from the project area to the mangrove eco-system of Kotdi creek. This may increase heavy metal toxicity in mangrove habitats.	• It is recommended that Dhaneshri River should be trained in such a way so that it does not carry pollutants with runoff from the project area. • Ensure that strict pollution control measures are implemented in the project. • Check health of mangrove eco-system at regular intervals. • Prepare a comprehensive mangrove

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			• If dusting, fugitive emission are not controlled, it could cause major damage to mangroves.	conservation plan for Kotdi and Baradimata creek system's mangroves located in the study area. • Take up mangrove restoration and afforestation activities in consultation with Kutch East forest division.
	Intertidal mudflats	Extent of mudflats on Kutch district coast is yet to be identified officially on Coastal Zone Maps of Gujarat.	• Chronic spillage and flow of pollutants, dust sediments, untreated effluents, construction debris, oil, grease etc from the project site through runoff into Kotdi creek system could affect mangroves and mudflats if present.	• Ensure that strict pollution control measures are implemented in the project. • Project is required to be Zero Liquid Discharge (ZLD) plant. • Project proponent shall ensure zero pollution discharge into surrounding areas particularly the intertidal areas which may include mudflats • Take up mudflat conservation activities in consultation with Kutch East forest division.
Flora	General Vegetation	This area has native vegetation representative of semi arid zones. These include typical tropical thorn forest area comprising of *Acacia, Salvadora, Caparis, Ziziphus, Commphora species.*	There will be irreversible loss of native vegetation from the core area i.e. 256.58 ha. The native vegetation from the immediate surroundings of the proposed project site would also be affected due to pollution load.	• Remove minimum vegetation from core area. • Install state of the art technologies so that pollution from the project area remains within applicable standards. • Vehicle movements shall be minimum. • No vegetation shall be cut by workers from surrounding area. • No collection of fuel wood from surrounding land shall be allowed. • Fire and safety precautions shall be in place during construction and operation Thick green belts shall be created using native species of plants in the periphery of project site.
	Important plant Species	*Commiphora wightii is* an important plant which is listed as Critically Endangered by IUCN. This plant is present in core and buffer area.	This important plant species would be affected in the surrounding area due to air and water pollution loads from project activities.	• Thick green belts shall be created using native species of plants in the periphery of project area. • In order to compensate for the potential

			As per EIA/air modelling, it is learnt that 2.2 km North-East direction there will be impacts of air pollution. Chronic air pollution would affect plant growth in this area.	damage/degradation of *Commiphora wightii* habitats AEL shall carry out plantation through Kutch-East Forest Division, Bhuj.
Fauna	Threatened or Endemic fauna Species	No threatened fauna species are reported from the study area during survey. i.e. core or buffer area during study.	Though, not reported during the present study, there may be presence of these species in future. Degradation of overall habitat could affect these species.	• Install state of the art technologies so that pollution from the project area remains within applicable standards. • Thick green belts shall be created using native species of plants in the periphery of project site. • Carryout biophysical monitoring of intertidal zone located south of project area at every 6 months.
	Schedule-I Reptiles	The Indian Flap shell Turtle (*Lissemys punctata*) is present in ponds and small wetlands of buffer area. Indian Monitor Lizard is present in agriculture, open scrubland and thorny bushes in the project area.	Degradation of overall terrestrial and aquatic habitat qualities in the buffer area are likely to affect these species and their distributions.	• Install state of the art technologies so that pollution from the project area remains within applicable standards. • Monitoring of biodiversity including these species and take corrective measures if needed. • Carry out habitat improvement activities through forest department in surrounding reserve forest areas, which would ensure their long term survival in the region.
	Schedule-I Birds	Indian peafowl and 5 Schedule-I bird species i.e. terrestrial Raptors are present in study area.	Pollution load, overall habitat degradation, direct loss of habitat worth 256.58 ha. and direct disturbance due to vehicle movements, illuminations and project activities could displace and disturb these species from the immediate surroundings of the project area.	• Install state of the art technologies so that pollution from the project area remains within applicable standards. • Maintain machinery so minimum vibrations and noise is controlled within the applicable standards at the boundary of the project. • Adjust lightings in the core area so minimum illumination spread outside core area. • Thick green belts shall be created using native species of plants in the periphery of project

			boundary. • Cary out tree plantations in surrounding villages to augment habitat for Indian Peafowl and other schedule-I birds species. • Monitor biodiversity including bird species and take corrective measures accordingly. • Carryout habitat improvement activities through forest department in surrounding reserve forest areas, which would ensure their long term survival in the region.
Schedule-I Mammals	Only one species of Schedule-I mammal is reported i.e. Chinkara from the study area. None from core area. It is mostly reported from the reserve forest areas within the study area.	Overall degradation of habitat due to pollution. Direct disturbance due to Noise, vibration due to vehicle movements could displace or deter this species. Lighting and illumination could displace the species from surrounding area. Hunting, chasing, killing by workers, road kills etc. are also envisaged.	• Install state of the art technologies so that pollution from the project area remains within applicable standards. • Maintain machinery so minimum vibrations and noise is generated. • Adjust lightings in the core area so minimum illumination spread outside core area. • Thick green belts shall be created using native species of plants in the periphery of project area. • Monitor biodiversity including mammal species and take corrective measures accordingly. • Provide funds for habitat improvement activities by the forest department in surrounding reserve forest areas, this could ensure their long term survival in the region.
Wildlife Corridors	No wildlife corridor is identified under any legal framework in the study area.	Nil	• Nil

6.4. WILDLIFE MITIGATION MEASURES & RECOMMENDATIONS

Based on our field study, information collected and consultation with project proponent, local community etc. we recommend following mitigation measures as self regulatory, monitoring and compensatory measures for protection, conservation and betterment of wildlife and ecology in the surrounding area of project site.

6.4.1. REGULATORY MITIGATION MEASURES & RECOMMENDATIONS

i. Since project deals with heavy metals, acids and hazardous materials, it is recommended that strict control on fugitive emission, dust pollution shall be carried out using state of the art methods and technologies. Maximum area under intensive use shall be made of hard floor. Professional dust suction system from the area under intensive use shall be placed.

ii. Ambient noise pollution and vibrations during construction and operation phases of copper refinery plant shall be within limits of the standards mentioned.

iii. Plantation of thick green belt on periphery of the project site shall be created using native and hardy tree species.

iv. Ensure no movement of vehicles or people through Forest Areas located immediate north (Siracha) and east (Navinal) of proposed copper refinery plant area.

v. Ensure zero discharge of waste water from the project site into surrounding area.

vi. Ensure safe passage of runoff through drainages located within and nearby the project area. It is recommended that a seasonal drainage/river (Dhaneshri River) should be trained in such a way so that it does not carry pollutants from the project site into mangrove eco-system located immediate south of the project boundary.

vii. Ensure no dust, fly ash, sediments, or any raw materials spill out from project areas and flow into nearby drainage, forest areas during the operation phase of the project.

viii. AEL shall ensure that their construction workers and other staff during construction or operational phase shall not be involved in poaching and hunting activities of birds, reptiles or mammals around the project site.

ix. Implement state of the art technologies to control pollution caused form the proposed project.

x. No trespassing or vehicle or people shall be allowed through, surrounding forest area or the mangrove eco-system. This shall be instructed to the workers and staff in advance.

xi. No workers camps shall be established within the surrounding forest area. This shall be instructed to the workers and staff in advance.

xii. No resources (i.e. fuel wood, stones, sand, soil etc.) from the surrounding forest area shall be collected by staff or workers. This shall be instructed to the workers and staff in advance.

xiii. No workers or staff members shall be involved in poaching or killing of any wild animals throughout the project life cycle. This shall be instructed to the workers and staff in advance and sign boards to this effect within project area.

6.4.2. MONITORING MEASURES & RECOMMENDATIONS

xiv. AEL shall regularly monitor health of the forest areas (Siracha and Navinal village), mangrove eco-system (Kotdi and Baradimata creeks) and biodiversity in the study area.

xv. AEL shall carryout annual monitoring of mangrove eco-system in Kotdi and Baradimata creeks. Details of monitoring are provided in mangrove conservation plan.

xvi. After commencement of the project AEL shall carryout comprehensive ecological & biodiversity monitoring at every 2 years for 10 years. The monitoring shall include status of flora, fauna and health of reserve forests and mangrove eco-system present in the immediate proximity of the proposed project site. In case any changes, damage is reported

to them AEL shall take necessary corrective measures accordingly. AEL shall bear the cost of third party monitoring.

xvii. Overall official monitoring would be carried out by Kutch-East Forest Division, Bhuj: AEL shall pay the administrative and monitoring cost for the same.

6.4.3. COMPENSATORY MEASURES & RECOMMENDATIONS

xviii. In view of the probable impacts of construction and operation of copper refinery project on mangroves of Kotdi and Baradimata creek areas, AEL shall chalk out Mangrove Conservation plan.

xix. In order to compensate for the potential damage/degradation of *Commiphora wightii* habitats AEL shall carry out 10.0 ha. of plantation through Kutch-East Forest Division, Bhuj.

xx. In view of the distribution of species of higher conservation significance and the Schedule-I species, in the study area particularly within the reserve forests around the project area, it is recommended that AEL shall financially support wildlife habitat improvement activities being carried out by Kutch East Forest Division.

6.5. IMPLEMENTATION OF MITIGATION PLAN

- Since the project is located away from protected area and their eco-sensitive zones, most of the wildlife mitigation recommendations are self regulatory for user agency, therefore the implementation of these mitigation measures shall be carried out by the user agency (AEL) through their own staff and CER budget.

- A special emphasis on ecological conservation shall be given by extending special responsibility to senior environment authority within the management of the proposed project authority. A senior ecologist shall be employed / consulted on regular basis to oversee ecological/wildlife conservation activates under CER. The senior personal responsible for the conservation of ecology shall report directly to the head of the organization.

- Substantial budget shall be allocated to carryout ecological conservation activities by the user agency (AEL).
- Any additional conditions towards wildlife mitigation activities by any of the Environment Appraisal Committees at state or central levels or by the Forest department shall be complied with.
- Annual Compliance report for these activities shall be submitted to Kutch West East Forest Division, Bhuj, Gujarat.

6.6. MONITORING OF MITIGATION & COMPLIANCES

Though, most of the recommendations are self regulatory for user agency, monitoring of these recommendations and other conditions imposed by various agencies towards wildlife mitigation measures shall be monitored by a third party agency. Third party monitoring would involve comprehensive ecological/biodiversity study at interval of 2 years for 10 years. These studies would be carried out to evaluate long term impacts of the proposed project activities on the wildlife, biodiversity, ecology and forest areas present in the 10 km periphery of the project site. Therefore, as per guidelines issued by the Principle Chief Conservator of Forests, Wildlife dated 13th August 2018, user agency shall allocate up to 5% of the total cost of mitigation plan as third party monitoring cost. Total Rs. 443.5 Lakh shall be allocated by the AEL for monitoring of mitigation plan for the period of 10 years.

Since the area falls under the jurisdiction of Kutch East Forest Division, the overall official monitoring of the implementation of mitigation plan would be carried out by the Kutch East Forest Division, Bhuj. Therefore, as per guidelines issued by the Principle Chief Conservator of Forests, Wildlife dated 13th August 2018, user agency shall allocate and pay the monitoring and administrative cost to the forest department. For carrying out overall monitoring activities, user agency shall pay monitoring and administrative cost to the authorities of Kutch East Forest Division.

7. MANGROVE CONSERVATION PLAN

7.1. Background

M/s. Adani Enterprises Limited (AEL) intends to set up a Greenfield copper refinery project of 1.0 MTPA (10 LTPA) capacity which would include facilities like copper smelter, sulphuric acid plant, copper refinery, continuous cast copper wire rod plant, precious metal recovery plant, phosphoric acid plant, aluminium fluoride plant, effluent treatment plant, utilities storage of water and fuel, etc. with the state of the art environment friendly technology. These facilities would be located in 256.58 ha. of land which include 154.19 ha of APSEZ land and 102.39 ha. forest land. The Gulf of Kutch sea coast is located at 3.9 km south from the proposed project site.

As per Environmental Impact Assessment (EIA) Notification dated 14th September 2006, proposed project falls under category-'A' of project activity 3(a) and requires prior Environmental Clearance (EC) to be obtained from Ministry of Environment, Forest & Climate Change (MoEF&CC) before the commencement of ground activity. The application for prior EC for the proposed project has been submitted to MoEF&CC Terms of Reference (TORs) has been issued by MoEF&CC. The proposed industry is for handling heavy metals and hazardous chemicals which could lead to severe impacts on the surrounding environment and health of eco-systems if not done carefully. In view of the nature of proposed industry and processes involved, it is imperative to consider impacts of such industry on the surrounding eco-systems and take appropriate mitigation measures. Since mangrove eco-system is present south of project boundary, an action plan is proposed to protect and conserve the same.

7.2. Importance of Mangroves

In general, mangroves are known to provide multifold eco-system benefits to mankind. Mangrove ecosystems represent natural capital capable of producing a wide range of goods and services for coastal environments and communities and society as a whole. Some of these include protection of coast from cyclones and disasters, resistant against coastal erosion, carbon

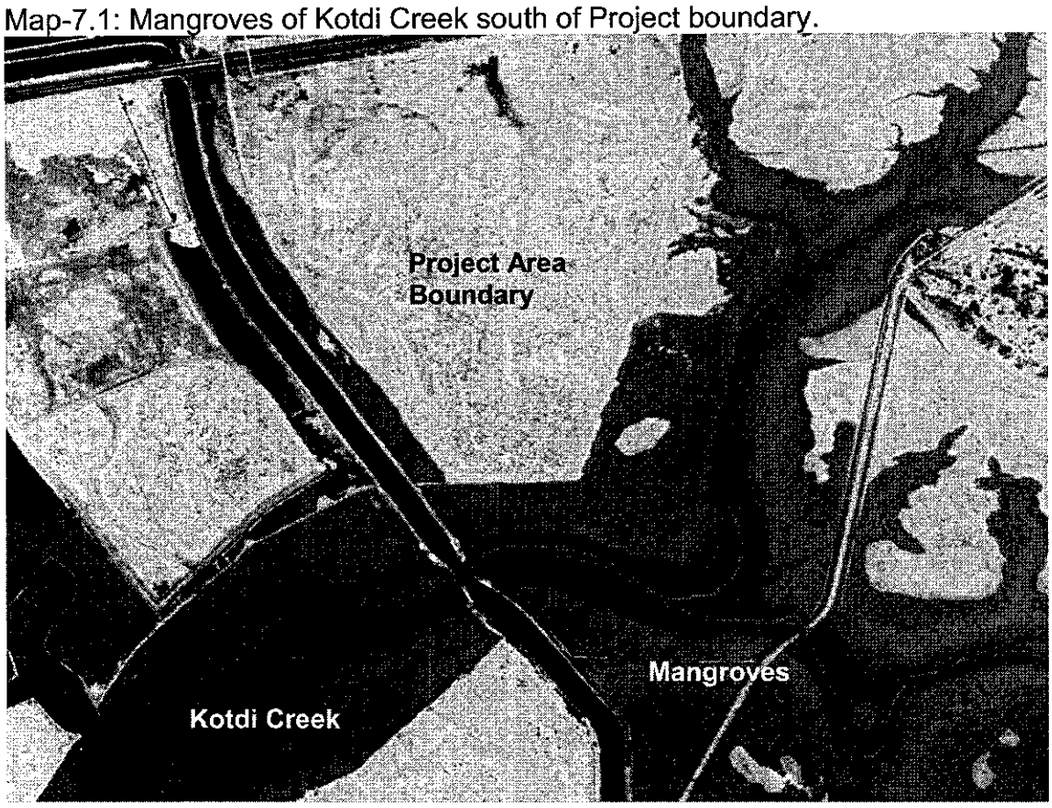
sequestration, provide fodder, timber, honey etc. Improved fish production in area where mangroves are present is also reported by many studies. Mangroves are believed to be the bio-filters of pollutants. Most importantly it provides substratum to a wide range of associated micro& macro flora and fauna which in turn constitutes a dynamic and functional mangrove eco-system that provides multifold socio-economic and environmental benefits to mankind.

7.3. Status of Mangroves Around Project Site

The baseline information suggests that the coastal area of Tunda, Navinal, Shiracha, Jarpara and Tragdi villages have patches of scattered, sparse and dense mangroves. Most of the mangrove areas are located in the notified reserve Mangrove Forest areas of Navinal, Shiracha and Jarpara village coasts. Closest mangrove distribution is located at 170 meters South form the project area on the bank of Kotdi creek (Plate-4.1, Map-4.2). The mangrove on the banks of Kotdi-I, Kotdi-II, Baradimata and Tragdi creeks fall within 10 km radius of the proposed project area. The mangroves of Kotdi–I and Kotdi-II creeks are closest mangrove (Map-7.1, Map-7.2).

There are total 3 species of mangroves present in the total three species of mangroves present these include *Avicennia marina, Ceriops tagal and Rhizophora mucronata.* A study carried out by National Centre for Sustainable Coastal Management (NCSCM), Chennai in year 2018, the total mangrove cover in Kotdi-I and Kotdi-II creeks was about 410 ha. out of which dense mangroves occurred to the extent of only 50 ha (12%), followed by sparse mangroves, distributed in 189 ha. The scattered mangrove covered an area of 171 ha. (Map-7.1). The above mentioned study reported an increase of 30.0 ha between year 2011 and 2016. A study by Thivakaran and Sawale (2016) reported 47 species of macrofauna in the Mundra mangrove eco-system. Total 12 species of gastropods, 14 species of crustaceans, 9 species of bivalves, 8 species of polychaetes and 4 species belonged to the category "others". Increasing spread of mangrove area and high species richness of macrofauna suggests healthy and dynamic condition of mangrove ecosystem in this area.

Map-7.1: Mangroves of Kotdi Creek south of Project boundary.



Map-7.2: Status of mangroves of Kotdi – I & Kotdi – II creek systems in 2016-17. (Map source: study by NCSCM 2018).

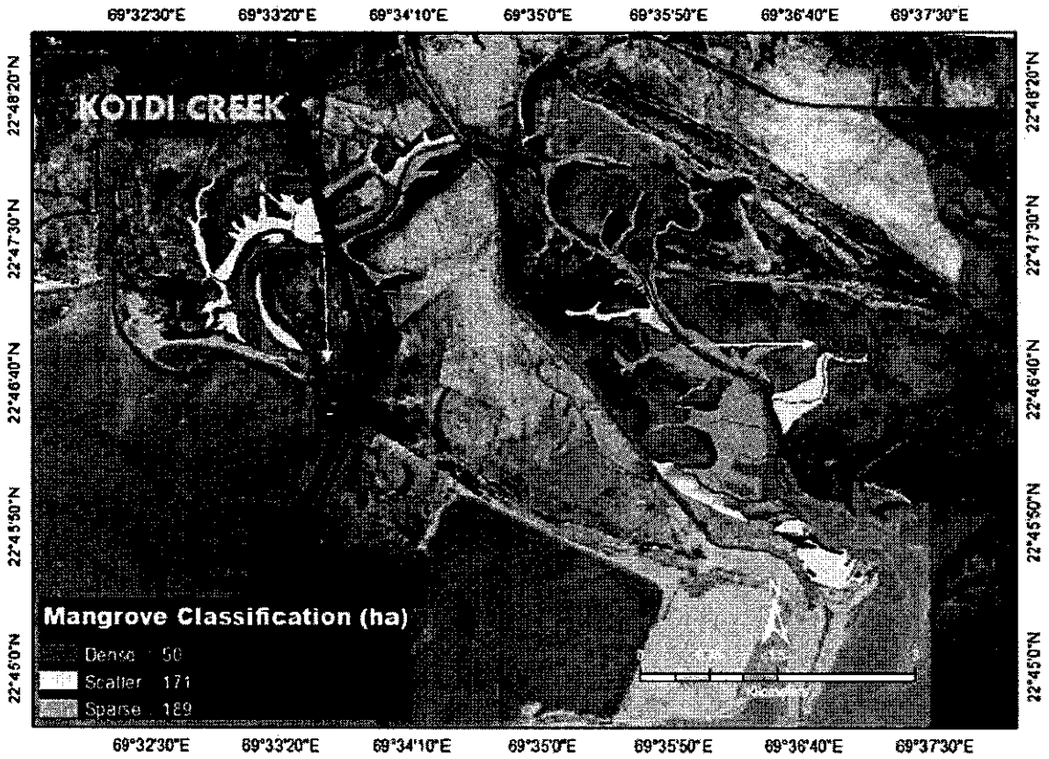
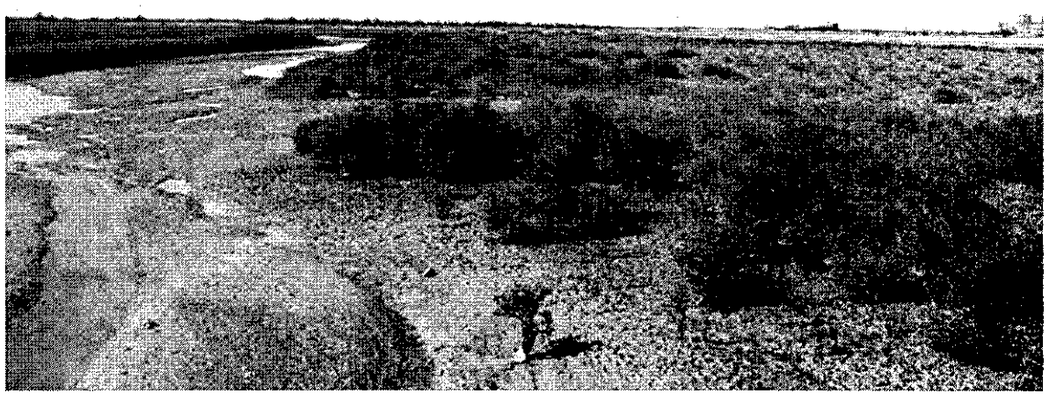


Plate-7.1: Mangroves of Kotdi-I creek.



7.4. Potential Impacts on Mangroves

Based on our survey and existing literature it is established that there are patches of scattered, sparse and dense mangroves located close to southern boundary of project area. The mangroves are located in Kotdi-I, Kotdi-II, Baradimata creeks. Since proposed project would involve large scale handling of heavy metals, hazardous chemicals and hazardous processes it could potentially affect mangroves located in the study area. Therefore, these mangroves which are located south of the project site are at higher risk of damage due to following impacts.

Air pollution: Though, the predominant wind direction is from south-west in the region, there are still chances of mangrove located on immediate southern boundary being impacted due to its close distance from the project site. Chances of damage to mangroves by fugitive emissions are high. The main sources of air pollution from the project will be from the processes and stacks. The pollutants from the plant include sulphur dioxide and particulate matter. Suspended particulate matter produced during construction and operational phases of the copper refinery plant would deposit in the surrounding mangrove ecosystem. Their direct deposition on mangrove could cause loss of chlorophyll content in leaves, arrest of photosynthesis

process, leaf injuries resulting in restricted growth and regeneration of mangrove plants. Toxic metal fumes could also increase heavy metal toxicity of the mangrove eco-system.

Water pollution: There is a drainage known as 'Dhaneshri Nadi' flows through the western part of the project site and it drains into Kotdi Creek system. Kotdi creek system has sparse and dense mangrove growth on both sides. Therefore, if the Dhaneshri river/drainage is not trained suitably, it may carry spilled out pollutant load from the project area to the mangrove eco-system of Kotdi creek. This may increase heavy metal toxicity to mangrove eco-system and its components. Among the various types of pollutants released from such industry, heavy metals are one of the most serious pollutants owing to their toxicity, persistence and bioaccumulation problems (Macfarlane & Burchett, 2002). The metal contamination is a major environmental problem as the metals in contaminated sediments may accumulate in the various organisms of the estuarine ecosystem and ultimately enter the food chain, thereby affecting the human well-being (Shakeri & Moore, 2010). The concentrations of heavy metals in the sediments usually exceed that of the overlying water (Zabetoglouet et al., 2002) and the high concentrations of these metals in water and sediments affect both plants and animals (Doganlar & Atmaca, 2011). Chronic heavy metal toxicity could prove to be lethal for a range of fauna present in the mangrove habitat and affect the overall function of mangrove eco-system.

7.5. MITIGATION MEASURES

In view of the above mentioned status, importance and role of mangroves and potential impacts of proposed copper refinery plant on mangroves, it is recommended to take up following measures so that the mangroves are not harmed and their health and spread improves in the study area.

7.5.1. Mitigation of Air Pollution:

- It is recommended that a tall wall around the project boundary be constructed so that dusting is controlled during construction and operation phases.

- Thick green belt around the project boundary shall be created so that particulate matters are arrested.
- State of the art technology for arresting dust pollution shall be implemented for controlling different types of pollutions from various sources in the plant areas.

7.5.2. Mitigation of Water Pollution:

- State of the art water pollution control measures shall be in place including treating industrial effluents with heavy metals.
- Train Dhaneshri river/drainage in such a way so that it does not carry spilled out pollutants from the project area to the mangrove eco-system of Kotdi creek.
- Do not release untreated sewage or effluents in to the creek areas having mangroves.

7.5.3. Plantation of Mangroves to Mitigate Heavy Metal Toxicity

Mangroves are considered as best natural bio-filters of pollutants. Mangrove trees are reported to tolerate high levels of heavy metals (MacFarlane, 2007) with *Avicennia* species exhibiting greater tolerance and accumulative properties to numerous metals than other mangrove species (MacFarlane and Burchett, 2002). The inorganic industrial waste composed basically by heavy metals do not degrade and although they can be diluted in the long run they will always be responsible for the environmental damage even if the source has ceased to operate. Mangroves have natural ability to act as a sink of anthropogenic and industrial pollutants. Mangroves are also known to arrest and carryout bioremediation of certain pollutants in local environment. Mangroves not only act as a sink or transfer the pollutants but they also oxidize the metals present in the sediment by exuding oxygen into the anoxic soil through aerial roots. Mangrove wetlands are therefore considered as low cost waste disposal site.

It is in this context, not only preservation of Kotdi and Baradimata creek mangroves are important but there is a need to increase mangrove spread in

this area so that it can mitigate the impacts of proposed industry on marine water and their biota. Therefore, it is recommended that AEL shall take up intensive mangrove plantation drive particularly on the bank of Kotdi-I, Kotdi-II and Baradimata creek systems. Total 50 ha. of plantation every year shall be taken up for 10 years period. It is recommended that mangrove plantation shall be carried out by Kutch East Forest Division as the area is under their jurisdiction and the staff has vast experience in mangrove plantation and management. Plantation shall be done using raised bed model.

7.5.4. Monitor Health of Mangroves:

- It is important to regularly check the health of mangrove eco-system located in the Kotdi-I, Kotdi-II and Baradimata creek systems.
- It is recommended to carryout monitoring of heavy metal contents in the sediments and mangrove plants (root & stem) at every 6 months intervals in the Kotdi-I, Kotdi-II and Baradimata creek systems. A minimum of 20 samples of sediments shall be collected and analyzed each time. The samples shall be collected at every 200 to 500 meters distances starting from northern most part of creeks to southern area.
- It is recommended to monitor the spread of mangroves in the Kotdi-I, Kotdi-II and Baradimata creek systems. This shall be done at the interval of every 2 years using standard high resolution satellite imageries and Remote-sensing & GIS techniques.
- The monitoring of floristic structure of mangrove stock shall be carried out annually to check if there are changes in its composition in terms of heights, girth and regeneration classes of Kotdi-I, Kotdi-II and Baradimata creek systems. This would enable us to check if the mangroves are degrading or healthy.
- It is recommended to monitor diversity and density of mangrove associated flora as well as macrofauna annually. This would help us monitor the functioning of food chains and food webs operating in mangrove eco-system of Kotdi-I, Kotdi-II and Baradimata creek systems. An initial baseline data shall be generated on this prior to commencement of the construction of the proposed project. It is

recommended to fix the location of sample plots and follow the same locations for subsequent monitoring efforts.

- It is recommended that the biological parameters of the mangrove eco-systems i.e. spread of mangroves, floristic structure, diversity, density, as well as diversity of mangrove associated flora and fauna shall be monitored by and independent NABET accredited experts.
- The samples collected from the mangrove plant and mangrove habitat sediments shall be analyzed only through NABL accredited laboratory.

7.5.5. Indicators for Monitoring of Mangroves.

Following are the indicators for monitoring of conservation plan. These indicators shall be monitored and the effectiveness of mangrove conservation plan shall be determined (Table-7.1.).

Table-7.1: Indicators for monitoring of Mangrove Conservation Plan.

No	Monitoring	Frequency	Negative Impacts	No Impacts
1	Spread of mangroves (area in ha.)	2 years	Decrease	Increase
2	Content of heavy metals in sediments	6 months	Increase	no increase
3	Content of heavy metals in mangrove plants	6 months	Increase	no increase
4	Mangrove stock structure (height, girth and regeneration classes)	Annual	Altered with decrease of area	Altered with increase area
5	Diversity of mangrove associate flora	Annual	Decrease	no increase or increase
6	Diversity of mangrove associated fauna	Annual	Decrease	no increase or increase

8. FINANCIAL LAYOUT

8.1. FINANCIAL ALLOCATION FOR WILDLIFE CONSERVATION ACTIVITIES

Following is the proposed budget estimated in consultation with forest department for 10 years towards wildlife conservation plan after approval from all statutory bodies permitting the project (Table-8.1).

Table-8.1: Proposed financial allocation for mitigation and conservation measures.

Sr No.	Activity	Implementing Agency	Duration Years	Rate/ Year (Lakh)	Total Amount (Lakh)
	Conservation Activities (Amount to be transferred by Project Proponent to KEFD)				
1	Mangrove & Mudflat conservation activities				
a	Carry out Mangrove Plantation activities through Forest Dept. 50 ha. per year for 10 years. by AEL @ Rs. 30000/ha. Reference: Raised bed model of Department of Forest, Govt of Gujarat.	Kutch East Forest Division (KEFD)	10 years	15	150
b	Forest department purchase/hire boat and satellite images for Mangrove & Mudflat monitoring and surveillance	KEFD	10 years	2.5	25
2	Habitat improvement for Schedule-I species in Reserve Forest areas	KEFD	10 yeas	10	100
3	Carryout plantation of *Commiphora wightii* 30.0 ha. in the first years (10ha/year) with maintenance @ Rs.95000/ha in Social Forestry Area Kutch district	KEFD	First 3 Years	0.95	28.5
4	Carry out tree plantation in surrounding villages habitat improvement for Schedule-1 birds species and Indian Peafowl	KEFD	10 years	2	20
	Subtotal for cost of activities				**323.5**
6	Monitoring and administrative activity cost (5% of total cost that is 323.5 Lc)	KEFD	10 years	5%	**16.2**
7	Contingencies @10% of total cost that is 323.5 Lc)	KEFD	10 years	10%	**32.4**
	Total Cost				**372.0**

8.2. JUSTIFICATION FOR FINANCIAL ALLOCATION

The present wildlife conservation plan is prepared as part of Environment Clearance process for the proposed Greenfield Copper Refinery project by Adani Enterprise Limited. As per Environmental Impact Assessment (EIA) Notification dated 14th September 2006, proposed project falls under category- A" of project activity 3(a) and requires prior Environmental Clearance (EC) to be obtained from Ministry of Environment, Forest & Climate Change (MoEF&CC) before the commencement of ground activity. Terms of Reference for EIA preparation has been issued by MoEF&CC vide letter reference F.No.J-11011/113/2016-IA.II(I) dated 21st June 2016. Approved ToR No. 5(v) reads as "*Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule-I fauna, if any exists in the study area is to be prepared*".

The present document is a wildlife conservation plan prepared after primary and secondary survey of flora and fauna in the study area by a NABET accredited consultant. Since the present study identified several Schedule-I species of reptiles, birds and mammals, along with plant species of higher conservation significance (*Commiphora wightii* and Mangroves) in the study area of 10/15 km radius, several activities are proposed for their conservation and management. Plantation activities of *Commiphora wightii* shall be done as per existing plantation model of forest department i.e. 95000/ha. Total 500 ha. of plantation of Mangroves is proposed in the budget which would be as per "Raised Bed Plantation Model" which would aprox 30,000/ ha. Habitat improvements in the reserve forest areas is proposed through plantation activities in the reserve forest areas as per Coastal Border Plantation Model i.e. DF7. Mudflat conservation activities involve monitoring and surveillance activities by the forest department which would be carried by providing financial support of R. 25 Lakh. This could be used for hiring boat for surveillance activities or purchase of a boat for long term monitoring as per decision and discretion of the forest department.

The Stage-1 Forest Clearance has been obtained by the M/s APSEZ for 1576.81 Ha Forest Land in various patches. M/s APSEZ is under obligation to comply with all conditions of this Forest Clearance to secure Stage-2 clearance.

Copper project is proposed by separate company "M/s AEL" for which land shall be provided by M/s APSEZ as a clear land after all clearance. M/s AEL has obtained the TOR from MoEFCC for EIA of Copper Project and this Wildlife and Mangrove Conservation Plan is being prepared Condition No 5 (v) of the TOR received by M/s AEL. This conservation plan scope is to identify Schedule-I Fauna if any exist in the study area (10Km radius) and identify if may get impacted by the proposed copper project and prepare conservation plan for the same.

Proposed Copper project boundary does not fall inside any protected area or any ESZ of any protected area. There is guideline for wildlife conservation plan budget on the basis of percentage of total project cost only in case a project involves diversion of forest land in protected area which is not the case for Copper project of M/s AEL.

Hence, the conservation cost for wildlife and the mangroves for proposed Copper project has been arrived on the basis of scientific study and estimate for Schedule—I species in the study area (10 Km radius of copper project). Total Rs 372.0 Lakhs has been proposed as budget for conservation activities. Total cost of entire project shall be Rs 10,000 Cr.

Table-8.2: Year wise break up of cost for implementation of various activities by Kutch East Forest Division and AEL for 10 years.

Sr No	Activity	Implementing Agency	Years/ Cost in Lakh										
			1	2	3	4	5	6	7	8	9	10	Total
A	**Implementation & Monitoring Activities by Forest Dept.**												
1	Mangrove & Mudflat conservation activities												
a	Carry out Mangrove Plantation activities through Forest Dept. 50 ha. Per year for 10 years. By AEL @ Rs. 30000/ha. Reference: Raised bed model of Department of Forest, Govt of Gujarat.	Kutch East Forest Division (KEFD)	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	150.0
b	Forest department purchase/hire boat and satellite images for Mangrove & Mudflat monitoring and surveillance	KEFD	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	25.0
2	Habitat improvement for Schedule-I species in Reserve Forest areas	KEFD	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	100.0
3	Carryout plantation of *Commiphora wightii* 30.0 ha. in the first years (10ha/year) with maintenance @ Rs.95000/ha in Social Forestry Area Kutch district	KEFD	9.5	9.5	9.5								28.5
4	Carry out tree plantation in surrounding villages habitat improvement for Schedule-1 birds species and Indian Peafowl	KEFD	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	20.0
5	**Subtotal for activities**		39.0	39.0	39.0	29.5	29.5	29.5	29.5	29.5	29.5	29.5	**323.5**
6	Monitoring and administrative activity cost (5% of total cost that is 323.5 Lc)	KEFD	2.0	2.0	2.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	16.2
7	Contingencies @10% of total cost that is 323.5 Lc)		3.9	3.9	3.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0	**32.4**
	Total Cost		**44.9**	**44.9**	**44.9**	**33.9**	**33.9**	**33.9**	**33.9**	**33.9**	**33.9**	**33.9**	**372.0**

ANNEXURE-8

Map-8.1: Locations identified for wildlife and mangrove conservation interventions by Gujarat Forest Department & AEL



Legend	Intervention Location	Interventions	Agency
	Project Area	Pollution control measures	AEL
	10 Km Buffer Study Area	Periodical Biodiversity Monitoring	AEL
	15 Km Buffer Study Area	Periodical Biodiversity Monitoring	AEL
	Social Forestry in Villages	Tree Plantation for Peafowls & other schedule-I Birds	Forest Dept.
	Forest Area	Habitat Improvement for Schedule-I species	Forest Dept.
		Commiphora wightii (Gugal) Plantation	
	Dense Mangrove	Mangrove Health Monitoring	AEL
	Sparse Mangrove	Mangrove Plantation	Forest Dept.
	Scattered Mangroves	Mangrove Plantation	Forest Dept.
	Mudflats *	Mudflat conservation activities	Forest Dept.

* Area of Mudflats are not yet identified on CZMP maps of Kutch district. After finalization of CZMP, areas of mudflats would be identified on maps. However, budget for their conservation is earmarked in the report.

9. REFERENCES

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Annexure-I: Approved Terms of Reference (ToR) by MoEF&CC for EIA for the project. 4585

ANNEXURE-8

F. No. J-11011/113/2016-IA-II.(I)
Government of India
Ministry of Environment & Forests
(IA-II Division)

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi-110 003.
Email: sharath.kr@gov.in

Dated: 24th March , 2017

To
M/s Adani Enterprises Limited,
Sambhaav House,
Judges Bungalow Road, Bodakdev,
Ahmedabad, Gujarat -380015.

CORRIGENDUM

Sub: Greenfield Copper Refinery Plant (10 MTPA) project of M/s Adani Enterprises Limited located at Adani Port Special Economic Zone Land in Village(s) Siracha and Navinal, Taluka Mundra, District Kutch, Gujarat – regarding corrigendum to ToR

Ref: AEL/Copper/Mundra/MoEFCC/Env/Amd/Feb2017/out-1 dated 21.02.2017

This has reference this Ministrys letter of even No. J-11011/113/2016-IA.II(I) dated 21.06.2016 prescribing ToRs for the above mentioned proposal for preparation of EIA/EMP report under the provisions of Environment Impact Assessment Notification, 2006 as amended.

2. The Ministry of Environment, Forest and Climate Change has examined the request. In partial modification of this Ministry's letter of even no. dated 21.06.2016, the following changes are incorporated in the ToR letter.

For	Read as
Greenfield Copper Refinery Plant (10 MTPA) project of M/s Adani Enterprises Limited located at Adani Port Special Economic Zone Land in Village(s) Siracha and Navinal, Taluka Mundra, District Kutch, Gujarat	Greenfield Copper Refinery Plant **(1.0 MTPA)** project of M/s Adani Enterprises Limited located at Adani Port Special Economic Zone Land in Village(s) Siracha and Navinal, Taluka Mundra, District Kutch, Gujarat

3.0 All other conditions of the above referred Terms of Reference letter shall remain unchanged

This issues with the approval of competent authority.

24/3/17

(Sharath Kumar Pallerla)
Scientist 'F'

Copy to:-

1. The Secretary, Department of Environment, Government of Gujrat.
2. The Additional Principal Chief Conservator of Forests (C), Ministry of Environment, Forest and Climate Change, Regional Office (WZ), E-5, Kendriya Paryavaran Bhawan, E-5 Arera Colony, Link Road-3, Ravishankar Nagar, Bhopal – 462016.

F. No. J-11011/113/2016-IA.II(I)
Government of India
Ministry of Environment, Forest and Climate Change
(I.A. Division)

Indira Paryavaran Bhawan
Jor Bagh Road, Aliganj,
New Delhi - 110003
E-mail: satish.garkoti@nic.in
Tel: 011-24695316

Dated: 21st June, 2016

To

M/s Adani Enterprises Limited.
Sambhaav House,
Judges Bungalow Road, Bodakdev ,
Ahmedabad, Gujarat-380015.

Subject: Greenfield Copper Refinery Plant (10 MTPA) project of M/s Adani Enterprises Limited located at Adani Port Special Economic Zone Land in Village(s) Siracha and Navinal, Taluka Mundra, District Kutch, Gujarat - prescribing of ToRs regarding.

Sir,

This has reference to your online application No. IA/GJ/IND/53004/2016 dated 21st April, 2016 along with the application in prescribed format (Form-I), copy of pre-feasibility report and proposed TORs for undertaking detailed EIA study as per the EIA Notification, 2006 for the project mentioned above. The proposed project activity is listed at S.No. 3(a), under category 'A' of the Schedule of EIA Notification, 2006 and appraised at the Central level.

2.0 M/s. Adani Enterprises Limited proposes to install a new manufacturing unit for 10 LTPA copper project. It is proposed to set up the plant for Copper Cathode based on Pyrometallurgical process technology and Electro-refining process. The proposed unit will be located at Adani Port Special Economic Zone (APSEZ) land (Siracha and Navinal Villages), Mundra Taluka, Kutch District, Gujarat State. The proponent has provided 3 sites for the project and proposed to set up the plant at Site-II. The land required for the project is 256.58 ha, out of which 154.18 ha is for industrial use and 102.38 ha is forest land. It has been informed that state government has recommended the forest diversion proposal to the Central Government. The proponent has also informed that the merits for selecting Site-II for the project inter-alia include proximity to west port from where major raw material will be imported, major part of land is within the notified SEZ and also the forest land diversion proposal is forwarded by the State government to Central Government. The proposed site lies between 22°48'55.78" N Latitude and 69°34'32.02" E Longitude. There are no national parks/ wildlife sanctuary within 10 km radius. The project area falls under Seismic Zone V. The estimated project cost is Rs. 10,000 Crore and the estimated environment protection cost is Rs. 900 crores. Employment generation from proposed project will be about 2000 direct employment and about 5000 indirect employment. The proposed capacity for different products for new site area as below:

Name of Unit	No. of Units	Capacity of each Unit	Production Capacity
Copper Smelter plant	2	4.5 LTPA	9 LTPA
Copper Refinery plant	2	5.0 LTPA	10 LTPA

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Continuous cast copper rod plant	2/3	2.5/ 1.67 LTPA	5 LTPA
Copper scrap melting facility	2	0.5 LTPA	1 LTPA
Sulphuric acid plant	2	15 LTPA	30 LTPA
Phosphoric acid plant	2	2.5 LTPA (100% P_2O_5)	5 LTPA (100% P_2O_5)
Aluminium Fluoride plant	2	15,000 TPA	30,000 TPA
Selenium Recovery plant	2	144 TPA	288 TPA
Precious metal recovery plant (Gold)	2	25 TPA	50 TPA
Precious metal recovery plant (Silver)	2	250 TPA	500 TPA
Oxygen (industrial) Plant (95% Purity)	2	45,000 TPM	90,000 TPM
Waste heat recovery boiler	2	25 MW	50 MW

3.0 The electricity load required is 300 MW, out of this, 40 MW will be generated from internal process steam by waste heat recovery; whereas the remaining 260 MW power will be sourced from APSEZ Ltd. through M/s. Mundra Utility Pvt Ltd. Company has also proposed to install 6 DG Set of 1200 - 2000 KVA Each, as a backup facility.

4.0 Proposed raw material requirement for project are Copper concentrate and Rock phosphate. Requirement would be fulfilled by importing as well as from domestic market. Fuel consumption will be mainly Furnace Oil, LPG/NG and Coal for process requirement. Water Consumption for the proposed project will be 32,800 KLD desalinated water and waste water generation will be nil outside the project boundary. Domestic waste water will be treated through Sewage treatment plant and industrial waste water generated will be treated in the Effluent Treatment Plant & through reverse Osmosis plant and reused in the process. ETP Sludge shall be disposed as per applicable hazardous waste management rules.

5.0 The above proposal was considered by the Expert Appraisal Committee (Industry) during its 6th meeting held on 3rd – 4th May, 2016 for prescribing TORs for undertaking detailed EIA/EMP study.

6.0 Based on the information furnished and presentation made by the project proponent, the Committee recommended prescribing following specific TORs for undertaking detailed EIA and EMP study in addition to the generic TOR enclosed at **Annexure I read with additional TORs at Annexure-2.**

i. The Public Hearing for the project should be conducted by Gujarat Pollution Control Board
ii. The issues raised during public hearing and commitment of the project proponent on the same along with time bound action plan to implement the commitment and financial allocation thereto should be clearly provided.
iii. The project proponent should carry out social impact assessment of the project as per the Office Memorandum No. J-11013/25/2014-IA.I dated 11.08.2014 issued by the Ministry regarding guidelines on Environment Sustainability and CSR related issues. The social impact assessment study so carried out should form part of EIA and EMP report.
iv. Plan for management of Arsenic bearing sludge should be submitted.

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ANNEXURE –I

GENERIC TERMS OF REFERENCE (TOR) IN RESPECT OF INDUSTRY SECTOR

1. Executive Summary
2. Introduction
   - i. Details of the EIA Consultant including NABET accreditation
   - ii. Information about the project proponent
   - iii. Importance and benefits of the project

3. Project Description
   - i. Cost of project and time of completion.
   - ii. Products with capacities for the proposed project.
   - iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
   - iv. List of raw materials required and their source along with mode of transportation.
   - v. Other chemicals and materials required with quantities and storage capacities
   - vi. Details of Emission, effluents, hazardous waste generation and their management.
   - vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
   - viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided
   - ix. Hazard identification and details of proposed safety systems.
   - x. Expansion/modernization proposals:
     - a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing /existing operation of the project from SPCB shall be attached with the EIA-EMP report.
     - b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4. Site Details

   - i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.
   - ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)
   - iii. Co-ordinates (lat-long) of all four corners of the site.
   - iv. Google map-Earth downloaded of the project site.

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v. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vi. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

vii. Landuse break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

viii. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

ix. Geological features and Geo-hydrological status of the study area shall be included.

x. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xi. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.

xii. R&R details in respect of land in line with state Government policy

5. **Forest and wildlife related issues (if applicable):**

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable).

ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (*in case of projects involving forest land more than 40 ha).*

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon.

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area.

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

6. **Environmental Status**

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.

iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with – min.,

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max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iv. Surface water quality of nearby River (60m upstream and downstream) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC.

vi. Ground water monitoring at minimum at 8 locations shall be included.

vii. Noise levels monitoring at 8 locations within the study area.

viii. Soil Characteristic as per CPCB guidelines.

ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

xi. Socio-economic status of the study area.

7. Impact Assessment and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be well assessed. Details of the model used and the input data used for modeling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality modelling – in case, if the effluent is proposed to be discharged in to the local drain, then Water Quality Modelling study should be conducted for the drain water taking into consideration the upstream and downstream quality of water of the drain.

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and disposal. Copies of MOU regarding utilization of solid and hazardous waste shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

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ANNEXURE-8

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8. Occupational health

i. Details of existing Occupational & Safety Hazards. What are the exposure levels of above mentioned hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved.

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of abovementioned parameters as per age, sex, duration of exposure and department wise.

iii. Annual report of heath status of workers with special reference to Occupational Health and Safety.

iv. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers.

9. Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

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10. Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

11. Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

12. 'A tabular chart with index for point wise compliance of above TORs.

13. The TORs prescribed shall be valid for a period of three years for submission of the EIA-EMP reports along with Public Hearing Proceedings (wherever stipulated).

The following general points shall be noted:

i. All documents shall be properly indexed, page numbered.
ii. Period/date of data collection shall be clearly indicated.
iii. Authenticated English translation of all material in Regional languages shall be provided.
iv. The letter/application for environmental clearance shall quote the MOEF file No. and also attach a copy of the letter.
v. The copy of the letter received from the Ministry shall be also attached as an annexure to the final EIA-EMP Report.
vi. The index of the final EIA-EMP report must indicate the specific chapter and page no. of the EIA-EMP Report
vii. While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MOEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry shall also be followed.
viii. The consultants involved in the preparation of EIA-EMP report after accreditation with Quality Council of India (QCI) /National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA-EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. Name of the Consultant and the Accreditation details shall be posted on the EIA-EMP Report as well as on the cover of the Hard Copy of the Presentation material for EC presentation.
ix. TORs' prescribed by the Expert Appraisal Committee (Industry) shall be considered for preparation of EIA-EMP report for the project in addition to all the relevant information as per the 'Generic Structure of EIA' given in Appendix III and IIIA in the EIA Notification, 2006. Where the documents provided are in a language other than English, an English translation shall be provided. The draft EIA-EMP report shall be submitted to the State Pollution Control Board of the concerned State for conduct of Public Hearing. The SPCB shall conduct the Public Hearing/public consultation, district-wise, as per the provisions of EIA notification, 2006. The Public Hearing shall be chaired by an Officer not below the rank of Additional District Magistrate. The issues raised in the Public Hearing and during the consultation process and the commitments made by the project proponent on the same shall be

x. included separately in EIA-EMP Report in a separate chapter and summarised in a tabular chart with financial budget (capital and revenue) along with time-schedule of implementation for complying with the commitments made. The final EIA report shall be submitted to the Ministry for obtaining environmental clearance.

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ANNEXURE-2

METALLURGICAL INDUSTRY (FERROUS AND NON-FERROUS)

1. Complete process flow diagram describing each unit, its processes and operations, along with material and energy inputs & outputs (material and energy balance).
2. Emission from sulphuric acid plant and sulphur muck management.
3. Details on installation of Continuous Emission Monitoring System with recording with proper calibration system
4. Details on toxic metals including fluoride emissions
5. Details on stack height.
6. Details on ash disposal and management
7. Complete process flow diagram describing process of lead/zinc/copper/ aluminium, *etc.*
8. Details on smelting, thermal refining, melting, slag fuming, and Waelz kiln operation
9. Details on Holding and de-gassing of molten metal from primary and secondary aluminum, materials pre-treatment, and from melting and smelting of secondary aluminium
10. Details on toxic metal content in the waste material and its composition and end use (particularly of slag).
11. Trace metals in waste material especially slag.
12. Plan for trace metal recovery
13. Trace metals in water

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Format for Executive Summary

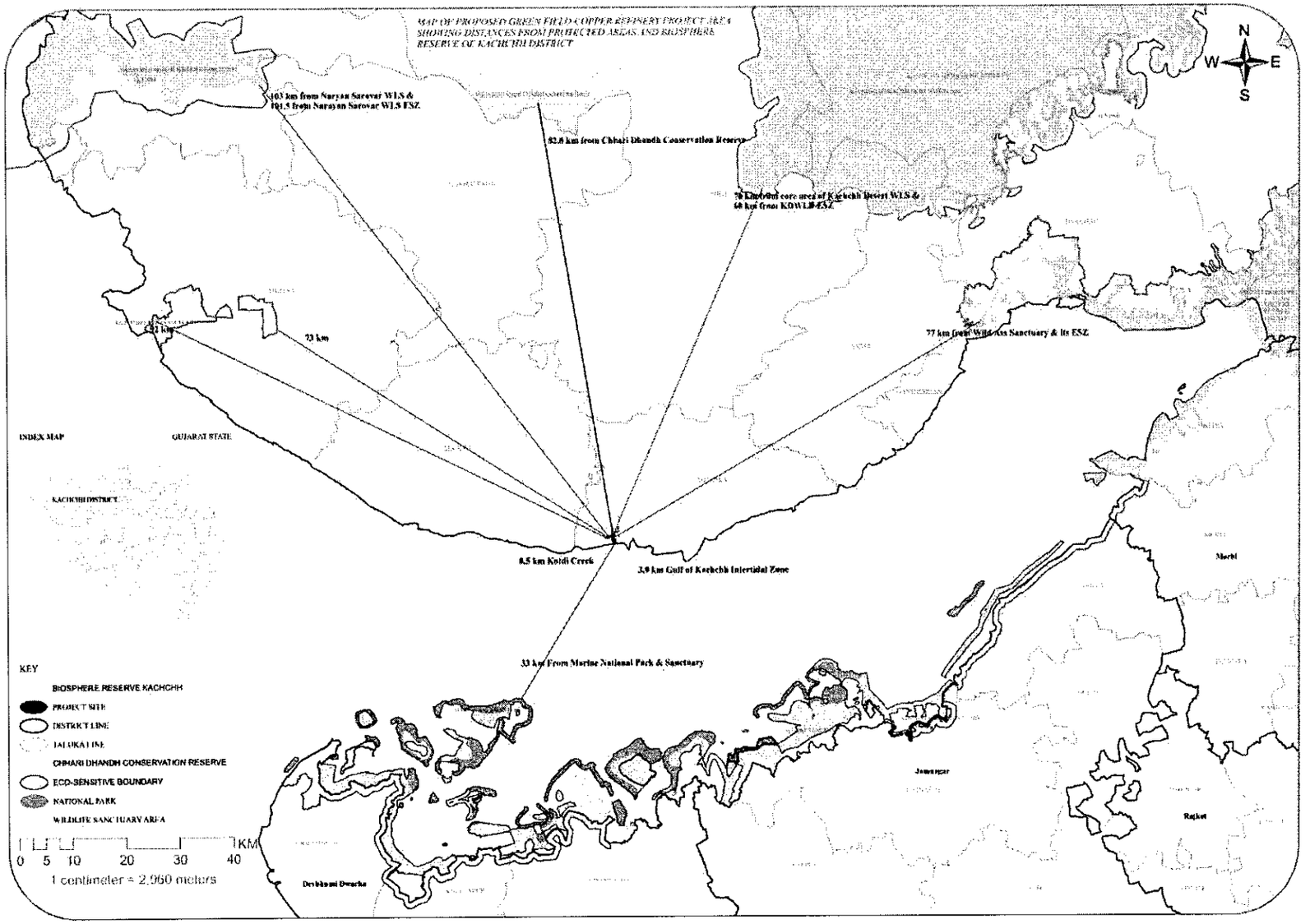
Executive summary of the report in about 8-10 pages incorporating the following:

i. Project name and location (Village, Dist, State, Industrial Estate (if applicable)
ii. Products and capacities. If expansion proposal then existing products with capacities and reference to earlier EC.
iii. Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative)
iv. Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
v. Measures for mitigating the impact on the environment and mode of discharge or disposal.
vi. Capital cost of the project, estimated time of completion
vii. Site selected for the project – Nature of land – Agricultural (single/double crop), barren, Govt/private land, status of is acquisition, nearby (in 2-3 km.) water body, population, with in 10km other industries, forest , eco-sensitive zones, accessibility, (note – in case of industrial estate this information may not be necessary)
viii. Baseline environmental data – air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population
ix. Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
x. Likely impact of the project on air, water, land, flora-fauna and nearby population
xi. Emergency preparedness plan in case of natural or in plant emergencies
xii. Issues raised during public hearing (if applicable) and response given
xiii. CSR plan with proposed expenditure.
xiv. Occupational Health Measures
xv. Post project monitoring plan

Annexure-II: Coordinates of sampling locations in Buffer and Core areas of the study area.

Core area Sample Locations			
Plot No	**North**	**East**	**Habitat type**
1	22°48'43.26"N	69°34'26.89"E	Open saline land
2	22°48'47.78"N	69°34'36.48"E	Open saline land
3	22°48'40.92"N	69°34'13.65"E	Open saline land
4	22°49'30.25"N	69°34'50.59"E	Open land
5	22°49'27.38"N	69°34'34.17"E	Open scrubland
6	22°49'20.13"N	69°34'26.52"E	Open scrubland
7	22°49'16.23"N	69°34'20.21"E	Open scrubland
8	22°49'0.08"N	69°34'12.49"E	Dense Scrubland
9	22°49'21.99"N	69°34'12.60"E	Open scrubland
10	22°49'31.29"N	69°34'13.50"E	Open scrubland
Buffer area Sample Locations			
1	22°49'16.23"N	69°35'25.35"E	Open Scrubland
2	22°48'47.15"N	69°35'39.74"E	Open Scrubland
3	22°49'49.35"N	69°36'22.90"E	Fallow Agriculture
4	22°50'5.46"N	69°37'25.37"E	Open Scrubland
5	22°50'15.41"N	69°38'14.63"E	Open Scrubland
6	22°50'34.88"N	69°34'30.17"E	Open Scrubland
7	22°50'29.27"N	69°33'0.13"E	Fallow Agriculture
8	22°49'56.48"N	69°31'17.98"E	Open wetland edge
9	22°49'50.35"N	69°30'37.38"E	Open Scrubland
10	22°49'35.06"N	69°29'48.16"E	Open Scrubland
11	22°49'33.20"N	69°28'56.54"E	Fallow Agriculture
12	22°50'11.94"N	69°29'0.95"E	Open Scrubland
13	22°48'55.92"N	69°28'43.35"E	Dense Scrubland
14	22°51'50.67"N	69°32'15.60"E	Open Scrubland
15	22°52'25.78"N	69°32'32.67"E	Fallow Agriculture
16	22°53'13.44"N	69°32'51.48"E	Open Scrubland
17	22°53'38.09"N	69°32'44.84"E	Open Scrubland
18	22°53'4.82"N	69°34'12.08"E	Open Scrubland
19	22°52'57.20"N	69°34'35.93"E	Fallow Agriculture
20	22°53'0.63"N	69°37'22.55"E	Dry River bed
21	22°51'47.01"N	69°37'30.81"E	Dry River bed
22	22°50'29.42"N	69°37'35.47"E	Dry River bed
23	22°50'19.32"N	69°37'34.24"E	Dry River bed
24	22°48'18.47"N	69°36'19.97"E	Open saline land
25	22°48'21.81"N	69°37'0.83"E	Open saline land
26	22°48'15.62"N	69°37'42.99"E	Wet mudflat
27	22°48'23.89"N	69°37'39.89"E	Open saline land
28	22°48'15.97"N	69°38'41.74"E	Open saline land
29	22°48'45.25"N	69°38'58.00"E	Dense Scrubland
30	22°49'30.21"N	69°38'58.00"E	Open saline land

Annexure-III: Map of proposed green field copper refinery project area showing distances from protected areas and biosphere reserve of Kachchh district.



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ANNEXURE-8

Annexure-IV: Stage-I Clearance for Forest Area to be diverted by APSEZ.

F. No. 8-04/2016-FC
Government of India
Ministry of Environment, Forest and Climate Change
(Forest Conservation Division)
****

Indira Paryavaran Bhawan
Aliganj, Jorbagh Road
New Delhi – 110 003
Dated: 16th November, 2018

To,

The Principal Secretary (Forests),
Department of Forests & Environment,
Government of Gujarat,
Gandhi Nagar.

Sub: Diversion of 1576.81 ha Reserved Forest Land in favour of Adani Ports and Special Economic Zone Ltd. (APSEZL) for the development of Special Economic Zone (SEZ) and Industrial Park at Village – Siracha, Navinal, Dhrub, Mundra, Baroi, Gorasama, Luni, Bhadreshwar, Tehsil Mundra, under Forest Division and District Kutch, Gujarat (Online Proposal No. FP/GJ/IND/17613/2004):- Reg.

Sir,

I am directed to refer to the APCCF (Land Management) and Nodal Officer, (FCA), Govt. of Gujarat letter No. FCA-1014/10-11/14/S.F-66/F dated 21.01.2016 for seeking prior approval of Central Government under Section-2 of the Forest (Conservation) Act, 1980. The proposal has been examined by the Forest Advisory Committee (FAC) constituted by the Central Government under Section-3 of the aforesaid Act.

2. After careful consideration of the proposal of the State Government of Gujarat and on the basis of the recommendations of the Forest Advisory Committee (FAC), the Central Government hereby agrees to accord *"In-principle"* approval under Section-2 of the Forest (Conservation) Act, 1980 for diversion of 1576.81 ha Reserved Forest Land in favour of Adani Ports and Special Economic Zone Ltd. (APSEZL) for the development of Special Economic Zone (SEZ) and Industrial Park at Village – Siracha, Navinal, Dhrub, Mundra, Baroi, Gorasama, Luni, Bhadreshwar, Tehsil Mundra, under Forest Division and District Kutch, Gujarat, subject to the following conditions:-

(i) Legal status of the diverted forest land shall remain unchanged;

(ii) *The entire forest area being diverted, should not be cleared off the vegetation in one go after diversion. The UA may clear vegetation for the purpose of basic/essential infrastructure to be developed in the SEZ. Thereafter, as and when a specific project / industry is to come up in the SEZ, the corresponding area shall be marked on the ground and cleared off vegetation. Till then the remaining areas shall be maintained as green cover. It shall be ensured that the lease agreement is made within six months of such clearing. A detailed land use for the marked area, on which clearing of vegetation is proposed shall be submitted to the Regional Office of MoEF&CC before start of work on the area, for information. The Regional Office of MoEF&CC shall ensure that the user agency carries out the work which is in conformity with the broad land use submitted by it. It shall be ensured that minimum number of trees are cleared. The user agency shall explore the possibility of trees of 10 cm dia at breast height and above, proposed for felling/clearing are translocated to suitable location within or outside the SEZ in consultation with State Forest department;*

(iii) Felling of tress on the forest land being diverted shall be reduced to the bare minimum and the trees should be felled under strict supervision of the State Forest Department;

(iv) *The diverted forest land shall not be proposed to be utilized for Golf Course, Beach Resort, Park or Residential purposes, or any other activity prohibited by FCA 1980, FC Rules and/or guidelines made there under*

(v) *The diverted forest land shall not be used for the construction/expansion of any private Aerodrome. The forest land may be considered, in future on merits, in case of commercial Airport is developed with the approval of DGCA.*

(vi) *The detailed existing land use with maps of all forest land 2008.41 ha (1840ha + 168.41 ha) for which the approval was granted vide letter dated 30.09.2009 and details of complete land use including forest land for the existing private Aerodrome and power plants within the SEZ may be provided for information;*

(vii) *Forest areas proposed within of Mundra survey no. 141/P, Baroi survey no. 207/P, Goversama survey no. 52/P, Luni survey no. 468/P and Bhadreswar survey no. 733/P are having sea front. 100mt shelter belt/green belt in above villages be included in the Master plan of the SEZ, excluding stretches where use of water front is inevitable;*

(viii) *All the conditions as recommended by the Chief Wildlife Warden shall be complied with the User Agency;*

(ix) *The State Government shall clarify whether any non-forest land situated in and around the SEZ but not forming part of the SEZ at present, can be acquired by/allotted to the APSEZ before Stage-II approval;*

(x) *If 683 ha land of GMB or any other non-forest land is allotted for this SEZ, then the equivalent forest land shall be reduced from the forest land diverted/being diverted for the SEZ;*

(xi) *The State Government and the UA shall make effort to include 122 ha of non-forest land in village Jarapara in the SEZ. Accordingly, it is recommended that 122 ha of forest land in Bhadreswar Block shall be maintained as green belt at the cost of UA;*

(xii) *State government will provide details of lease period, terms and conditions on which the forest land is proposed to be diverted in favour of the Use Agency;*

(xiii) *All other conditions imposed in the approval granted for diversion of 2008.41 ha (1840ha + 168.41 ha) forest land on 30.09.2009 shall be complied;*

(xiv) *Only site-specific activities, permissible under the Rules and guidelines framed under the FC Act, shall be taken up in the forest land to be diverted;*

(xv) *The recommendation of the FAC is subject to the condition that in case of conflicts, the provisions of FC Act, 1980, shall prevail over those of SEZ Act 2005;*

(xvi) *All other conditions/recommendations made by FAC on this proposal in its meeting on 25.01.2018, not in conflict with the recommendation of FAC on 20.09.2018 shall remain unchanged.*

(xvii) *The User agency shall identify suitable land for Compensatory Afforestation over double the forest area being diverted. The land shall be mutated in the name of State Forest Department before the Stage-II approval;*

(xviii) *The User Agency shall deposit in the designated account the estimated amount towards compensatory afforestation to be carrying out by the State Forest Department;*

(xix) The Compensatory Afforestation shall be done over double non-forest land (NFL) i.e *3154 ha* to the forest area proposed to be diverted, as per the recommendation of Government of Gujarat, vide its GR No. FCA-1013/11-10/SF-24/F, dt 12.06.2015. The Compensatory Afforestation shall be done within a period of three years with effect from the date of issue of Stage-II clearance and maintained thereafter in accordance with the approved plan in consultation with the State Forest Department at the cost of the User Agency. CA at rate of 1000 saplings per hectares shall be planted over *3154.00* ha.

(31,54,000 plants). If this is not possible to plant these many seedlings in the identified NFL, the balance seedlings will be planted in degraded forest land as per the prescriptions of the Working Plan at the cost of the User agency. In such case CA cost will be revised and duly approved by competent authority and will be deposited online in the Adhoc-CAMPA account of the state concerned;

(xx) The User agency shall identify and mutate in the name of State Forest Department of Government of Gujarat, 3154 ha of suitable non-forest land for CA adjacent to notified Forest for raising Compensatory Afforestation (CA) shall be notified as reserved Forest under Section-4 or Protected Forest under Section-29 of the Indian Forest Act, 1927 or under the relevant Section(s) of the local Forest Act. The Nodal officer must report compliance within a period of 6 month from the date of grant of final approval and send a copy of the notification declaring the non-forest land under Section 4 or Section 29 of the Indian Forest Act, 1927, or under the relevant section of the local Forest Act as the case may be, to this Ministry for information and record;

(xxi) The State Government shall submit a certificate, that site for CA is suitable and free from all encroachments and other encumbrances, under the signature not below the rank of Nodal Officer (FCA) in the State Government;

(xxii) The land identified for the purpose of CA shall be clearly depicted on a Survey of India toposheet of 1:50,000 scale;

(xxiii) *The Compensatory Afforestation land shall be surveyed at the cost of User Agency and the User Agency shall erect pillars and barbed wire fencing or trench under the consultation of CCF, Kutch Circle;*

(xxiv) The User Agency shall deposit the cost of raising and maintaining the compensatory afforestation at the current wage rate in the account of Adhoc-CAMPA of the state concerned through online e-portal only. The scheme may include appropriate provision for anticipated cost increase for works scheduled for subsequent years;

(xxv) The User Agency shall provide additionally 25% of the CA cost towards Soil and Moisture Conservation measures in the proposed CA area as per site requirement and the said amount shall be deposit in the account of Adhoc-CAMPA of the state concerned through online e-portal only;

(xxvi) The User Agency shall deposit, the Net Present Value (NPV) of the forest land being diverted under this proposal, as per the orders of the Hon'ble Supreme Court of India dated 28.03.2008, 24.04.2008 and 09.05.2008 in Writ Petition (Civil) No. 202/1995 and the guidelines issued by this Ministry vide its letter No. 5-3/2007-FC dated 05.02.2009. The requisite funds shall be deposited in the account of Adhoc-CAMPA of the state concerned through online e-portal only;

(xxvii) At the time of payment on the Net Present Value (NPV) at the then prevailing rate, the User Agency shall furnish an undertaking to pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India;

(xxviii) The user agency should ensure that the compensatory levies (CA cost, NPV etc.) are deposited through challan generated online on web portal and deposited in appropriate bank online only. Amount deposited through other modes will not be accepted as compliance of Stage-I clearance;

(xxix) The forest clearance will be for a period co-terminus with the lease period specified in the lease agreement. The State Government will submit the lease agreement documents specified in the lease agreement;

(xxx) The User agency shall obtain the Environment Clearance as per the provisions of the Environment (Protection) Act, 1986, if required;

(xxxi) *Complete compliance of CRZ regulations shall be ensured;*

(xxxii) Layout plan of the proposal shall not be changed without the prior approval of the Central Government;

(xxxiii) The User Agency will abide by the applicable recommendations of the State Government including State Forest/Wildlife Departments;

(xxxiv) State Government shall complete settlement of rights, in terms of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence as prescribed by this Ministry in its letter No. 11-9/1998-FC (pt.) dated 03.08.2009 read with 05.07.2013 in support thereof;

(xxxv) The user agency shall provide alternate fuels (LPG) to the labourers and the staff working at the site so as to avoid any damage and pressure on the nearby forest areas;

(xxxvi) Boundary of the forest land proposed to be diverted shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, forward and back bearing, distance from pillar to pillar and GPS co-ordinates;

(xxxvii) Any other condition that the concerned Regional Office of this Ministry may stipulate, from time to time, in the interest of conservation, protection and development of forests & wildlife;

(xxxviii) The user agency shall submit the annual self-compliance report in respect of the above conditions to the State Government, concerned Regional Office and this Ministry by the end of March of every year regularly; and

(xxxix) The user agency and the State Government shall ensure compliance to provisions of the all Acts, Rules, Regulations, Guidelines, relevant Hon'ble Court Order (s) and National Green Tribunal (NGT) Order(s), if any, pertaining to this project for the time being in force, as applicable to the project.

3. After receipt of the report on compliance to the conditions stipulated in the paragraph-2 above, from the State Government of Gujarat, Final/Stage-II approval for diversion of the proposed forest land under Section-2 of the Forest (Conservation) Act, 1980 will be issued by this Ministry. Diversion of the proposed forest land to the user agency shall not be effected by the State Government of Gujarat, till Final/Stage-II approval is issued by this Ministry.

Yours faithfully,

16/11/2018

(Shrawan Kumar Verma)
Dy. Inspector General of Forests (FC)

Copy to:-

1. The PCCF, Govt. of Gujarat, Gandhinagar.
2. The Addl. PCCF (Central), Regional Office (Western Zone), Bhopal.

ANNEXURE-8

4601

3. The Nodal Officer FCA, 1980, Forest Department O/o PCCF, Govt. of Gujarat, Gandhinagar.
4. User Agency.
5. Monitoring Cell, FC Division, MoEF & CC, New Delhi, for uploading.
6. Guard File.

16/11/2018

(Shrawan Kumar Verma)
Dy. Inspector General of Forests (FC)

EAC OBSERVATION:

Storm water management plan to be revised based on peak rainfall. Rainwater Harvesting calculations to be provided.

REPLY:

All the plants such as Copper smelter, refinery, SAP, PAP, AlF_3 plant, CCR, PMR will have their internal process water network for collection of spillages and floor washings. The same will be collected in the sumps provided in the respective areas. Sumps will be built with RCC concrete and lined with suitable lining. Sump pumps with valve and piping arrangement will be provided for utilising within the respective plant for process requirement and balance will be pumped to ETP for treatment.

The peak rainfall in the study area is about 467.9 mm/day (in Year 1959), while the average peak rainfall is about 41.38 mm/day in the region.

The runoff from roads & paved area and green belt/cover only will be carried by storm water drains. The runoff coefficients considered for estimating the runoff from these areas of the plants is based on CGWA guidelines and are as given below:

- Roads & paved area - 0.9; and
- Green belt/ green cover - 0.25

Strom water management system is designed using a simple drainage system considering peak/design discharge and sizing the drain to cope with the design peak run-off rate. In the absence of short duration rainfall data, India Meteorological Department (IMD) empirical reduction formula has been used for estimation of 1 hour rainfall (44.72 mm/hr).

As per CWC guidelines, discharge estimation for the watershed/catchment area less than 25 sq km can be done for a maximum flood of 50 years return period. The entire plant area is divided into four sections:

Section-I: Plant area (South) of Unit-I: Collection Pond – 5,500 M^3
Section-II: Plant area and slag storage (West) of Unit-II: Equalisation Pond – 8,000 M^3
Section-III: Plant area of (East) Unit-II: Collection Pond – 5,500 M^3
Section-IV: All storage areas (North) Unit-I & II: Equalisation Pond – 15,000 M^3

Above mentioned land use categories are considered as catchment areas and peak discharge from these catchments are calculated using modified Rational Method Qp = 1/36(KPcA)

where Qp = Discharge in m^3/s (for the 50 years return period)

K = Run-off Coefficient (calculated using catchment characteristics and 50-year 24-hour point rainfall)
Pc = Critical rainfall intensity in cm/hr (50 years rainfall intensity)
A = Catchment area in ha

The size of the drain is calculated with formula

$$Q = 1000 \times \left(\frac{A \times (R)^{0.67} \times (S)^{0.5}}{N} \right)$$

EAC OBSERVATION NO.-9

Sr. No.	Land Use	Preliminary Area (ha)	Run-off Coefficient	Annual Rainfall (m)	Annual Run-off (m^3)	Monsoon Rainfall (m)	Monsoon Run-off (m^3)
4	Green belt	89.84	0.25	0.432	97126.02	0.425	95385.37
5	Storage of Waste (slag yard, gypsum & Secured Landfill - Undeveloped land/clay loam)	48.55	0.5	0.432	104974.81	0.425	103093.50
Total/average		**256.58**	**0.61**	**0.432**	**611006.93**	**0.425**	**600056.73**

The total project site, rain water from plant area, and secured landfill areas will be treated and used for plant and other purposes as described under 7.3. Admin building & canteen, HSE office building and engineering stores (shown as building area in **Table-1**) are found to be feasible for roof top water harvesting and use. An amount of 6,832 m^3 (0.007 MCM) of rain water will be available from these roof areas. Considering only 80% of the run-off as available volume after evaporation, spillage and first flush wastage, 5,566 m^3 (0.006 MCM) of rain water is available from the roof top areas for harvesting and use. A typical roof top rain water harvesting model is presented in **Figure-1**.

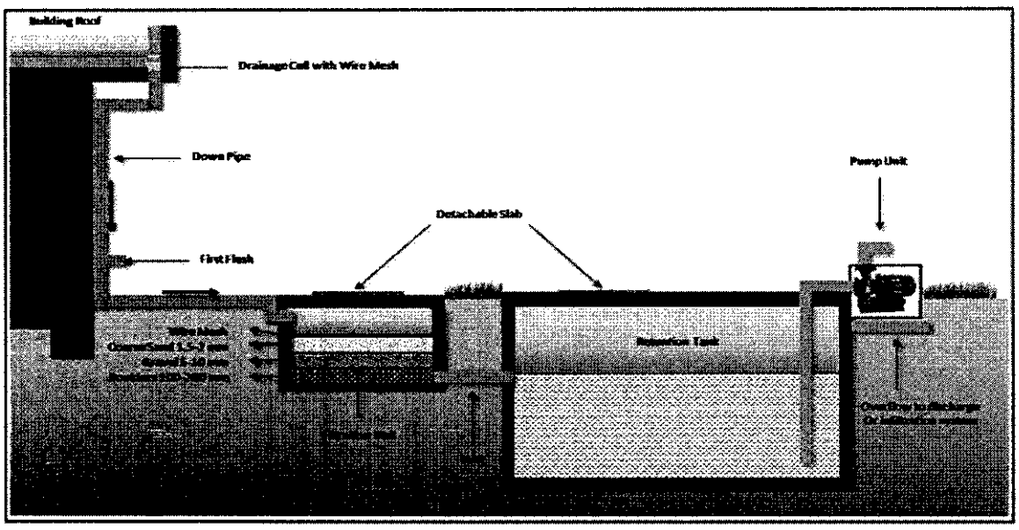


FIGURE-1:
TYPICAL ROOF TOP RAIN WATER HARVESTING MODEL

To hold 80% of rainfall from these buildings during wettest months of July and August (308.1 mm) and use for the project during non-monsoon period, the volume of storage structure(s) shall be 4096 m^3. This storage may be spread in 3 locations with pit sizes of 32 m x 32 m x 4 m. For simultaneous use, the volume of storage structure may be reduced to 50%. Considering 25% of the roads and paved area 50% of the green belt area free from contamination, 84,877 m^3 (0.085 MCM) of run-off from the rainfall collected in these areas is available for harvesting after 20% of this run-off accounting for evaporation, spillage and other losses.

The amount of run-off available from the above areas if managed with at least 70% efficiency will be **63,310 m^3 (0.063 MCM),** which would meet 69.96% of proposed green belt water requirement.

where Q = capacity of discharge of the drain (in l/s)
A = cross section of the flow (in m^2)
R = hydraulic radius of the drain
S = gradient of the drain
N = Manning's roughness coefficient

Section wise peak discharge and storm water drain dimensions worked based on above given formula are as given in table below:

TABLE-2:
SECTION WISE PEAK DISCHARGE AND STORM WATER DRAIN DIMENSIONS DETAILS

Section	Preliminary Areas Considered (ha)	Discharge (m^3/s)	Drain Width (m)	Drain Depth (m)	Drain cross sectional area (m^2)	Collection Sump Capacity (m^3)
I	22.89	1.52	0.8	1.2	0.96	5500
II	15.45	1.03	0.6	1.2	0.72	-
III	31.69	2.11	0.9	1.6	1.44	5500
IV	43.58	3.89	1.4	1.8	2.52	-

Note:- The drains will be laid on either side of the road. The design may be suitably modified based on detailed engineering.

All the solid waste storages will be constructed as per CPCB guideline with garland drains. Garland drains around respective solid waste facilities will be connected to the intermediate sumps. Water collected in these intermediate sumps will be pumped through pipeline network to two collection sumps of 8,000 m^3 and 15,000 m^3.

Storm water drainage system will be provided along the side of plant roads with required gradient. Intermediate sumps with gate valve arrangements, sump pumps and piping network will be provided to pump collected water to two collection sumps of 5500 m^3 each. The initial rain water will be collected in the proposed collection sumps and will be recycled for plant operation particularly in slag granulation system and MOL preparation. Any additional rain water post initial rainfall during monsoon will be discharged outside plant premises, after conforming with the discharge standards, in case of non-availability of space in proposed collection sumps.

Rainwater Harvesting (RWH) Structures

The RWH structure shall be designed as per the quantification of the rainwater run-off based on the average rainfall in the region. To understand the quantum of water available from the project area for rain water harvesting, reuse and ground water recharge, a tentative run-off estimation based on different land uses in the area is worked out and presented in **Table-1**. The annual volume of rain water available from the project site spread in 256.58 ha (634 acres) is estimated at 6,11,007 m^3 (0.61 MCM) and during SW and NE monsoon periods is 6,00,057 m^3 (0.60 MCM).

TABLE-1:
ANNUAL & MONSOON RUN-OFF FROM PROJECT SITE

Sr. No.	Land Use	Preliminary Area (ha)	Run-off Coefficient	Annual Rainfall (m)	Annual Run-off (m^3)	Monsoon Rainfall (m)	Monsoon Run-off (m^3)
1	Buildings/sheds	2.30	0.7	0.432	6957.44	0.425	6832.75
2	Plant & utilities	56.76	0.7	0.432	171817.06	0.425	168737.83
3	Roads & paved area	59.13	0.9	0.432	230131.59	0.425	226007.28

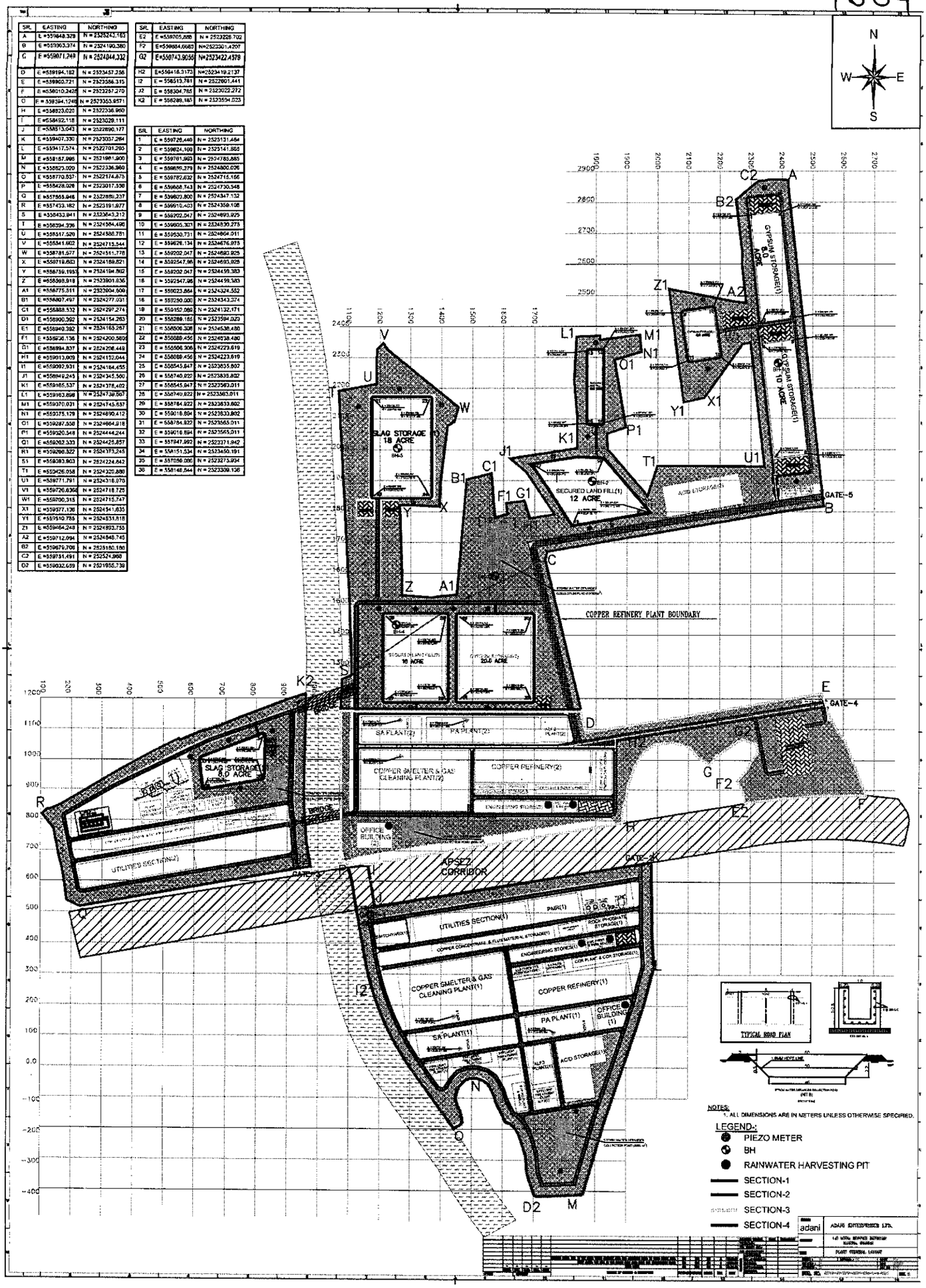
ANNEXURE-9

4604

SR.	EASTING	NORTHING
A	E =559848.329	N = 2525243.163
B	E =559963.374	N = 2524190.380
G	E =559871.249	N = 2524044.332
D	E =559194.182	N = 2523457.256
E	E =559860.721	N = 2523586.315
F	E =559010.342	N = 2523257.270
G	E = 559394.1248	N = 2523353.9571
H	E =558823.020	N = 2522336.960
I	E =558492.118	N = 2523029.111
J	E =558513.043	N = 2522890.177
K	E =559407.330	N = 2523037.264
L	E =559417.574	N = 2522701.265
M	E =558187.998	N = 2521981.900
N	E =558825.020	N = 2522336.960
O	E =558770.537	N = 2522174.675
P	E =558428.026	N = 2523017.336
Q	E =557555.946	N = 2522855.237
R	E =557453.182	N = 2523191.977
S	E =558433.941	N = 2523643.212
T	E =558394.336	N = 2524584.496
U	E =558417.520	N = 2524586.781
V	E =558341.602	N = 2524715.544
W	E =558781.577	N = 2524511.778
X	E =558719.623	N = 2524169.821
Y	E =558739.193	N = 2524194.562
Z	E =558398.918	N = 2523901.836
A1	E =558775.511	N = 2523904.609
B1	E =558807.497	N = 2524277.031
C1	E =558888.532	N = 2524297.274
D1	E =558900.562	N = 2524154.263
E1	E =558940.382	N = 2524165.267
F1	E =558936.156	N = 2524200.589
G1	E =558994.837	N = 2524208.448
H1	E =559013.009	N = 2524152.044
I1	E =559092.931	N = 2524164.455
J1	E =558949.245	N = 2524345.500
K1	E =559165.537	N = 2524378.402
L1	E =559163.898	N = 2524738.567
M1	E =559370.031	N = 2524745.557
N1	E =559375.129	N = 2524890.412
O1	E =559297.558	N = 2524864.918
P1	E =559320.549	N = 2524444.244
Q1	E =559202.333	N = 2524425.857
R1	E =559268.522	N = 2524373.245
S1	E =558383.803	N = 2524224.842
T1	E =559426.058	N = 2524320.880
U1	E =559771.791	N = 2524318.079
V1	E =559726.636	N = 2524718.725
W1	E =559700.315	N = 2524715.747
X1	E =559377.136	N = 2524541.635
Y1	E =559510.755	N = 2524531.818
Z1	E =559464.249	N = 2524893.755
A2	E =559712.094	N = 2524848.745
B2	E =559679.706	N = 2525160.180
C2	E =559751.491	N = 2525243.968
D2	E =559032.659	N = 2521955.739

SR.	EASTING	NORTHING
E2	E =559705.886	N = 2523228.702
F2	E=559684.6683	N=2523301.4207
G2	E=559743.9055	N=2523422.4578
H2	E=559418.3173	N=2523419.2137
I2	E = 558513.781	N = 2522801.441
J2	E = 558304.765	N = 2523022.272
K2	E = 558289.185	N = 2523594.523

SR.	EASTING	NORTHING
1	E = 559726.449	N = 2525131.484
2	E = 559824.199	N = 2525141.865
3	E = 559781.993	N = 2524785.885
4	E = 559896.279	N = 2524800.026
5	E = 559782.632	N = 2524715.166
6	E = 559668.743	N = 2524730.548
7	E = 559603.800	N = 2524347.132
8	E = 559510.403	N = 2524359.108
9	E = 559702.047	N = 2524693.925
10	E = 559605.321	N = 2524690.275
11	E = 559530.731	N = 2524664.011
12	E = 559626.134	N = 2524676.975
13	E = 559702.047	N = 2524693.925
14	E = 559547.96	N = 2524693.925
15	E = 559702.047	N = 2524459.383
16	E = 559547.96	N = 2524459.383
17	E = 559623.864	N = 2524324.552
18	E = 559250.000	N = 2524343.374
19	E = 559152.089	N = 2524132.171
20	E = 559289.185	N = 2523594.523
21	E = 559506.308	N = 2524536.480
22	E = 559689.456	N = 2524538.480
23	E = 559506.308	N = 2524223.619
24	E = 559689.456	N = 2524223.619
25	E = 559545.847	N = 2523835.802
26	E = 559740.822	N = 2523835.802
27	E = 559545.847	N = 2523563.011
28	E = 559740.822	N = 2523563.011
29	E = 559784.822	N = 2523633.802
30	E = 559016.894	N = 2523633.802
31	E = 559784.822	N = 2523565.011
32	E = 559016.894	N = 2523565.011
33	E = 557847.992	N = 2523371.942
34	E = 558151.534	N = 2523450.191
35	E = 557856.096	N = 2523275.934
36	E = 558148.544	N = 2523309.136



4605

EAC OBSERVATION NO.-10

EAC OBSERVATION:

OHS monitoring plan based on ICMR-NIOH study and ILO guidelines to be included.

REPLY:

Occupational health hazards assessment & monitoring plan study was carried out by **M/s. Indian Council of Medical Research-National Institute of Occupational Health (ICMR-NIOH);** Department of Health Research, Ministry of Health & Family Welfare, Government of India and report is submitted.

Report prepared by ICMR-NIOH has used following references for preparation of "**Occupational Health Assessment and Monitoring Plan for the Proposed Copper Refinery Project**"

1) Indian factories act.
2) CPCB Guidelines.
3) OSHA Guideline.
4) NIOSH Guidelines.
5) American Industrial hygiene association.

Recommendation provided by ICMR-NIOH and as per International Labour Organization (ILO) guidelines as well as applicable standards/regulations will be implemented.

- Study covers the following:

  - Potential Health Hazards
  - Health Effects and Prevention
  - Summary of Occupational Health and work place monitoring unit-wise with frequency.
  - Occupational Health Assessment/ Medical Evaluation

- Based on the comprehensive Occupational Health study, by ICMR-NIOH following tests and frequency of the test based on area of work have been identified.

  Clinical assessments, Electrocardiogram (ECG) for persons aged > 45 years, Blood investigations, Biological monitoring programme, Liver function test, Renal function test, Audiometry, Ophthalmic evaluation, Dermatological evaluation, Neurological evaluation and Biological monitoring.

- Based on the study budget of **Rs. 2000/ person/ year** has been estimated for monitoring the health of the human resources engaged at the Copper Refinery Project.

4606

EAC OBSERVATION NO.-10

Following general medical test (Clinical Examination and Questionnaire) will be conducted for the employees (company & contract) working within the copper refinery plant:

Clinical Examination and Questionnaire:

- Age
- Sex
- Education
- Tobacco usage, alcohol usage pattern (habits & addiction)
- Details of previous and present medical illness / diseases or symptoms or on medicines.
- Family history of diseases and illnesses
- Menstrual & obstetric history (females)
- General physical examination:
- Temperature
- Pulse
- Respiratory rate
- Blood pressure
- Anthropometry (height, weight, hip circumference, waist circumference)
- Pallor
- Icterus
- Lymphadenopathy (swelling of lymph nodes)
- Oedema
- Clubbing
- Cyanosis
- Thyroid swelling
- Prominent veins (neck, lower limbs)

Respiratory system evaluation:

- Clinical evaluation will include detailed history of respiratory symptoms, dyspnea, exertional dyspnea, cough, cough with expectoration, pharyngitis, laryngitis, sore throat, respiratory tract infections etc.
- Pulmonary function tests (spirometry)
- Chest X-ray PA View

Cardiovascular system:

Electrocardiogram (ECG) for persons aged > 45 years.

Blood investigations:

- Complete hemogram: Hemoglobin, cell count (TC, DC), blood grouping, platelet, RBC count, peripheral blood smear (PBS), bleeding time (BT), clotting time (CT), erythrocyte sedimentation rate (ESR),
- Random blood sugar (RBS)
- Liver function test:
  - Clinical examination: change in appetite, jaundice, nausea, vomiting, dyspepsia etc.
  - Laboratory investigation: Albumin, globulin, AG ratio, SGOT, SGPT, ALP, serum bilirubin, GGT
- Renal function test:
  - Blood: Serum urea & creatinine, uric acid

EAC OBSERVATION NO.-10

- Urine examination: Protein, sugar

Ophthalmic evaluation:

- History such as burning, dryness, redness, water of eyes etc. will be enquired along with clinical evaluation of conjunctiva, cornea, sclera, lens etc.

The above test will be conducted as part of pre-employment, pre-exit and periodical for regular employees. Additionally, the Colour blindness test will be carried out as part of pre-employment examination.

It is proposed to have following frequency for periodical medical examination

a) Administrative staff once in two years
b) Operational and maintenance staff once in year
c) Specific test mentioned in the below table will be conducted once in six months

There will be workplace monitoring will be carried out as per prevailing legislation.

4609

EAC OBSERVATION NO.-11

EAC OBSERVATION: -

Provide linkage between Public Hearing, Social Impact Assessment and CER proposed.

REPLY:

Many of the participants in public hearing were in the support of the project as recorded in Public Hearing (PH) proceedings videos. The consolidated point-wise issues raised and responses along with action plan for implementation has been provided in Chapter-7 of final EIA Report.

A budgetary provision of Rs 1044 Cr for Environmental protection and provision of Rs. 58 Cr has been allocated as Corporate Environment Responsibility (CER). The allocation of fund in CER has been arrived on the basis of issues raised in public hearing and the Social Impact Assessment (SIA) study findings was based on the interactions, focused group discussions with different stakeholders at the village level community based institutions. Keeping in view of the community's interests and opinion expressed during interactions, focused group discussions with different stakeholders, the suitable interventions have been planned under CER plan. During implementation of CER interventions M/s AEL will promote communities participation and ensure that the intended outcomes realized through community.

The budgetary provision of Rs 1044 Cr for Environmental protection has been allocated for Air protection: Rs. 639 Cr, Water protection: Rs.360 Cr, Solid waste & EMS: Rs. 45 Cr has been detailed in the **chapter-6 of EIA in table-6.5**.

The details about CER is provided in **Annexure-33 of Reply of 23rd August 2019 EAC observation-33.**

Details of PH proceedings along with action plan is attached as **Annexure-20(a) Reply of 23rd August 2019 EAC observation-20.**

Details of PH hardcopy representations along with action plan is attached as **Annexure-20(b) of Reply of 23rd August 2019 EAC observation-20.**

Based on the issues discussed in PH, study conducted for SIA various projects has been proposed as part of CER. The details of the same is presented in table below:

EAC OBSERVATION NO.-10

Following operational area specific test will be conducted frequency every 6 months:

Test	Copper Smelter	Copper Refinery	CCR Plant	PMR Plant	SAP	PAP	AlF_3 Plant	ETP
Respiratory system	✓	✓	✓	✓	✓	✓	✓	✓
Cardiovascular system	✓	✓	✓	✓	✓	✓	✓	✓
Central nervous system	✓	✓	✓	✓	✓	✓	✓	✓
Gastrointestinal system	✓	✓	✓	✓	✓	✓	✓	✓
Dermatological assessment	✓	✓	✓	✓	✓	✓	✓	✓
Musculoskeletal system	✓			✓				✓
Serum copper	✓			✓				
Ceruloplasmin ferroxidase	✓			✓				
Urinary copper	✓			✓				
Screen for heavy metals	✓			✓				✓
Delta amino levulinate dehydratase levels				✓				✓
Measure fluoride levels in blood and urine						✓	✓	✓
Dental (Gingival tissue) examination (Fluorosis)						✓	✓	
Audiometric test	✓	✓	✓	✓	✓	✓	✓	✓
Hepatic (liver)	✓	✓	✓	✓				✓
Detect acidosis	✓			✓	✓			

4624245

EAC OBSERVATION NO.-11

4611

PROPOSED CER BUDGET EXPENDITURE:

Sr. No.	Key Area Identified for intervention through CER activities by proposed Copper Smelter Plant	Proposed Expenditure in Project construction phase (Rs.)					Total Proposed Expenditure (Rs.)	Linkage
		1st Year	2nd Year	3rd year	4th Year	5th Year		
A	**Education Initiatives**	**11,880,000**	**15,002,000**	**15,492,000**	**11,172,000**	**9,492,000**	**63,038,000**	
	1 Development of Smart Classes facilities	5,880,000	9,002,000	9,492,000	5,172,000	5,492,000	35,038,000	**PH**
	2 Renovation/development of primary/middle school infrastructure for education and sports facilities	6,000,000	6,000,000	6,000,000	6,000,000	4,000,000	28,000,000	**PH**
B	**Community Health Initiatives**	**19,250,000**	**31,250,000**	**36,000,000**	**33,500,000**	**0**	**120,000,000**	
	1 Fully Furnished and equipped Trauma Centre with Burnt Care Unit at Bhuj Hospital	14,250,000	23,750,000	28,500,000	28,500,000	0	95,000,000	
	2 Burnt Care Unit at Mundra	5,000,000	7,500,000	7,500,000	5,000,000	0	25,000,000	
C	**Sustainable livelihood**	**14,500,000**	**15,200,000**	**20,200,000**	**6,400,000**	**6,400,000**	**62,700,000**	
	1 Development of 3 Cowsheds at Kandagara	1,000,000	1,000,000	0	0	0	2,000,000	**PH**
	2 Skill Development Centre (SDC) to make the youth for achieving their Goals in life by becoming Skilled Professionals.	5,000,000	5,000,000	10,000,000	0	0	20,000,000	**PH**
	3 Support for tissue culture and soil laboratory development for farmers in the area.	1,500,000	2,000,000	3,000,000	3,000,000	3,000,000	12,500,000	**PH**
	4 Support for Drip Irrigation for farmers in the area.	2,000,000	2,200,000	2,200,000	2,400,000	2,400,000	11,200,000	**PH**
	5 Infrastructure improvement for Fisherman community and fund creation for fisherman life insurance to cover risk in fishing.	5,000,000	5,000,000	5,000,000	1,000,000	1,000,000	17,000,000	**SIA**
D	**Community Environment development**	**2,500,000**	**2,500,000**	**13,500,000**	**1,100,000**	**1,800,000**	**21,400,000**	
	1 Provide samplings of forest species and development of Eco-clubs of Teachers & Students for Waste mangemnet and Mass plantation in Schools & community land in the Villages.	1,500,000	1,500,000	12,500,000	100,000	800,000	16,400,000	
	2 Support and provide plant saplings of *Commiphora Wightii* (Guggal Dhoop) Plantation in schools and panchayat lands and other common lands.	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	5,000,000	
E	**Community Rural Infrastructure Development**	**33,400,000**	**63,505,000**	**69,117,350**	**80,737,565**	**63,866,194**	**310,626,109**	
	1 Drinking Water Facility	**20,000,000**	**40,000,000**	**40,000,000**	**40,000,000**	**20,000,000**	**160,000,000**	
	i Overhead Water Tanks of 500kL at 8 locations	20,000,000	40,000,000	40,000,000	40,000,000	20,000,000	160,000,000	**PH**
	2 Water Conservation Ground water recharge	**9,500,000**	**19,500,000**	**25,000,000**	**36,500,000**	**36,000,000**	**126,500,000**	
	i Deepening of Ponds	4,500,000	4,000,000	4,000,000	4,500,000	4,500,000	21,500,000	**PH**
	ii Check Dams/Milli Micro water shade management	5,000,000	15,500,000	21,000,000	32,000,000	31,500,000	105,000,000	**PH**
	3 Solar Street Lights	**1,500,000**	**1,605,000**	**1,717,350**	**1,837,565**	**1,966,194**	**8,626,109**	**PH**
F	**Institutionalize development for Key areas in Education, Community Health Initiatives, Sustainable livelihood, Community Environment development, Community Rural Infrastructure Development**	**2,400,000**	**2,400,000**	**2,400,000**	**2,400,000**	**5,900,000**	**15,500,000**	
G	**Contingency Fund to cover shortfall in above segments or additional investment in infrastructure development in education and sports**	**400,000**	**400,000**	**400,000**	**400,000**	**900,000**	**2,500,000**	
	Total Expenditure (Rs)	**69,430,000**	**128,727,000**	**144,801,350**	**135,709,565**	**88,358,194**	**580,264,109**	

4246

4612

EAC OBSERVATION NO.-11

The following issues were raised by the public and the following actions plan has been prepared:

Issue Related to Need for project:

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	Plant will produce 30 lakh tons of Sulphuric acid, so why do you want to establish this plant here? We want clean environment	India import ~ 1.5 MMTPA of Sulphur for production of Sulphuric Acid (equivalent qty of Sulphuric Acid 4.5 MMTPA) and 1 MMTPA as a Sulphuric Acid product. Sulphuric Acid is by-product of Copper Refinery Project (Copper Smelter Plant); which is widely used for manufacture of fertilisers and other chemicals. This will reduce import for acids requirement of India and thereby foreign exchange. Mundra location for this project has been selected based on the following advantages: 1. Proximity to Market. 2. Availability of land; and 3. Availability of infrastructure such as port facilities, water, power, road, rail etc. Environmental Management Plan has been developed to keep the environmental parameters within the stipulated limits as per NAAQMS. The comparison of salient features of alternative sites done and details are presented in Table-5.1 and shown in Figure-5.1 of the EIA report.	-

EAC OBSERVATION NO.-11

4613

Issue Related to Community Development

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	Develop 3 Cowsheds in Kandagara.	Cowshed will be construction in Kandagara village as per Panchayat resolution.	Under CER a budget of Rs. 20 Lakhs has been allocated for Cowshed construction in the said village.
2	What will Adani do for the education, health and fodder for cattle?	Various education and health program is ongoing in the area by Adani Foundation. Establishment of a full fledged a burn care facility at Bhuj District Hospital Fodder issue will be addressed through CSR activities.	It is proposed to establish a full fledged a burn care facility at Bhuj of Rs. 9.5 Crores and Burn care unit at Mundra of Rs. 2.5 Crores. Establish Smart Classes and Renovation/development of primary/middle schools of Rs. 6.7 Crores.
3	Develop fisheries harbour	Bhadreshwar is outside the study area of this project.	Under CER a budget of Rs. 1.7 Crore has been allocated for Infrastructure improvement for Fisherman community and fund creation for fisherman life insurance to cover risk in fishing
4	He represented that this project is only 5 km away from our village. Therefore it is submitted that our village should also be given priority in the manner that Navinal and Shiracha are given priority.	CER Project village wise to be prepared.	-
5	Farming gets affected due to sea water, High TDS in borewell water	Drinking water facility has been proposed by providing overhead tank in the project area villages (Moti Khakhar, Desalpar and Siracha). To reduce the salinity ingress, it is planned to adopt program which is inline with state government activities for watershed management by check dams in upstream areas with due engineering details in consultation with Water Recourses Department.	CER budget (Rs. 16 Crores) for drinking water project by providing overhead tank in the project area villages (Siracha, Jarpara, Desalpar and Moti Khakhar village) has been proposed. Watershed management by check dams in upstream areas with due engineering details in consultation with Water Recourses Department under CER budget (Rs. 10.5 Crores).
6	Dates agriculture development should also take place. Adani Company should establish a laboratory at Mundra for Tissue culture development of date farming.	Tissue cuture laboratory in local dates palm Research Institute, Govt of Gujarat in Mundra, will be established.	Under CER budget Rs. 1.25 Crores has been allocated for development of tissue culture laboratory in local dates palm Research Institute, Govt of Gujarat in Mundra.
7	Jobs and livelihood opportunities for women to be created. How ladies will be given employment?	Local ladies will be made capable by providing training for getting employed in services like horticulture, housekeeping and canteen etc. Apart from this other livelihood opportunities under Self Help Group through Adani Foundation under CSR will be created.	-

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4614

EAC OBSERVATION NO.-11

Issue Related to Employment

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	Will I be given job at the new plant? What is the duty time and salary of on roll employees? what is the percentage of local public that will get employment?	Locals will be given preference to employment based on skill set & eligibility requirement as per the job. Facility and infrastructure will be added in existing skill development centre run by Adani Foundation at Mundra. Plant will be operated round o'clock basis. There will be 3 shifts for the plant people and day shift for the non-plant employee and administrative staff. Salary will be based on the skill set, Job experience and role offered. As per the existing regulations of central & state government and availability of skillsets, local people will be provided preference for employment.	Fund of Rs. 2 Crores has been allocated for facility and infrastructure addition in existing skill development centre run by Adani Foundation at Mundra.
2	A committee should be constituted so that the local public gets employment and an open discussion / meeting should be held between the company officers and committee for the purpose of providing employment to local public. Create a database for the qualified persons for providing job opportunities.	Database exchange center facility, in the exiting skill development center run by Adani Foundation; so that records of skilled people from the area will be maintained and will be made available to other industries.	Under CER for proposed project, fund of Rs. 2 Crores has been allocated for database exchange center facility, in the exiting skill development center run by Adani Foundation
3	What steps will been taken to develop the unskilled people to give them the right opportunity? What kind of employment will be given to the unskilled people? How will employment be provided in this plant? what is the percentage of local public that will get employment?	Locals will be given preference to employment based on skill set & eligibility requirement of the job. Required Skillset for the proposed project: • Mechanical Maintenance • Electrical Maintenance • HEMM Operations & Maintenance • Horticulture • C&I Unskilled people will be made capable by providing training for getting employed in services like horticulture, housekeeping and canteen etc.	Under CER for proposed project, fund of Rs. 2 Crores has been allocated for facility and infrastructure addition in existing skill development centre run by Adani Foundation at Mundra.

4615

4761

EAC OBSERVATION NO.-11

Issue Related to Environment

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
1	Which organization has conducted the study? Which laboratory has conducted the monitoring? Provide certificate of the same.	M/s. Vimta Labs Limited (VLL), Hyderabad is a QCI/NABET accredited and MoEF&CC recognized and NABL accredited Laboratory; who has conducted study and laboratory analysis.	-
2	VIMTA is a Private organization, we don't accept VIMTA's report.	M/s. Vimta Labs Limited (VLL), Hyderabad is a QCI/NABET accredited and MoEF&CC recognized and NABL accredited Laboratory. The credentials of M/s. Vimta Labs Limited are given in Chapter-11 of the EIA Report.	-
3	How many villages of the Mandvi and Mundra taluka are affected in this project? Provide the details about distance.	The study area of 10 km radial distance from the boundary of the proposed project consists of 16 villages. This includes 12 villages from Mundra Taluka (Tunda, Siracha, Navinal, Deshalpar, Khakhar Moti, Kandagara Mota, Nani Bhujpur, Jarpara, Moti Bhujpar, Borana, Pratappar and Dhrab), 4 villages from Mandvi Taluka (Nani Khakhar, Nana Bhadiya, Mota Bhadiya, and Tragadi). The list of Number and locations of monitoring stations (as per CPCB guidelines) are decided based on the nature of project, meteorological conditions, Topography, selected pollution pockets in the area and likely impact areas. Based on the impact assessment modelling, the GLC to land around 2.1 km in NE direction. Total cumulative concentration of pollutants is found to be well within the prescribed limits.	-
4	At the time of making this report, how many numbers of villages have been visited by the company and were the local people present at that relevant point of time?	Baseline monitoring was carried out in the study area of 10 km radial distance from the boundary of the proposed project. It consists of 16 villages. This includes 12 villages from Mundra Taluka (Tunda, Siracha, Navinal, Deshalpar, Khakhar Moti, Kandagara Mota, Nani Bhujpur, Jarpara, Moti Bhujpar, Borana, Pratappar and Dhrab), 4 villages from Mandvi Taluka (Nani Khakhar, Nana Bhadiya, Mota Bhadiya, and Tragadi). Focussed Group Discussion for Social Impact Assessment was also carried out in these villages.	-
5	At the time of presentation, the list of only 8 villages is shown. Why other villages are not included? Why is monitoring done in only 8 villages? Show us the list of 16 villages. Give the proof of 08 villages visited.	The baseline ambient air quality, noise and soil monitoring was carried out at 8 location s per the TOR prescribed by MoEF&CC. The monitoring locations were selected based on the nature of project, meteorological conditions, topography, land use conditions, existing pollution pockets in the area and the likely impact areas. Photograph to be attached/ Hyperlinked.	-
6	1) The photographs of place and equipment used shall be shown from where the samples were	1) The photographs of place and equipment used shall be shown from where the samples were collected. 2) You are showing the photographs of your proposed project, show the photographs of the	1) The photographs of sampling place and

4250

4616

EAC OBSERVATION NO.-11

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
	collected. 2) You are showing the photographs of your proposed project, show the photographs of the monitoring carried out.	monitoring carried out.	equipment used for monitoring had been shown during the public hearing. 2) Monitoring photographs along with the respective sampling locations have been given Annexure-VIII in the EIA report.
7	As per the EIA report, you state that no perennial river is present within the project land.	Dhaneshwari, a seasonal river and not a perennial river flows in the western part of the proposed site.	-
8	The project proponent has concealed the information in Form-1. As per the S.No. 16 and 26 of Basic Information of Form-1, with reference to the Gochar land, PIL no. 17/2011 judgment, the project proponent has mentioned that there is no pending PIL for this land. This information is not mentioned in Form-1.	We have not concealed any information in Form-1. The PIL has been disposed. The application has been filed for the diversion of forest land. Under the Form-1, it is stated that the non-forest land is of APSEZ and the application for forest land is under process.	-
9	In the S.No. 2 and 10 of Form-1, it is not mentioned that the Daneshwari river passes through the forest land.	In the EIA report, maps are provided and Daneshwari river is shown in it. Dhaneshwari river also referred as Danesri Nadi (as per Topo sheet no: F42 J9 & 10) stream passing within site (west side). Dhaneshwari, a seasonal river which flows in the western part of the proposed site. The river will not be diverted. The flow of the river will be maintained, as shown in the plant layout on Figure-2.1 of EIA report.	-
10	The sr. no. 10 on page C1-4 of the draft EIA report states that, there is no archaeological place at this site. However, at a distance of around 500 to 1000	As per Archaeological Survey of India, there is no notified archaeological site present within 10 km radius from the proposed project site. The nearest archaeological site is Kotai Sun Temple, which is 70 km from the project site.	-

EAC OBSERVATION NO.-11

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
	meters from the proposed project site, the site of Navinal Archaeological site is present. I have the report of the MS University which states that it relates to the Harappa civilization.		
11	How many villages are affected? What is the radius of affected area? How many people were met? How many villages were visited?	The study area of 10 km radial distance from the boundary of the proposed project consists of 16 villages. This includes 12 villages from Mundra Taluka (Tunda, Siracha, Navinal, Deshalpar, Khakhar Moti, Kandagara Mota, Nani Bhujpur, Jarpara, Moti Bhujpar, Borana, Pratappar and Dhrab), 4 villages from Mandvi Taluka (Nani Khakhar, Nana Bhadiya, Mota Bhadiya, and Tragadi). The list of Number and locations of monitoring stations (as per CPCB guidelines) are decided based on the nature of project, meteorological conditions, Topography, selected pollution pockets in the area and likely impact areas. Based on the impact assessment modelling, the GLC to land around 2.1 km in NE direction. Total cumulative concentration of pollutants is found to be well within the prescribed limits.	-
12	What effect will this project produce on sea creatures that have direct connection with fishermen?	No treated effluent will be released into the sea. The proposed project has been designed based on zero liquid discharge system consisting of effluent treatment plant, RO plant and Multi Effect Evaporator. No treated effluent will be discharged outside the plant premises. Rain water collection pond (4*4000 m3) will also be constructed to collect runoff from the process areas. This collected water will be recycled in plant operation. A total of Rs 360 crores will be invested for ETP design and wastewater management.	-
13	What would be the constituents in raw material that would be stored?	Raw materials Copper Ore Concentrate contains mainly copper, iron, sulphur, trace of precious metals and traces of heavy metals. Rock Phosphate contains mainly Calcium Phosphate and Calcium Fluoride. Detailed analysis is provided in the ADS point no:	-
14	which water will be used in the upcoming plant?	APSEZ will provide desalinated water from its Desalination plant.	-
15	You have mentioned that you will make road from the waste. Which waste will be used for road making?	Copper Slag is useful for road making ad NHAI has issued a directive for use of copper slag in road construction.	-
16	Is there any chance of any kind of blast?	HIRA study has been done. There is a chance of blast, if water comes in contact with hot metal. Based on HIRA study as well as recommendation from the technology supplier, adequate measures will be put in place to avoid such incidents. There will be continuous monitoring of flow and temperature of cooling water circulating within the furnace copper	-

EAC OBSERVATION NO.-11

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
		cooling elements.	
17	How much water will be obtained for this project and from which place will it be taken? Have you conducted study for the impact of desalination plant on the marine ecology? What is the impact?	The proposed project will require about 32,800 m^3 desalinated water per day, supplied by desalination plant of APSEZ, who has already obtained the Environmental Clearance.	-
18	Sulphur Di-Oxide impact in a radius of 20-25 km	Modelling studies reveal that the maximum incremental short term 24 hourly ground level concentrations (GLC) will be 17.90 µg/m^3 for SO_2 at a distance of 2.2 km in NE direction. The resultant concentrations are predicted to be well within the standards specified by CPCB.	-
19	concentration of Sulphur Dioxide and height of its release quantity of Sulphur Dioxide will be released in air and density of Sulphur Dioxide?	Sulphur Dioxide Concentration in residual gases post tail gas scrubbing and FGD system will be 300 mg/Nm^3 at the outlet of Process Stack. Proposed stack height will be 150 m. About ~375 kg per hour of Sulphur Dioxide will be released in air which will be dispersed quickly with atmospheric air flow and Ground level concentration for SO_2 will remain well within the NAAQ standards as modelling has been done.	-
20	Where the Acidic Water and Chemicals will be released?	No treated effluent will be released into the sea. The proposed project has been designed based on zero liquid discharge system consisting of effluent treatment plant, RO plant and Multi Effect Evaporator. No treated effluent will be discharged outside the plant premises. Rain water collection pond (4*4000 m^3) will also be constructed to collect runoff from the process areas. This collected water will be recycled in plant operation. A total of Rs. 360 Crores will be invested for ETP design and wastewater management.	-
21	In the production of copper plant, Sulphur is to be used and this will have acidic processes.	Installation of Sulphuric Acid Plant for conversion of sulphur di-oxide off-gases generated from the smelting and converting furnaces into sulphuric acid. Installation of Scrubbers for treating fugitive and tail gas emission generated during the production processes with the help of high suction hoods.	-
22	The project is entirely chemical based, which will have impact on water, air, noise, land, etc. and it will affect the agricultural land. What are the measures for protection from such kind of project?	Based on the baseline monitoring and the impact assessment modelling Environmental Management plan has been prepared to safeguard the environment. Air Pollution Protection: High suction hoods for collection of fugitive gases and scrubbing system to treat the same before releasing through process stack in the atmosphere. Water Pollution Protection: Plant will be operated under Zero Liquid Discharge (ZLD) System and all the treated water will be recycled within the plant process. No treated water will be released outside the plant boundaries.	-

EAC OBSERVATION NO.-11

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
	Such projects are welcome. We are 100% in favour of the development but not at the cost of environment.	Ground/ Soil Pollution: All the raw material will be stored in concrete paved and covered storage. Solid waste generated will be handled and stored as per CPCB Guidelines. Rs 1,044 Crore environmental protection budget has been proposed for pollution control equipment's within the proposed project site.	
23	It is required that 33% green belt shall be provided	Total of > 33% Greenbelt has been proposed including 15 m wide greenbelt around the plant boundary. Native species with rich canopy will be planted. Following Species will be planted: 1) Neem (Azadirachta indica) 2) Sisoo, Shisham (Dalbergia sissoo) 3) Babul (Acacia nilotica) 4) Imli (Tamarindus indica) 5) Karanj (Pongamia pinnata) 6) Piloo (Salvadora persica) The trees will be planted in several rows with a tree density of 2000-2500 trees/ha with adequate width around the plant boundary and maintained as per CPCB guidelines.	-
24	No one is against development. The fishermen should also not be affected	No treated effluent will be released into the sea. The proposed project has been designed based on zero liquid discharge system consisting of effluent treatment plant, RO plant and Multi Effect Evaporator. No treated effluent will be discharged outside the plant premises. Rain water collection pond (4*4000 m^3) will also be constructed to collect runoff from the process areas. This collected water will be recycled in plant operation. A total of Rs. 360 crores will be invested for ETP design and wastewater management. Take additional input from SIA findings.	Under CER a budget of Rs. 1.7 Crore has been allocated for Infrastructure improvement for Fisherman community and fund creation for fisherman life insurance to cover risk in fishing
25	how will you control the air emissions that will be released in the atmosphere? What is the facility that is done by you as for this? How impact of sulphur dioxide on environment is reduced? The sulphur dioxide that is released in air will damage health and so what steps have	Installation of Sulphuric Acid Plant for conversion of sulphur di-oxide off-gases generated from the smelting and converting furnaces into sulphuric acid. Installation of Scrubbers for treating fugitive and tail gas emission generated during the production processes will the help of high suction hoods. The residual SO_2 gases post manufacturing of Sulphuric Acid and treatment in tail gas scrubbing & fugitive gas desulphurization approx. **~300 mg/Nm^3, which is lower than the stipulated standard.**	-

EAC OBSERVATION NO.-11

Issue Related to Environment Note:- Project Site Environmental protection: Air-Rs. 639 Cr, Water-Rs.360 Cr, Solid waste & EMS- Rs. 45 Cr			
Sr. No.	**Issues Represented**	**Proponent Response**	**CER Budget**
	been taken by the company?		
26	This area is under the CRZ-1 area. There is no provision for approval of such land.	The proposed project is outside the CRZ area and project boundaries superimposed on CRZ Map prepared in 2011 by MoEF&CC authorised agency is submitted Chapter1 In EIA. Further, NCSCM has also been engaged by MoEFCC for CRZ mapping of entire country and CZMP approval of Kutch district is in process at state government level. M/s. AEL has engaged NCSCM to superimpose proposed project boundary on the approved CZMP maps.	-
27	Different CRZ maps are submitted in the Public Hearing for the years 1991, 2008, 2010 and 2017, which is the correct map out of those? If one map is correct out of four then this shows that the other three are false which indicates the Company has violated the rules of CRZ.	The proposed project is outside the CRZ area and project boundaries superimposed on CRZ Map prepared in 2011 by MoEF&CC authorised agency is submitted. In EIA. Further, NCSCM has also been engaged by MoEF&CC for CRZ mapping of entire country and CZMP approval of Kutch district is in process at state government level. M/s AEL has engaged NCSCM to superimpose proposed project boundary on the approved CZMP maps.	-
28	If the company comes and if there are any chances of environmental degradation, then the government authority should consider it seriously. The work should not remain only on paper.	Based on the baseline monitoring and the impact assessment modelling Environmental Management plan has been prepared to safeguard the environment. Considering possibility of worst case scenarios during plant operation disaster management plan has been prepared.	-
29	why you have selected site No. 2?	3 alternate sites were analysed and the site-2 was selected based on the following parameters; a) Distance from west port (Bulk material handling) b) Distance from Water Source c) Distance from power Source d) Closeness to Railway e) Closeness to State and National highway f) Social and R& R related issues. The details of the same has been already provided in EIA Report Chapter-5.	-

EAC OBSERVATION NO.-11

4621

Issue Related to Health & Safety

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	How you will control the dust? How many doctors will be available?	Dust will be captured at source of generation by providing suction hoods and bag filter. Dust collected will be recycled back into plant process. Dust emission outlet of the bag filter will be < 50 mg/Nm^3. Total of Rs. 639 Crores budget has been allocated for protection of Air Pollution.	CER Budget of Rs. 1.64 Crores has been allocated for the mass plantation in the 10 km radius area of the plant site.
2	Provide about the side effects, risk, etc. from the project.	M/s. NIOH; had been engaged to identify the various health hazards. NIOH had also suggested type and frequency of the various medical test to be carried out. M/s. TALEEM Foundation had been engaged to carry out the base line health index study. M/s. Safety Consultancy Services operated by former Regional Labour Institute (RLI) Director, had been engaged to carry out the HIRA and subsequent remedial measures for reduce the risks. Based on the risk assessment, disaster management plan is prepared. Worst case scenario for the following has been worked out. 1. LPG & Fuel oil Fire 2. Sulphuric Acid and Phosphoric Acid Tank Leakage 3. SO2 Gas leak 4. Furnace Metal Leak	-
3	provide the information that what diseases are possible due to the dust of copper?	Dust will be captured at source of generation by providing suction hoods and bag filter. Dust collected will be recycled back into plant process. Dust emission outlet of the bag filter will be < 50 mg/Nm^3. The PM emission will be well within the prescribed limit set by MoEF&CC. Total of Rs. 639 Crores budget has been allocated for protection of Air Pollution.	CER Budget of Rs. 1.64 Cr has been allocated for the mass plantation in the 10 km radius area of the plant site.

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4622

EAC OBSERVATION NO.-11

Issue Related to Material Handling & Storage

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	How sludge from ETP will be disposed?	Arsenic bearing sludge will be collected from ETP in Truck/ Tractor trolley and will be stored in secured land fill. Arsenic Bearing ETP Sludge will be stored in Secured land fill with double HDPE Liner of 2 mm thick and will be constructed as per CPCB Guidelines. Chemical gypsum will be collected from ETP in Truck/ Tractor trolley and will be stored in Gypsum storage. Further, it will be sold to cement industries.	-
2	How raw material will be stored & transferred?	Raw material will be stored in covered storage paved with concrete. Raw material (Copper Ore Concentrate and Rock Phosphate) will be transported through closed conveyor system from port to plant.	-
3	How finished product will be transported?	Finished product such as Copper Cathode, Copper Rods will be transported through trucks & container, Sulphuric Acid will be transported through Acid Tankers made of SS316L and Phosphoric Acid will be transported through Rubber lined Acid Tankers.	-
4	List of waste material generating from the plant. What chemicals will be present in the waste? Will mercury come out from this waste? What is the arrangement for waste material storage?	Arsenic bearing sludge will be generated from ETP. Truck/ Tractor trolley and will be used for transporting to secured land fill for storage purpose. Chemical gypsum will be generated from ETP. Truck/ Tractor trolley will be used for transporting to gypsum storage area. Copper slag will be generated as by-product from copper smelter. The same will be transported to slag storage area through conveying system. Phospho-Gypsum will be generated from phosphoric acid plant. The same will be transported to gypsum storage area through closed conveying system. Mercury will be recovered during the manufacturing process of Sulphuric Acid as Calomel and will be sold in the market. The detailed chemical analysis for arsenic bearing sludge (ETP sludge), Phospho-Gypsum, Copper slag has been provided in Chapter-2 in the Final EIA report. Arsenic Bearing ETP Sludge will be stored in Secured land fill with double HDPE Liner of 2 mm thick and will be constructed as per CPCB Guidelines. approx. 13 ha land has been marked for construction of SLF, capacity of storage for 20 years operation. Gypsum will be stored in gypsum storage lined with 1.5 mm HDPE liner and will be constructed as per CPCB Guidelines. Chemical gypsum and phospho-gypsum will be sold for cement manufacturing. Copper slag will be sold for road construction as well as for cement manufacturing.	-

EAC OBSERVATION NO.-11

Issue Related to PH

Sr. No.	Issues Represented	Proponent Response	CER Budget
1	All our questions shall be replied to in Gujarati language. The project representative does not reply in Gujarati language and therefore this means that the local public will not receive employment. The project officer should provide his qualification and identification before giving reply in Gujarati. Company officers should make submissions in the local Gujarati language.	Project Officer has introduced himself with name, qualification and provided photo ID proof for identification. The project presentation was detailed in Gujarati language and responses were provided in Gujarati and Hindi by project proponent.	-
2	When was the report submitted to Mandvi Taluka Panchayat? Is the report provided to community leaders?	the copy of report and CD is provided to Mandvi Taluka Panchayat office on 27.03.2017.	-
3	It is our expectation that the plant will be established by considering the rules framed by the Government of Gujarat and Central Government as well as considering the public interest.	The plant will be established by considering the rules framed by the Government of Gujarat and Central Government as well as considering the public interest. Budget of Rs 1,044 has been allocated for pollution control equipment within the plant for environmental protection.	-
4	The person providing the reply on behalf of the company must provide the company photo ID card, only then he will be allowed to reply. Our boys are not permitted to enter the company without an ID-card.	ID Card was shown on the screen.	-
5	At which five places were the EIA reports placed?	As per the EIA notification of the Government of India, the draft EIA report is made available at following offices: i. District Collector office, Kutch-Bhuj ii. Office of District Development officer, Kutch-Bhuj iii. District Industrial Center, Bhuj-Kutch, iv. Office of the Taluka Development officer, Mundra v. Office of the Taluka Development officer, Mandvi	-
6	How can the public hearing be conducted for this project when the process of forest clearance is still going on?	Public Hearing was organised (Date of Public Hearing: 29th April 2017) by state pollution control board upon considering all the requisite requirement for the public hearing. During the public hearing response was provided by the project proponent that forest clearance for the forest land identified for this project has already been applied (Date of Forest diversion application:8-04/2016) before receipt of the TOR (Date of TOR received - 21st June 2016).	-

EAC OBSERVATION NO.-12

EAC OBSERVATION:

Confirm suitability of air model used as per site characteristics in view of the complex atmospheric conditions of the coastal line and fumigation scenario. Superimpose air modeling isopleth on the land use map of the study area considering worst case scenario of the pollutants. Mitigations measures based on the receptor points and path to be submitted.

REPLY:

- **Details of Mathematical Modeling**

As the proposed copper refinery project site is located in coastal environment, air dispersion modeling studies were conducted using CALPUFF model. CALPUFF is an advanced, integrated multi-layer, multi-species non-steady-state puff dispersion model that simulates the effects of time and space varying meteorological conditions on pollution transport, transformation and removal. CALPUFF can be applied on scales of tens to hundreds of kilometers. This model has been adopted by the United States Environmental Protection Agency (EPA) in its Guideline on Air Quality Models as a preferred model for assessing long range transport of pollutants.

The model builds on the CALMET gridded wind field, and contains modules for complex terrain, overwater transport and coastal interaction effects, building downwash, wet scavenging, dry deposition, and simple chemical transformation.
The integrated modeling system consists of 3 main components and a set of preprocessing and post processing programs. The main components of the modeling system are CALMET (a diagnostic 3-dimensional meteorological model), CALPUFF (an air quality dispersion model), and CALPOST (a post processing package).

In addition to these components, there are numerous other processors that may be used to prepare geophysical (land use and terrain) data in many standard formats, meteorological data (surface, upper air, precipitation, and buoy data), and interfaces to other models such as the Penn State/NCAR Mesoscale Model (MM5), the National Centers for Environmental Prediction (NCEP) Eta model and the RAMS meteorological model.

The CALPUFF model is designed to simulate the dispersion of buoyant, puff or continuous point and area pollution sources as well as the dispersion of buoyant, continuous line sources.

The components of the CALPUFF system include:
- **CALPUFF**
- **CALMET**
- **CALPOST**

➢ **CALPUFF**

CALPUFF is a puff model that is capable of fully accounting hour-by hour and spatial variations in wind and stability. Puff models, in general, perform well at downwind distances from a few kilometers to more than 100 km. CALPUFF contains additional algorithms that allow it to emulate AERMOD (or ISCST3) at short distances where puff model are generally less reliable. CALPUFF has been evaluated and found to be reasonably accurate at a distance up to 300 km.

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EAC OBSERVATION NO.-12

- **CALMET**

CALMET is a diagnostic meteorological model which includes a diagnostic wind field generator containing objective analysis and parameterized treatments of slope flows, kinematic terrain effects, terrain blocking effects, a divergence minimization procedure, and a micro meteorological model for overland and overwater boundary layers.

- **CALPOST**

CALPOST is a post-processing program with options for the computation of time-averaged concentrations and deposition fluxes predicted by the CALPUFF model. CALPOST computes visibility impacts in accordance with IWAQM and FLAG recommendations. CALPOST requires only the CALPUFF outputs, although the final visualization often requires multiple additional programs.

- **Model Set-up and Scenarios**

In Calpuff, the modeling domain has set-up by 25 X 25 km horizontal grid with each grid cell spacing of 4 X4 km to provide adequate resolution of terrain features. Calpuff has run with 10 different layer options with default cell face heights of 20 m, 40 m, 80 m, 160 m, 320 m, 640 m, 1200 m, 2000 m, 3000 m and 4000 m. The Calpuff model set-up details are presented in **Table-1** below:

TABLE-1
CALPUFF MODEL SET-UP

Sr. No.	Parameter	Details
1	Model Name	CALPUFF (Version 8.6.1)
2	Model Type	Non-Steady-State Puff Dispersion model
3	Topography	Rural, Flat and Coastal
4	Averaging Time	15 m, 1, 3, 8 & 24 hours
5	Source Type	Point Source
6	Boundary Limits	25 km X 25 km
7	Co-ordinate System	Uniform Cartesian Grid
8	Meteorological data	MM5 (Fifth-Generation Penn State/NCAR Mesoscale Model) 1st January 2018 to 31st December 2018

Sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) and Particulate Matter (PM) emissions are the main pollutants in the copper refinery plant. Air Dispersion modeling studies have been conducted considering 2 scenarios for the above pollutants. The annual wind rose diagram is presented in **Figure-1** and the 3D view of vertical wind field distribution for the same period is presented in **Figure-2**.

4626

EAC OBSERVATION NO.-12

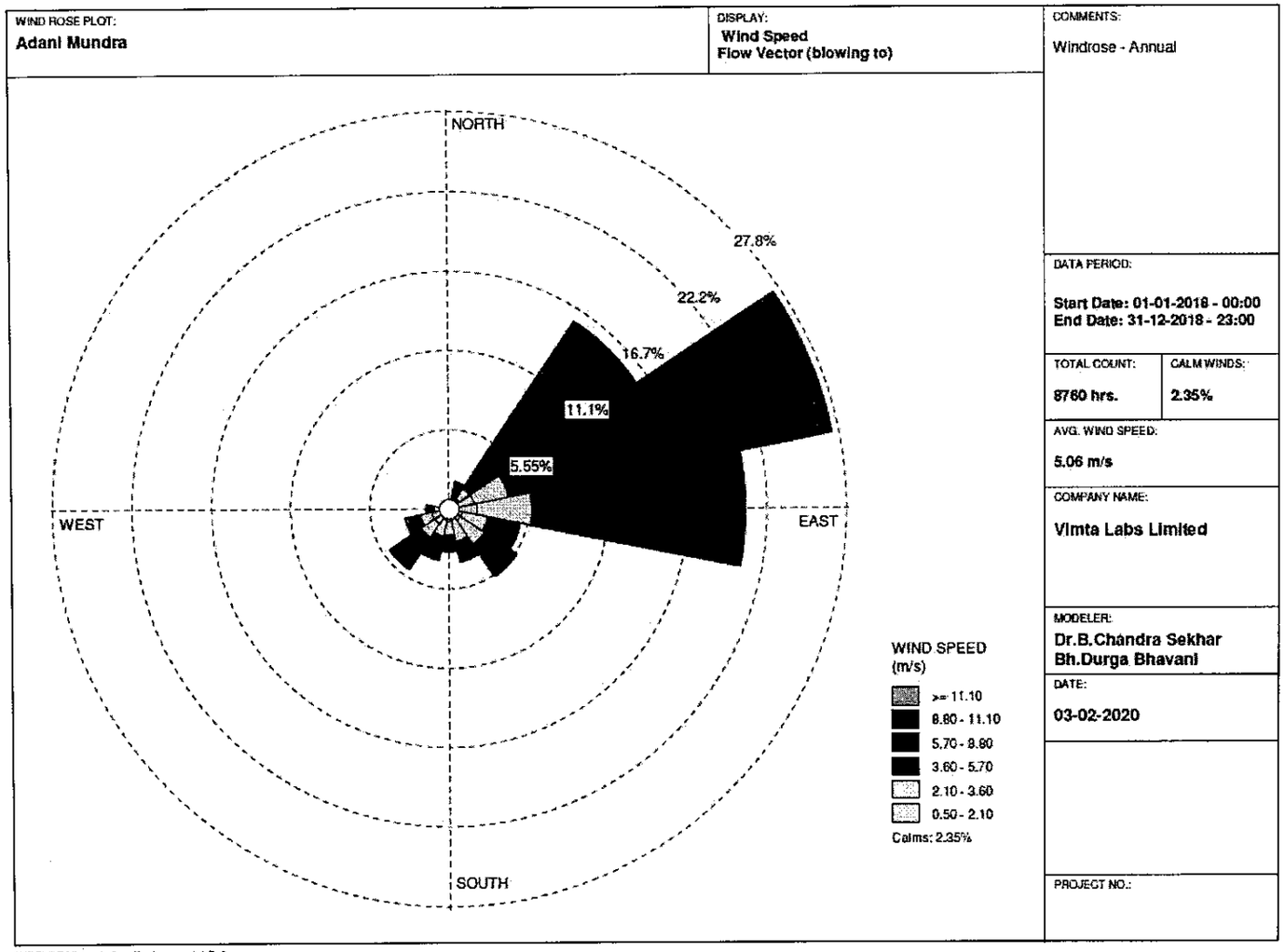


FIGURE-1

WIND ROSE DIA GRAM (1ST JANUARY 2018-31ST DECEMBER 2018)

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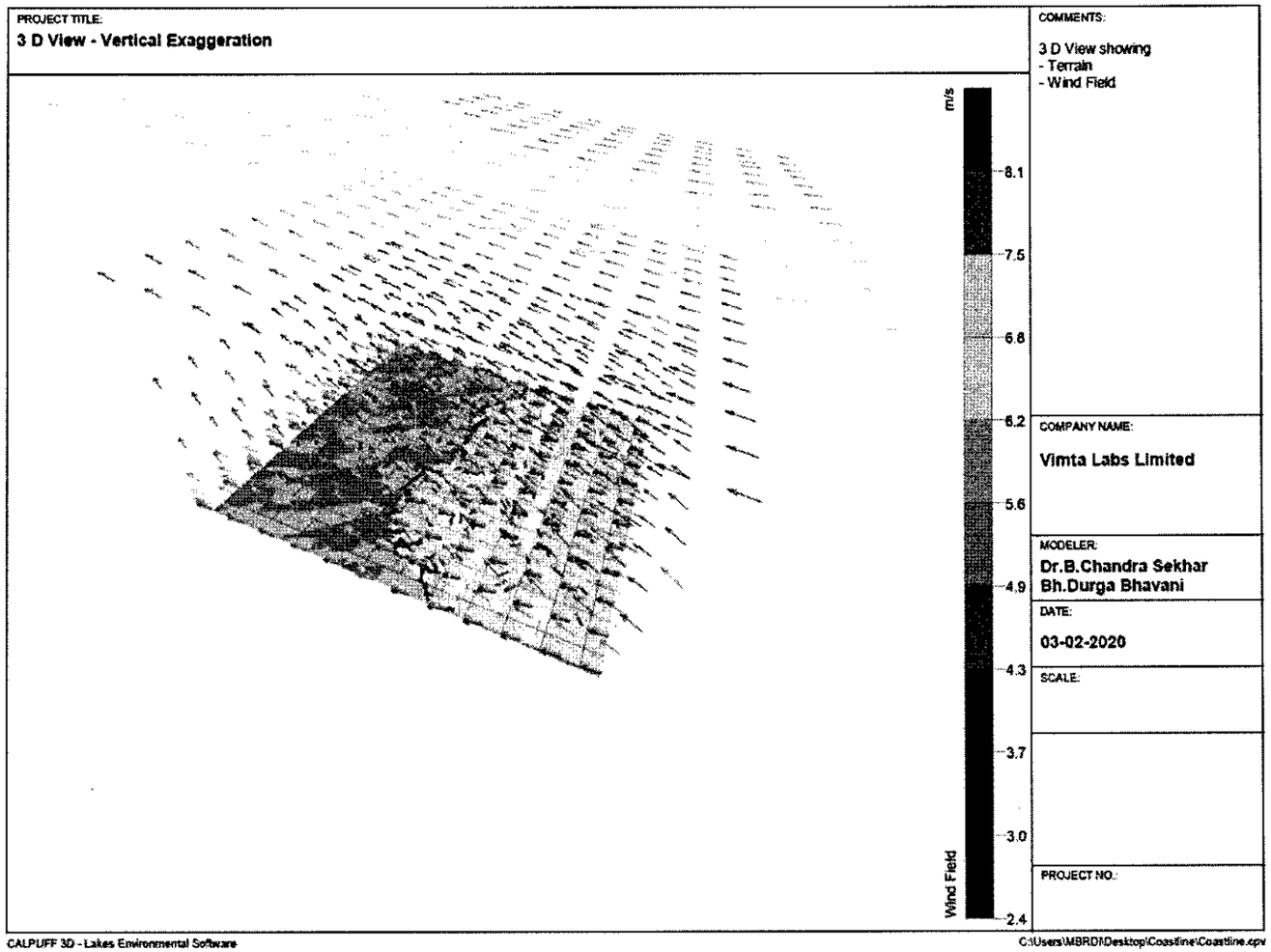


FIGURE-2
VERTICAL WIND FIELD DISTRIBUTION

4262

EAC OBSERVATION NO.-12

Model Limitations:

An attempt has been made to determine incremental concentrations during daytime and nighttime. However, the model limitation (selection option) permits 5 AM-5 PM and 24 Hour average only. Hence, model predictions were carried out for 24 Hour average and 12 Hour option. The model predictions were carried out with a model domain of 25 km X 25 km.

Scenario-1: **Normal Operating conditions with coast line fumigation (24 hourly average);**
Scenario-1A: **Normal Operating conditions with coast line fumigation (Day time 12 hourly average);**
Scenario-2: **Under pollution control system failure (representing Worst case) with coastline fumigation (24 hourly average); and**
Scenario-2A: **Under pollution control system failure (representing Worst case) with coastline fumigation (Day time 12 hourly average).**

- ***Model Input Data***

  The details of stack emissions of proposed copper refinery project considered for conducting air dispersion modelling are presented in **Annexure-I.**

- **Results and Discussions**

  Scenario-1: Normal Operating conditions with coast line fumigation (24 hourly average)

  The simulations have been carried out to evaluate incremental concentration of Sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) and Particulate Matter (PM) likely to be contributed by the proposed project on various land uses. The maximum concentrations of SO_2 and PM are occurring at X-556.212 km and Y-2519.521 km and NOx maximum concentrations are occurring at X-560.212 km and Y-2523.521 km. The maximum SO_2 concentrations are occurring at a distance of 2.55 km in NE direction on a barren land and the nearest settlement is Bhujpar Mota village which is located at a distance of 1.2 km NE direction.

  The predicted incremental concentrations of SO_2, NOx and PM (98^{th} percentile) due to the proposed project on various land uses are presented in **Table-2** and the isopleths of the same are shown in **Figure-3** to **Figure-5** respectively.

TABLE-2
INCREMENTAL CONCENTRATIONS UNDER NORMAL OPERATING CONDITIONS WITH COASTLINE FUMIGATION – 24 HOUR AVERAGE

All values are in $\mu g/m^3$

Parameter	Barren Land	Streams & Canals	Range Land	Agriculture Land	Max Conc.
PM	1.96	0.90	1.00	0.50	1.96
SO_2	8.00	13.90	8.00	4.00	13.90
NO_x	0.30	0.47	0.08	0.004	0.47

4629

EAC OBSERVATION NO.-12

Scenario-1A: Normal Operating conditions with coast line fumigation (Daytime 12 hourly average)

The simulations have been carried out to evaluate daytime (5 AM – 5 PM) incremental concentration of Sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) and Particulate Matter (PM) likely to be contributed by the proposed project on various land uses. The maximum concentrations of SO_2, and PM are occurring at X-568.212 km and Y-2527.521 km and for NOx the maximum concentrations are occurring at X-560.212 km and Y-2523.521 km.

The predicted incremental concentrations for SO_2, NOx and PM (98% percentile) are presented in **Table-3** and isopleths of the are shown in **Figure-6** to **Figure-8** respectively. Further, the 3D view of the same is given in **Figure-9 to Figure-11.**

TABLE-3
INCREMENTAL CONCENTRATIONS UNDER NORMAL OPERATING CONDITIONS WITH COASTLINE FUMIGATION – DAYTIME 12 HOURS

All values are in $\mu g/m^3$

Parameter	Barren Land	Streams & Canals	Range Land	Agriculture Land	Max Conc.
PM	0.90	0.10	0.41	0.080	0.41
SO_2	0.80	0.50	3.29	0.10	3.29
NO_x	0.09	0.053	0.008	0.00053	0.053

From the above observations, it can be concluded that the maximum concentrations are occurring at streams and canals. The concentrations of PM, SO_2 and NOx over agricultural land were observed to be 0.080, 0.10 and 0.00053 $\mu g/m^3$ respectively. It is to be noted that the SO_2 incremental concentrations resulting from the plant operations are occurring on range land.

4630

EAC OBSERVATION NO.-12

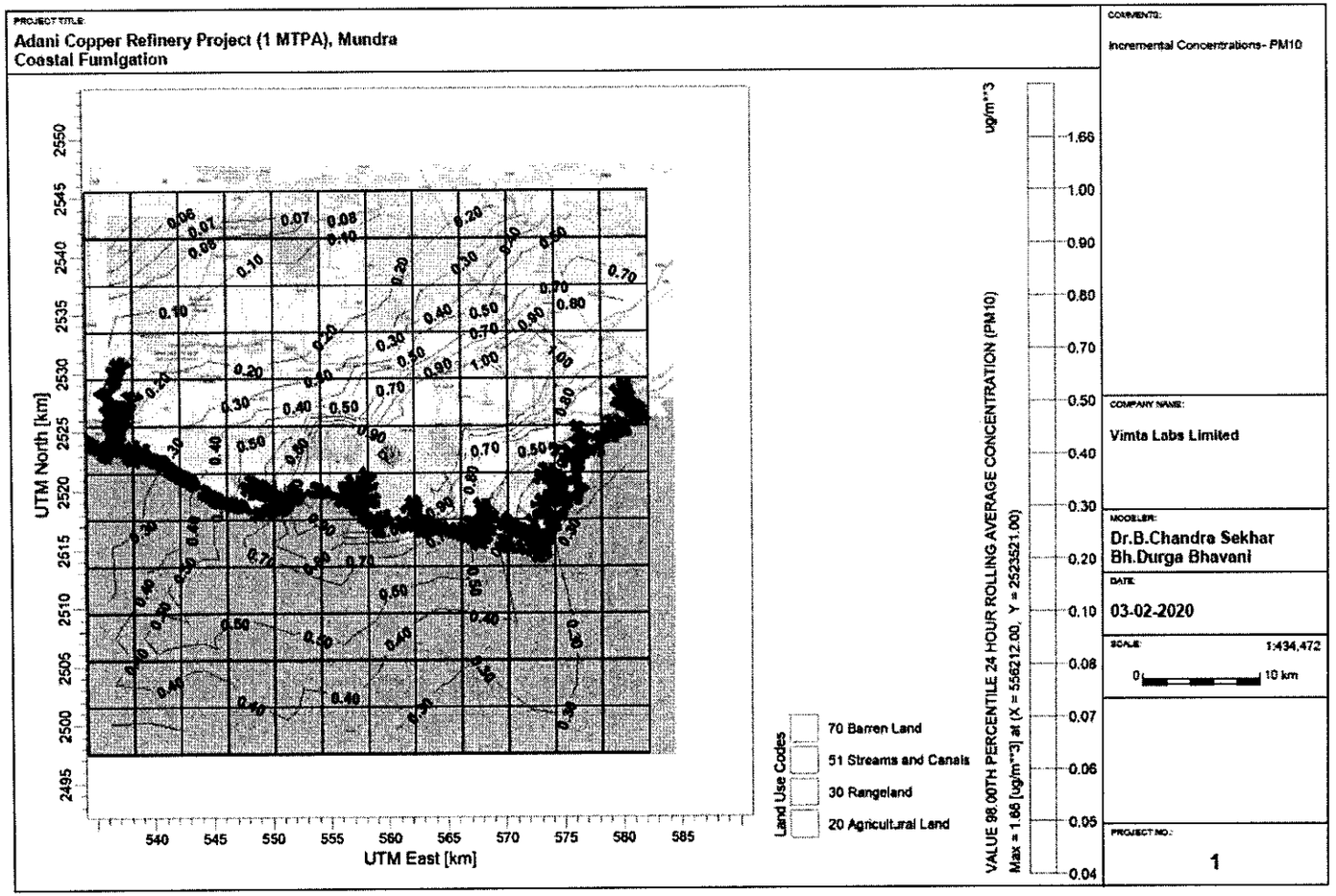


FIGURE-3
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS - PARTICULATE MATTER (NORMAL OPERATING CONDITIONS – 24 HRS)

4265

EAC OBSERVATION NO.-12

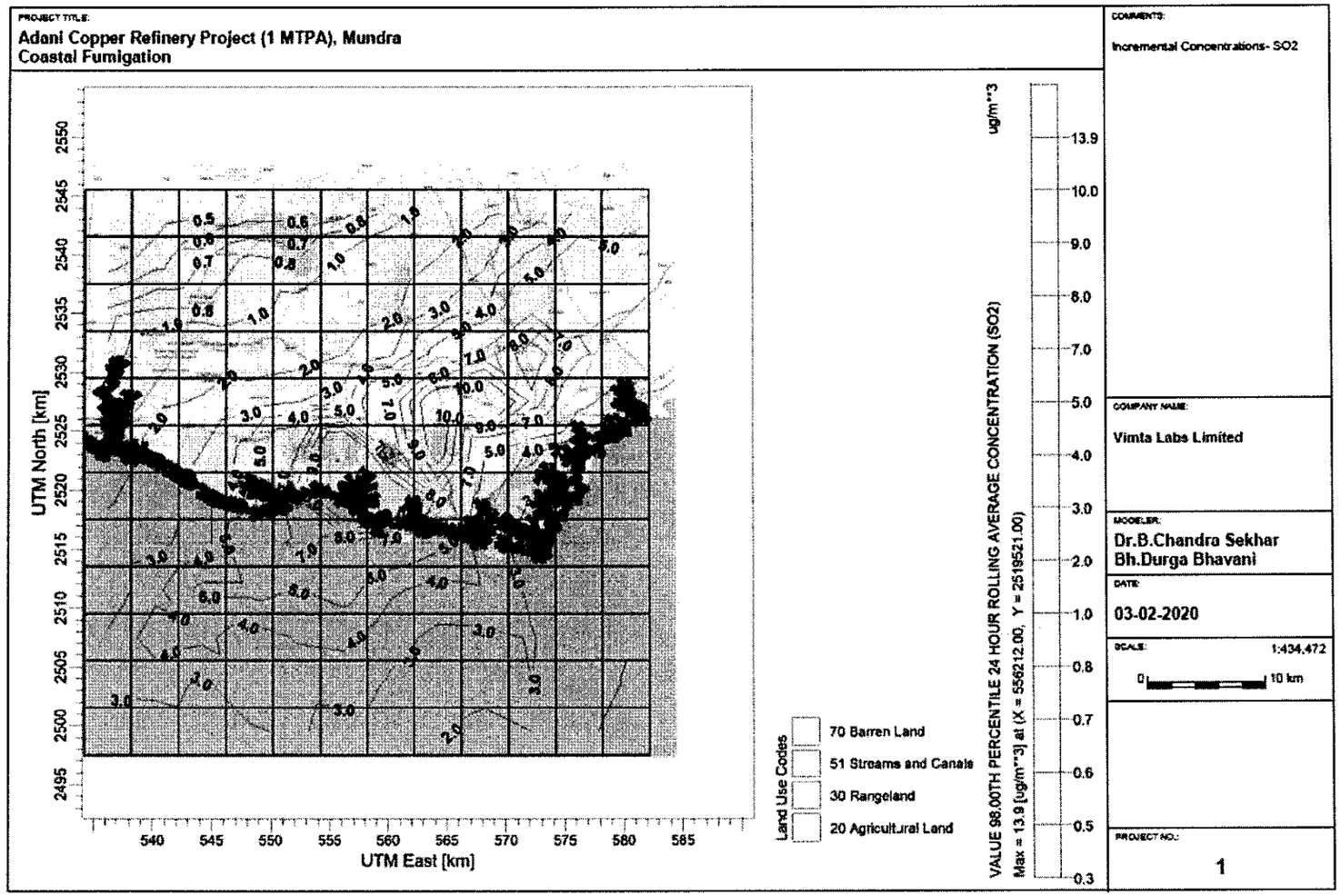


FIGURE-4
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS - SO_2
(NORMAL OPERATING CONDITIONS – 24 HRS)

4682

EAC OBSERVATION NO.-12

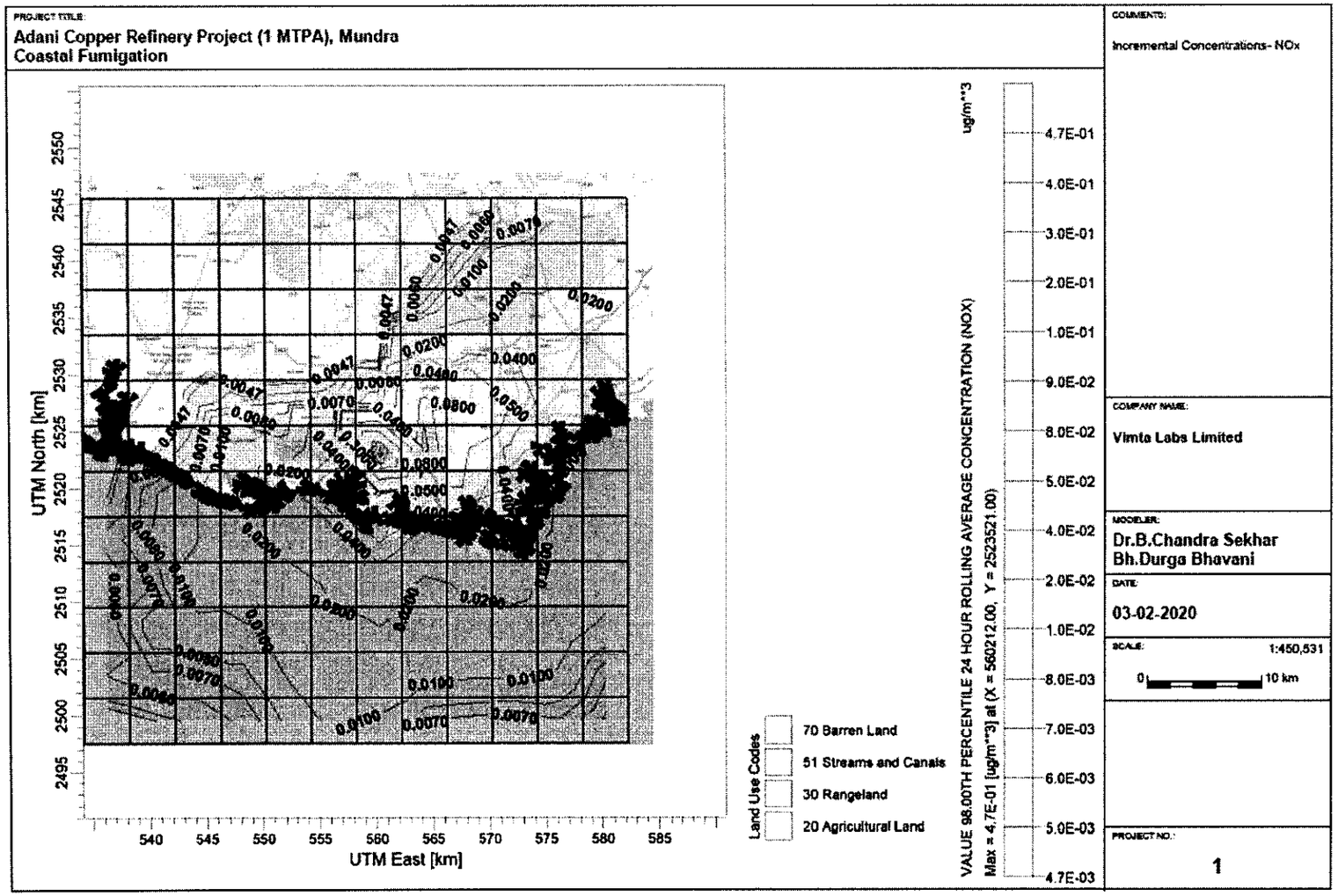


FIGURE-5
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS - NOx
(NORMAL OPERATING CONDITIONS – 24 HRS)

4267

4683

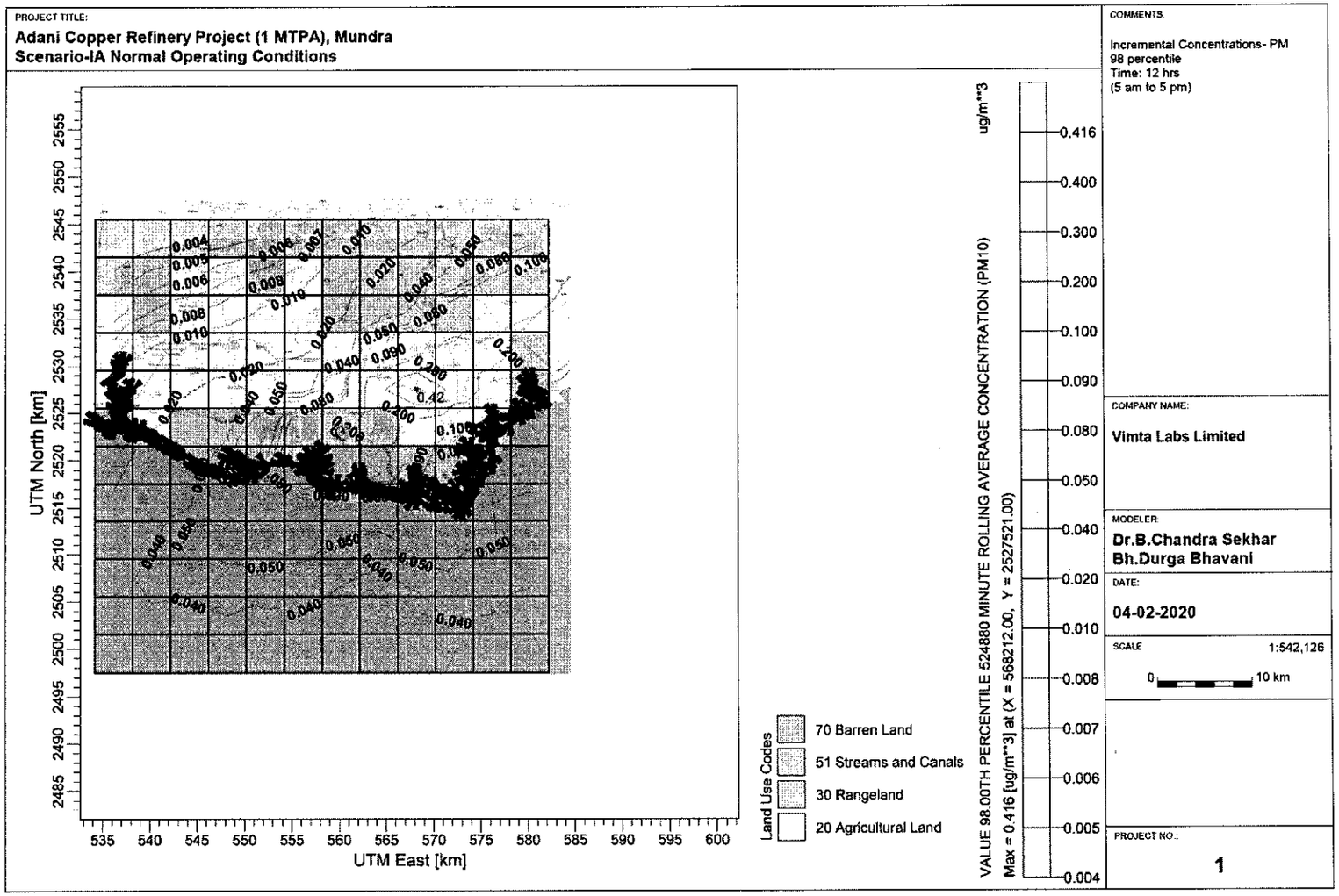


FIGURE-6
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS - PARTICULATE MATTER (NORMAL OPERATING CONDITIONS 12 HRS)

4268

4634

EAC OBSERVATION NO.-12

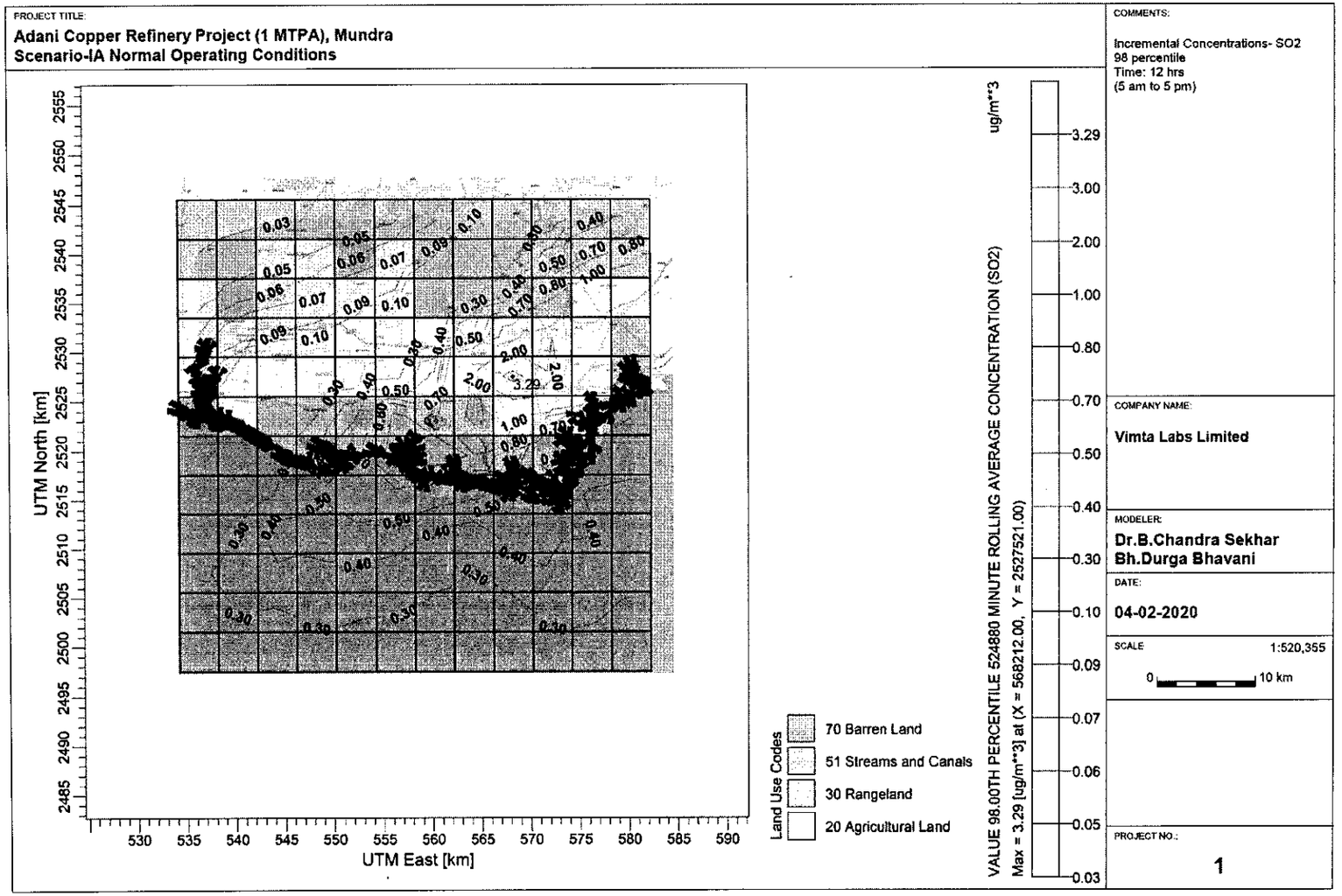


FIGURE-7
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS – SO_2
(NORMAL OPERATING CONDITIONS 12 HRS)

4269

EAC OBSERVATION NO.-12

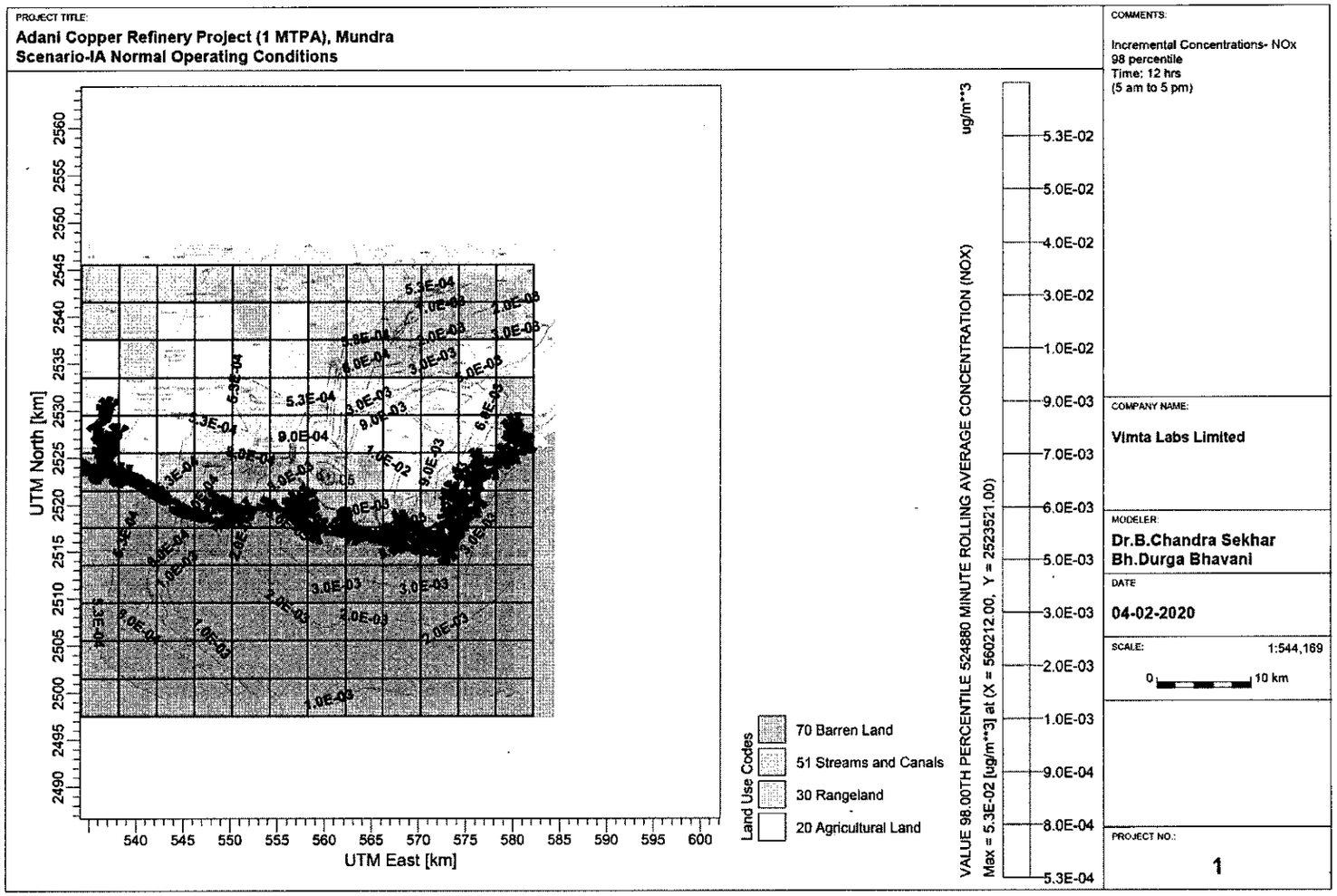


FIGURE-8
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS – NOx
(NORMAL OPERATING CONDITIONS 12 HRS)

EAC OBSERVATION NO.-12

Scenario-2: Under pollution control system failure (representing Worst case) with coastline fumigation

The simulations have been carried out to predict maximum incremental concentrations of Sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) and Particulate Matter (PM) likely to be contributed by the proposed project during upset conditions on various land uses. The simulations carried out for 1minute interval. The isopleths showing the incremental concentrations on various land uses are shown in **Figure-12** to **Figure-14** respectively.

The long-term incremental concentrations due to the proposed project on various land use pattern is presented below:

TABLE-4
INCREMENTAL CONCENTRATIONS UNDER POLLUTION CONTROL SYSTEM FAILURE REPRESENTING WORST CASE – 1 MINUTE INTERVAL

All values are in $\mu g/m^3$

Parameter	Barren land	Streams & Canals	Range Land	Agriculture Land	Max Conc.
PM	31.69	5.0	3.0	0.3	31.69
SO_2	21534	10000	5000	215	21534
NO_x	6.24	1.0	1.0	0.06	6.242

4637

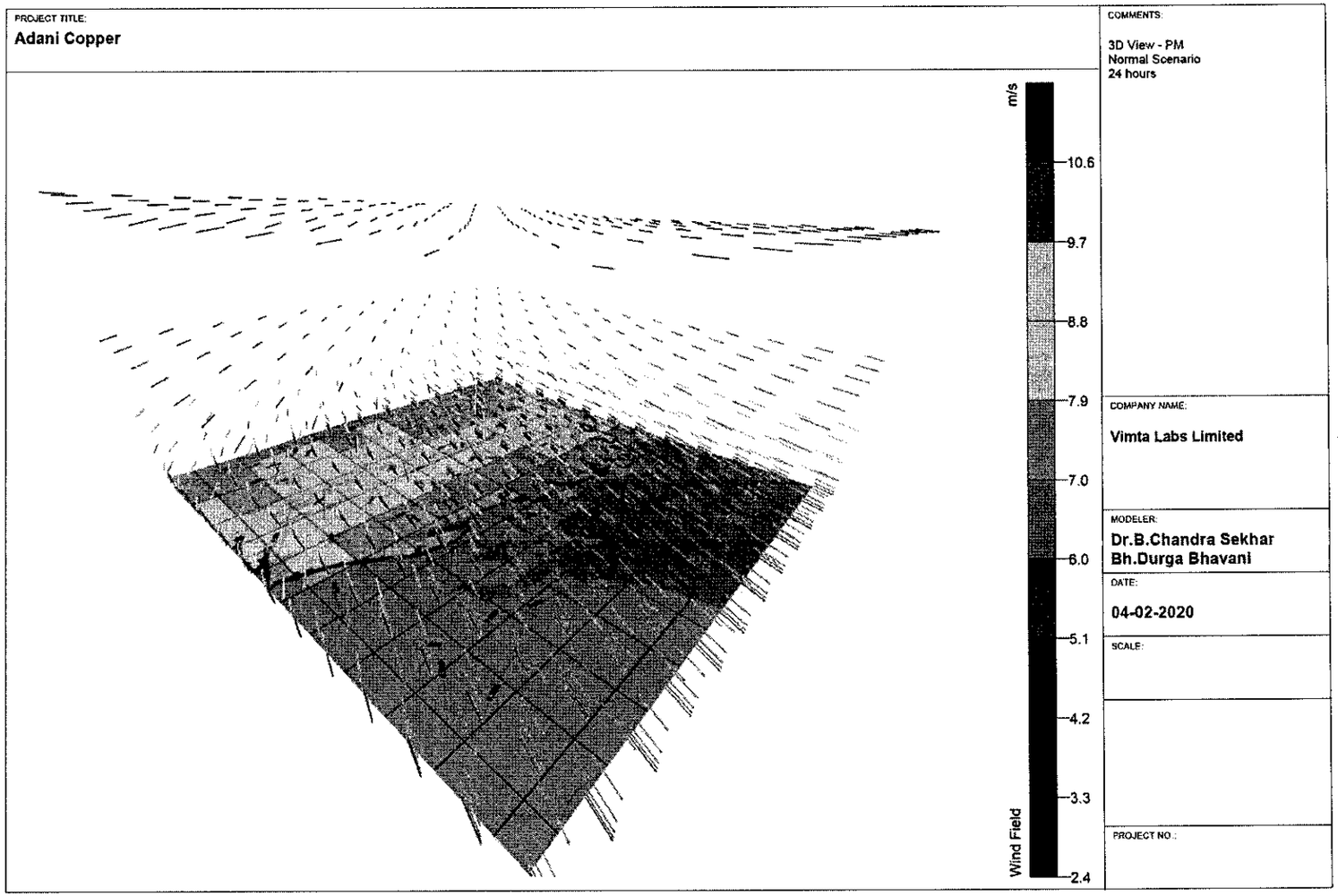


FIGURE-9
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS – PARTICULATE MATTER (NORMAL CONDITIONS-24 HRS AVG -3D VIEW)

4638

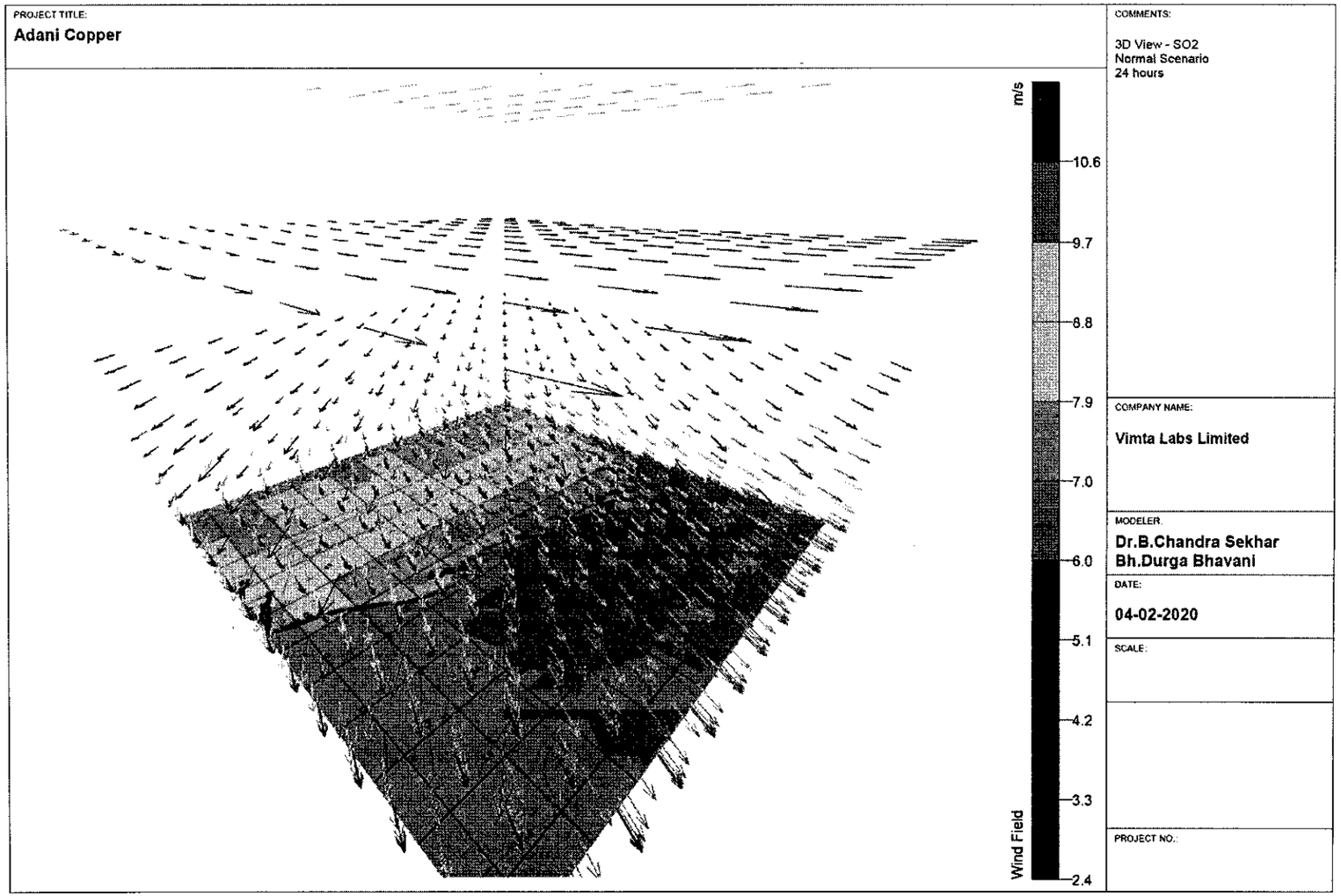


FIGURE-10
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS – SO2
(NORMAL CONDITIONS – 24 HRS AVG - 3D VIEW)

4273

4639

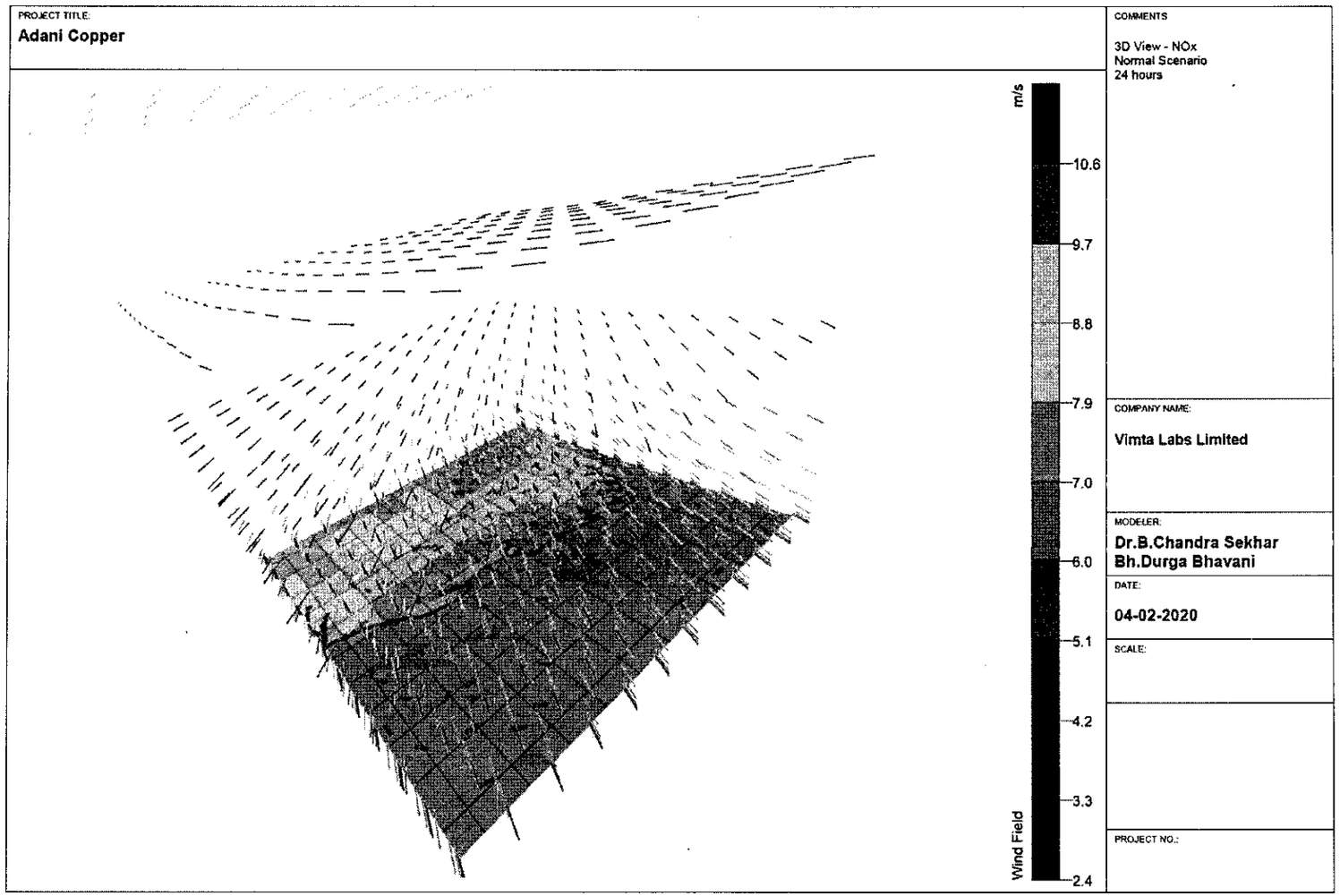


FIGURE-11
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS – NOX
(NORMAL CONDITIONS – 24 HRS AVG - 3D VIEW)

4274

4640

EAC OBSERVATION NO.-12

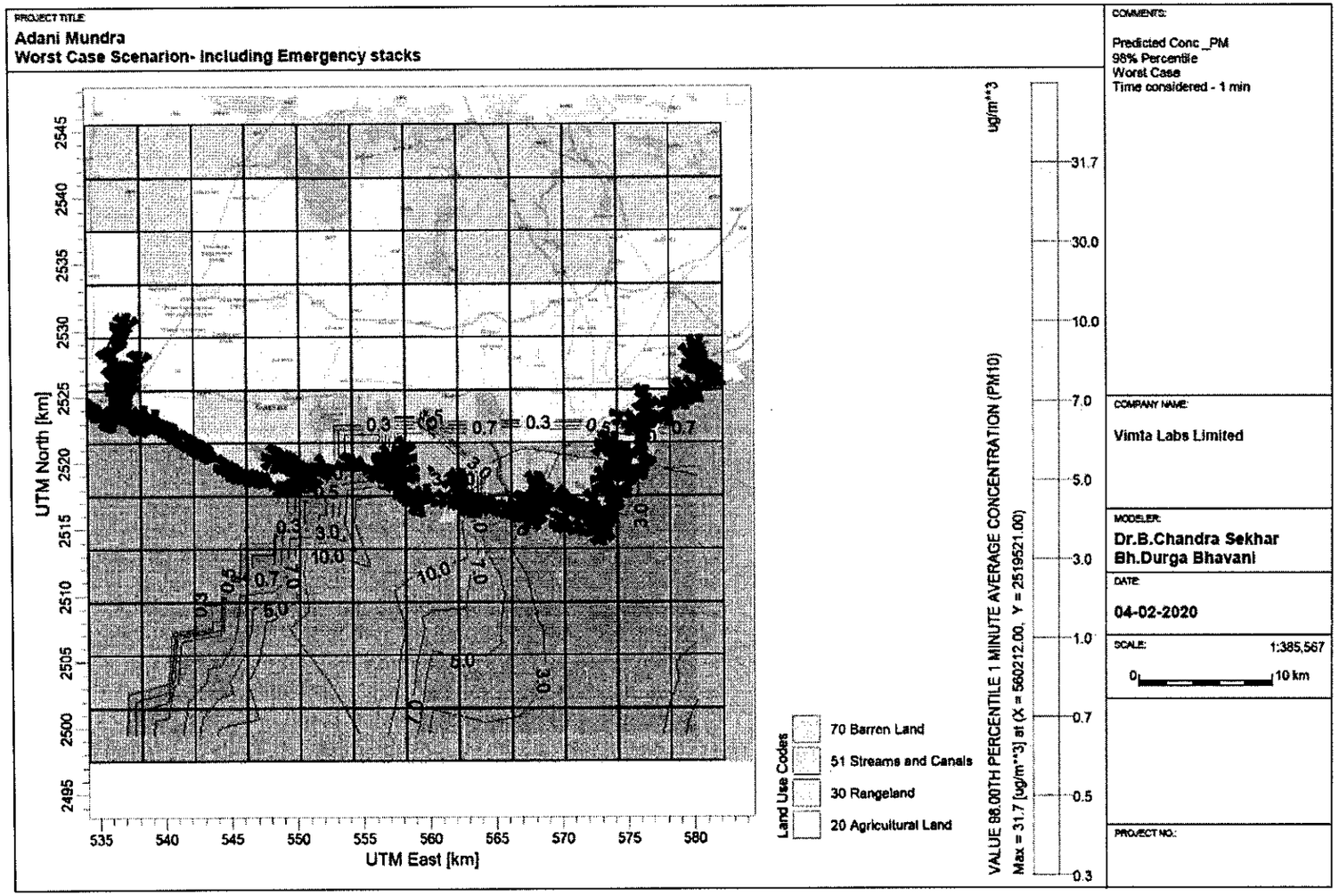


FIGURE-12
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS - PARTICULATE MATTER (WORST CASE SCENARIO-1 MIN)

4275

EAC OBSERVATION NO.-12

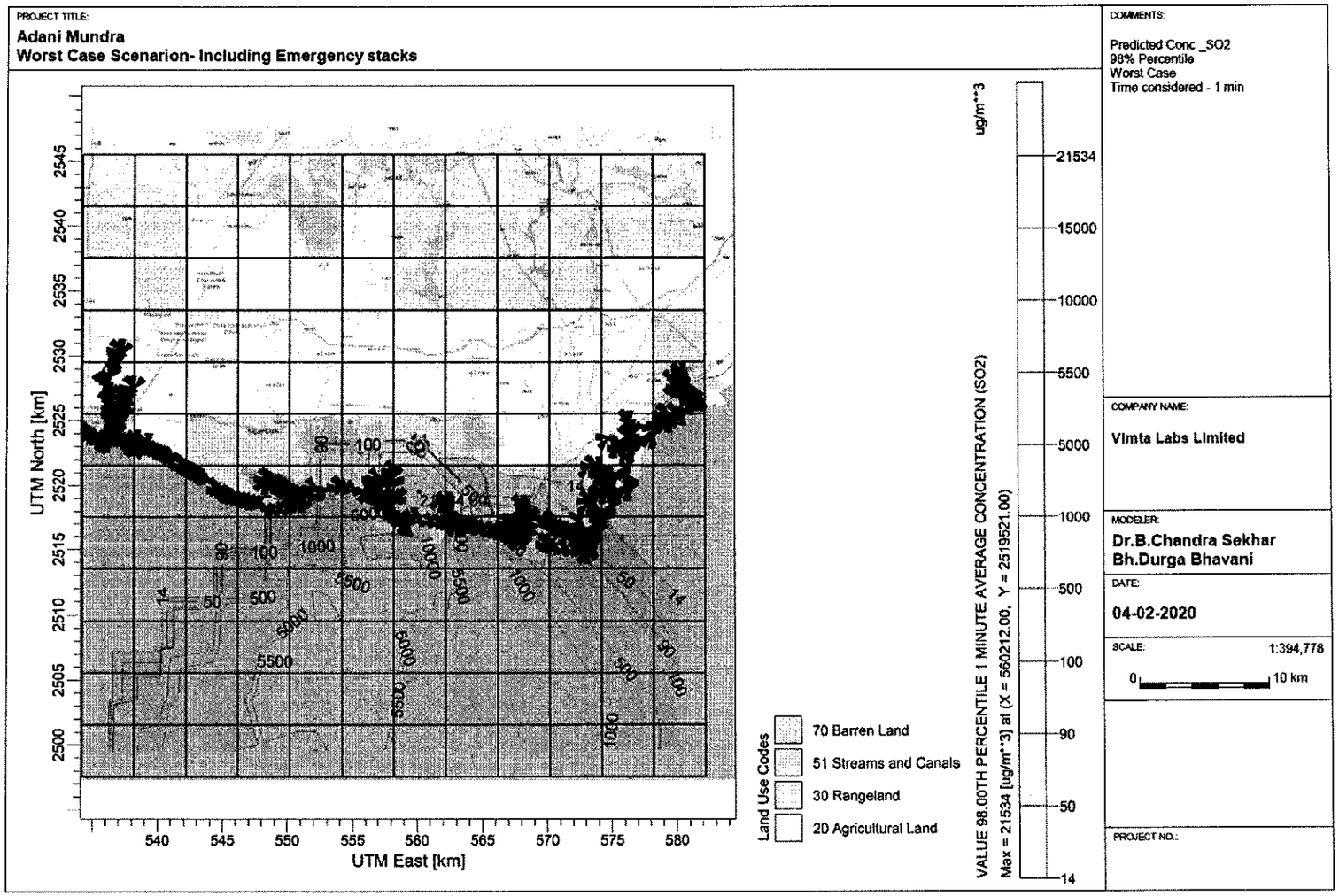


FIGURE-13
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS - SO_2
(WORST CASE SCENARIO-1 MIN)

4642

EAC OBSERVATION NO.-12

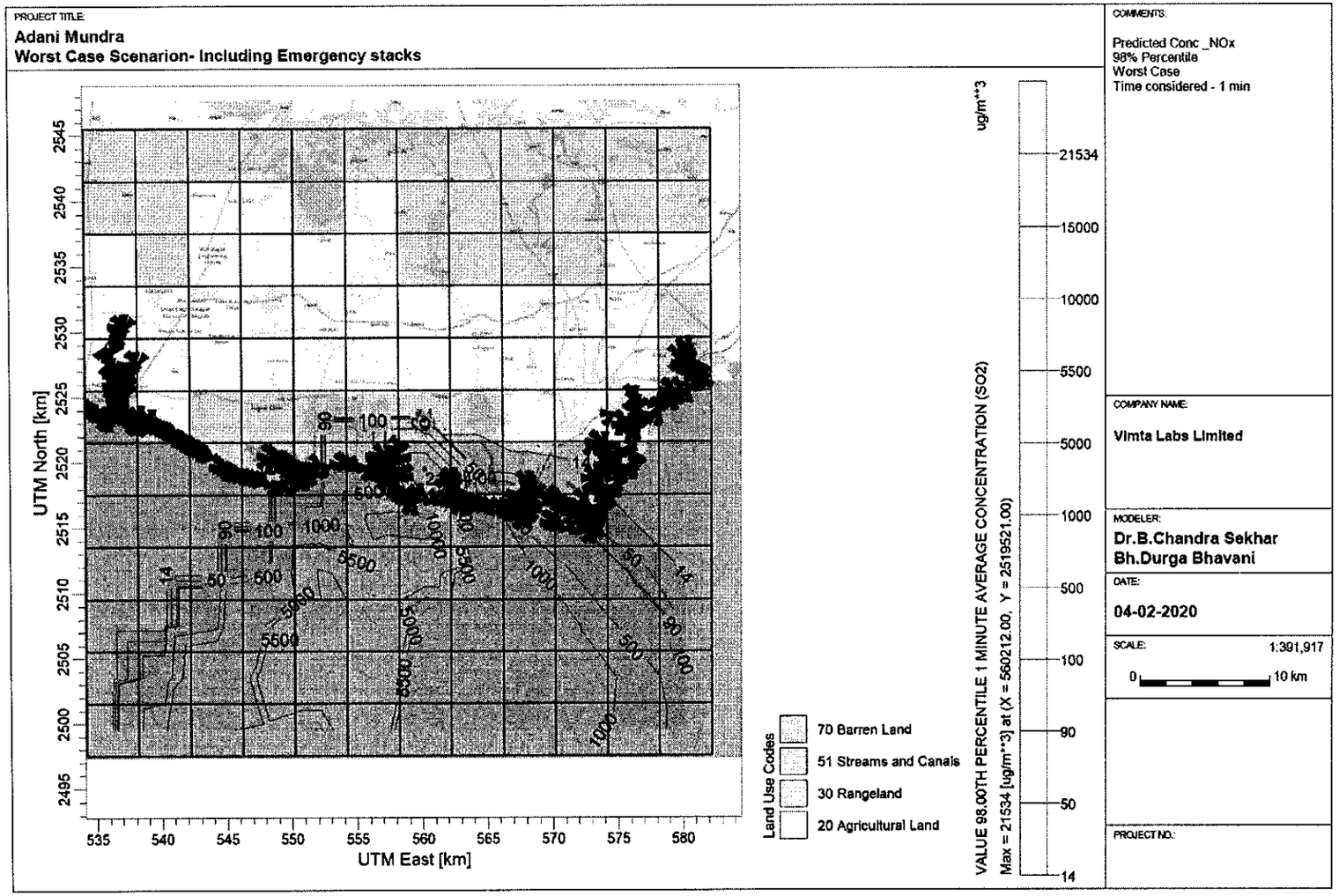


FIGURE-14
ISOPLETHS SHOWING THE INCREMENTAL CONCENTRATIONS – Nox
(WORST CASE SCENARIO-1 MIN)

4277

EAC OBSERVATION NO.-12

4643

Impact on Habitation:

The release of air pollutant attributes from the emission sources of the proposed project and its impact on nearby habitations have been assessed for two scenarios i.e.; normal scenario and worst case scenario. The resultant concentrations are given below in **Table-5** to **Table-10**.

TABLE-5
IMPACT ON NEAREST HABITATION – PM -NORMAL SCENARIO

(Expressed in µg/m³)

AAQ	Village Name	Distance/ Direction	Baseline Concentration (PM_{10}) – 98th %ole	Predicted GLCs	Resultant Concentrations	NAAQ Norms
AAQ1	Project Site	-	54.2	1.00	55.2	100
AAQ2	Navinal	1.7 km, ENE	60.6	0.90	61.5	
AAQ3	Bhujpar Mota	6.2 km, NE	74.1	0.90	75.0	
AAQ4	Jarpara	6.8 km, ENE	63.7	1.00	64.7	
AAQ5	Wandh	1.8 km, SW	76.6	0.80	77.4	
AAQ6	Siracha	4.4 km, NW	82.2	0.40	82.6	
AAQ7	Siravha	1.7 km, NNW	64.8	0.90	65.7	
AAQ8	Moti Khakhar	5.9 km, NNW	84.1	0.20	84.3	

TABLE-6
IMPACT ON NEAREST HABITATION – SO_2 - NORMAL SCENARIO

(Expressed in µg/m³)

AAQ	Village Name	Distance/ Direction	Baseline Concentration (PM_{10}) – 98th %ole	Predicted GLCs	Resultant Concentrations	NAAQS 2009
AAQ1	Project Site	-	24.6	8.0	32.6	80
AAQ2	Navinal	1.7 km, ENE	32.1	7.0	7.1	
AAQ3	Bhujpar Mota	6.2 km, NE	30.7	7.0	37.7	
AAQ4	Jarpara	6.8 km, ENE	20.4	9.0	29.4	
AAQ5	Wandh	1.8 km, SW	29.8	8.0	37.8	
AAQ6	Siracha	4.4 km, NW	30.6	3.0	33.6	
AAQ7	Siravha	1.7 km, NNW	30.8	8.0	38.8	
AAQ8	Moti Khakhar	5.9 km, NNW	42.0	2.0	44.2	

TABLE-7
IMPACT ON NEAREST HABITATION – NOx -NORMAL SCENARIO

(Expressed in µg/m³)

AAQ	Village Name	Distance/ Direction	Baseline Concentration (PM_{10}) – 98th %ole	Predicted GLCs	Resultant Concentrations	NAAQS 2009
AAQ1	Project Site	-	19.9	0.08	19.98	80
AAQ2	Navinal	1.7 km, ENE	23.1	0.007	23.11	
AAQ3	Bhujpar Mota	6.2 km, NE	28.5	0.04	28.54	
AAQ4	Jarpara	6.8 km, ENE	27.5	0.05	27.55	
AAQ5	Wandh	1.8 km, SW	27.7	0.02	27.72	
AAQ6	Siracha	4.4 km, NW	27.3	0.008	27.31	
AAQ7	Siravha	1.7 km, NNW	28.5	0.007	28.51	
AAQ8	Moti Khakhar	5.9 km, NNW	31.7	0.0047	31.71	

TABLE-8
IMPACT ON NEAREST HABITATION – PM -WORST CASE SCENARIO

(Expressed in µg/m³)

AAQ	Village Name	Distance/ Direction	Baseline Concentration (PM_{10}) – 98th %ole	Predicted GLCs	Resultant Concentrations
AAQ1	Project Site	-	54.2	0.7	54.9
AAQ2	Navinal	1.7 km, ENE	60.6	0.3	60.9
AAQ3	Bhujpar Mota	6.2 km, NE	74.1	0.3	74.4
AAQ4	Jarpara	6.8 km, ENE	63.7	0.3	64.0
AAQ5	Wandh	1.8 km, SW	76.6	0.5	77.1
AAQ6	Siracha	4.4 km, NW	82.2	0.3	82.5
AAQ7	Siravha	1.7 km, NNW	64.8	0.3	65.1
AAQ8	Moti Khakhar	5.9 km, NNW	84.1	0.3	84.4

TABLE-9
IMPACT ON NEAREST HABITATION – SO_2 -WORST CASE SCENARIO

(Expressed in µg/m³)

AAQ	Village Name	Distance/ Direction	Baseline Concentration (PM_{10}) – 98th %ole	Predicted GLCs	Resultant Concentrations
AAQ1	Project Site	-	24.6	50.0	74.6
AAQ2	Navinal	1.7 km, ENE	32.1	14.0	46.1
AAQ3	Bhujpar Mota	6.2 km, NE	30.7	14.0	44.7
AAQ4	Jarpara	6.8 km, ENE	20.4	14.0	34.4
AAQ5	Wandh	1.8 km, SW	29.8	100.0	129.8
AAQ6	Siracha	4.4 km, NW	30.6	90.0	120.6
AAQ7	Siravha	1.7 km, NNW	30.8	50.0	80.8
AAQ8	Moti Khakhar	5.9 km, NNW	42.0	14.0	56.0

Incase of tripping of the system the worst case scenario will take place. The residual gases in the system will escape within less than 90 sec. Calpuff modelling has been done for releases gases incase of trip as worst case scenario and the resultant peak GLC has been predicted, which will be temporary in the ambient air and will get normalize instantaneously.

TABLE-10
IMPACT ON NEAREST HABITATION – NOx -WORST CASE SCENARIO

(Expressed in µg/m³)

AAQ	Village Name	Distance/ Direction	Baseline Concentration (PM_{10}) – 98th %ole	Predicted GLCs	Resultant Concentrations
AAQ1	Project Site	-	19.9	0.10	20.00
AAQ2	Navinal	1.7 km, ENE	23.1	0.40	23.50
AAQ3	Bhujpar Mota	6.2 km, NE	28.5	0.10	28.60
AAQ4	Jarpara	6.8 km, ENE	27.5	0.10	27.60
AAQ5	Wandh	1.8 km, SW	27.7	0.40	28.10
AAQ6	Siracha	4.4 km, NW	27.3	0.50	27.80
AAQ7	Siravha	1.7 km, NNW	28.5	0.10	28.60
AAQ8	Moti Khakhar	5.9 km, NNW	31.7	0.10	31.80

4645

EAC OBSERVATION NO.-12

Mitigation measures at Receptor locations:

- Greenbelt/green cover shall be developed in the surrounding villages
- Provision of CER funds to develop greenbelt/green cover out side the plant premises
- Sulphur absorbing species shall be planted the villages in consultation with forest department
- Continuous Ambient Air Quality Monitoring Systems (CAAQMS) shall be installed to perform real time checks in nearby villages

EAC OBSERVATION NO.-13

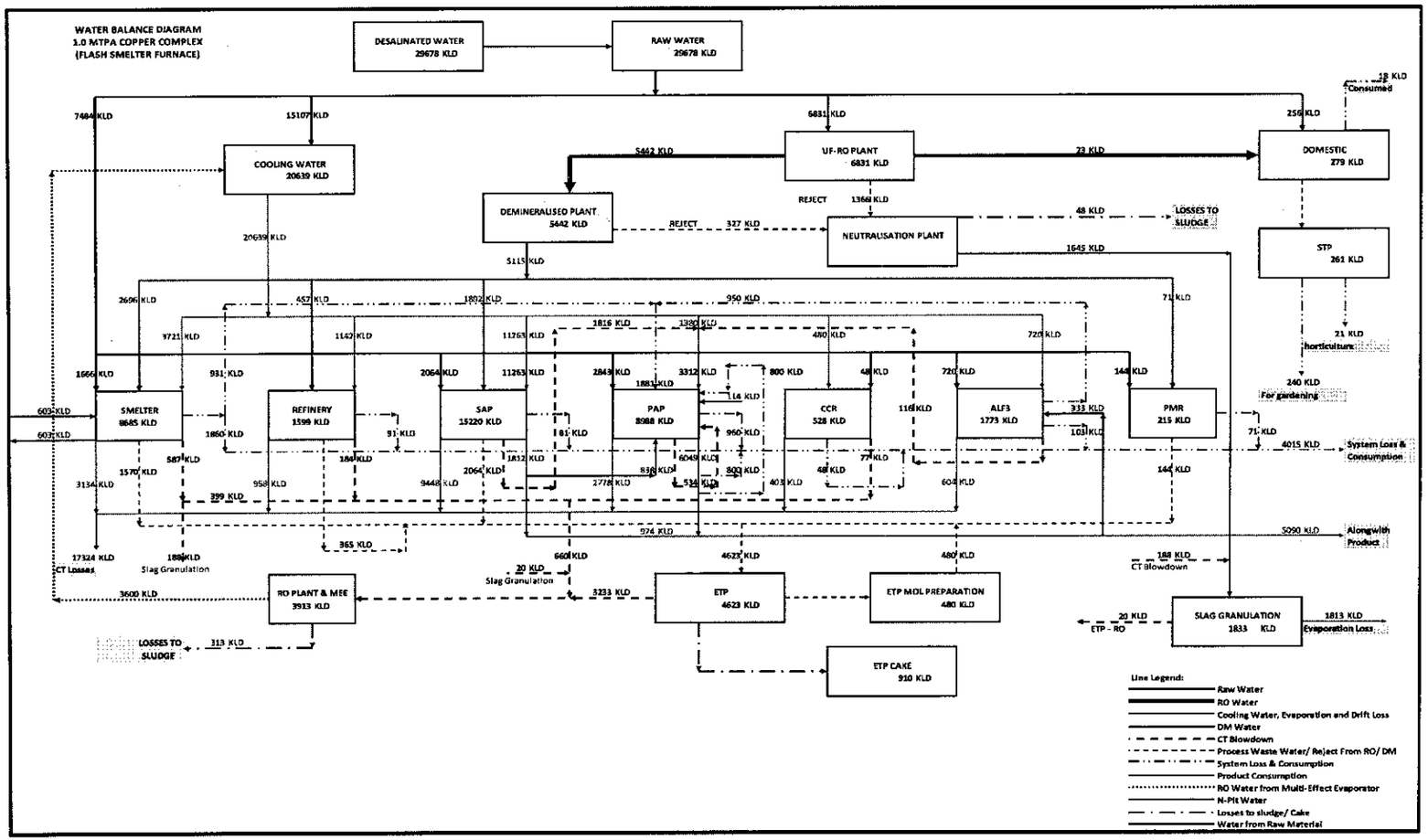
4646

EAC OBSERVATION:

Unit wise water balance to be submitted in tabular form

REPLY:

Water Balance for the proposed Copper refinery project has been reworked and water requirement has been **reduced from 32,800 KLD to 29,678 KLD**, by increased **reuse and recycling**.



42811

EAC OBSERVATION NO.-13

The water requirements for each facility-wise are mentioned below.

WATER BALANCE | 1.0 MTPA COPPER REFINERY										
Sr. No.	Area	Input		Output						
		Fresh	Recycled	Product Acid	Evaporation Loss	ETP	ETP - RO	Recycled within the plant	Used in the Other Plant	System Loss & Consumption
1	Smelter	7,795	2,771		4,947	1,570	419	188		3,443
2	Refinery	1,599			958	365	184			91
3	Sulphuric Acid Plant (SAP)	13,600	1,620	974	9,448	2,064			2,654	81
4	Phosphoric Acid Plant (PAP)	4,223	6,098	4,449	2,778			1,334		1,760
5	Continuous Cast Rod (CCR)	528			403		77			48
6	Aluminium Fluoride Plant (ALF3)	1,440	333		604				1,066	103
7	Precious Metal Recovery (PMR)	215				144				71
8	Domestic Consumption	279								279
Total		**29,678**	**10,823**	**5,423**	**19,138**	**4,143**	**680**	**1,522**	**3,720**	**5,876**

4648

EAC OBSERVATION NO.-13

The specific water consumption (raw water) per ton of product and per ton of copper production is as follows, mentioned below for facility-wise.

Sr. No.	Plant Area	UOM	Installed Production Capacity	UOM	Specific Water Consumption (Raw Water)	
					Per Ton of Product	Per Ton of Cu Production
1	Smelter	t/day	3,030	m^3/t	2.57	2.57
2	Refinery	t/day	3,030	m^3/t	0.53	0.53
3	Sulphuric Acid Plant (SAP)	t/day	9,091	m^3/t	1.50	4.49
4	Phosphoric Acid Plant (PAP)	t/day	1,515	m^3/t	2.79	1.39
5	Continuous Cast Rod (CCR)	t/day	1,515	m^3/t	0.35	0.17
6	Aluminium Fluoride Plant (ALF_3)	t/day	91	m^3/t	15.84	0.48
7	Precious Metal Recovery (PMR)	Kg/day	1,667	m^3/kg	0.13	0.07

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EAC OBSERVATION NO.-13

Unit wise water balance for Copper Refinery Project has been prepared facility-wise providing the details of fresh water, recycled water and waste water generated.

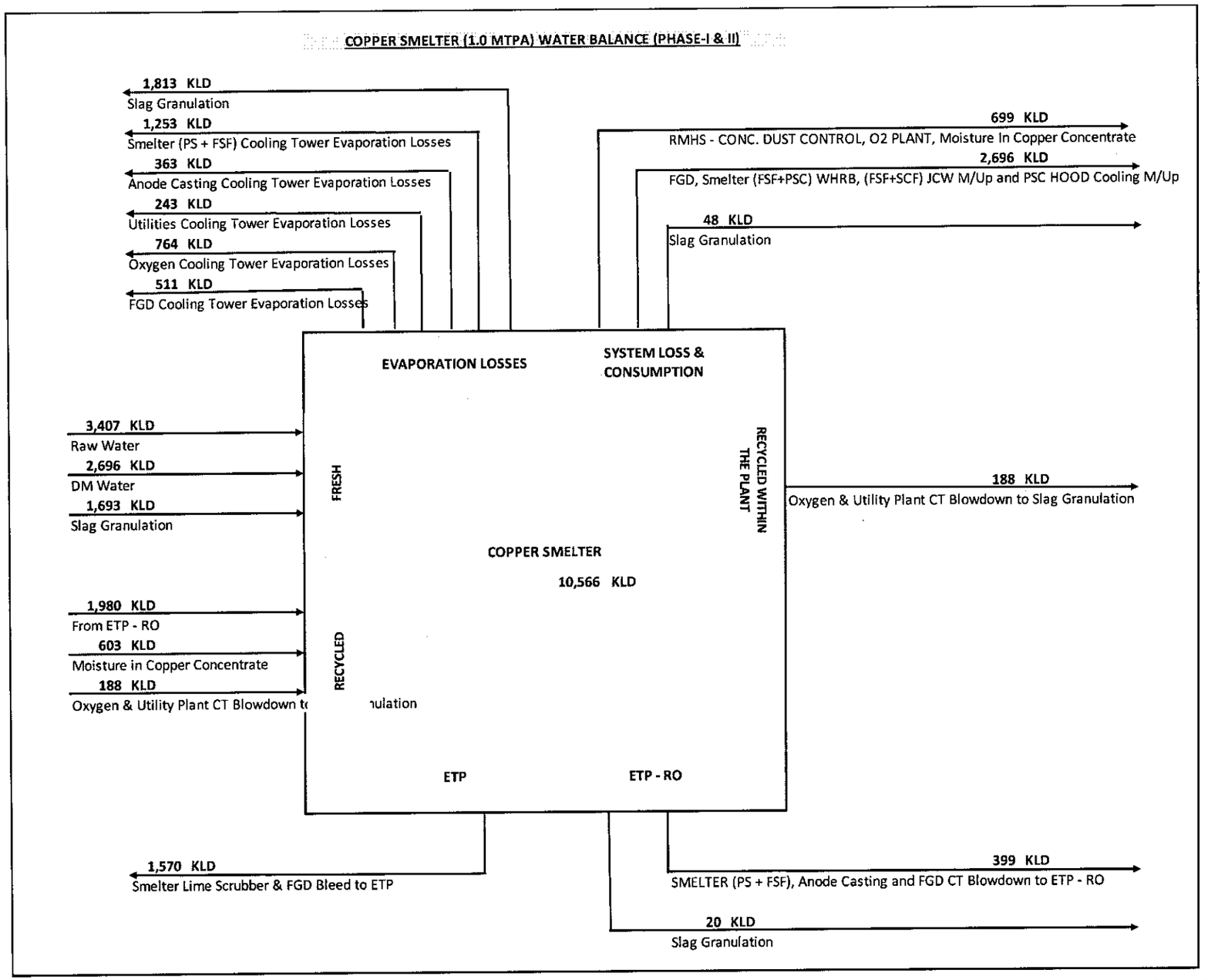
Smelter water balance (KLD).

Sr. No.	Area	Input		Output				
		Fresh	Recycled	Evaporation Loss	ETP	ETP - RO	Recycled within the plant	System Loss & Consumption
1	Raw Water	3,407						
2	DM Water	2,696						
3	Slag Granulation	1,693		1,813		20		48
4	From ETP - RO		1,980					
5	Moisture in Copper Concentrate		603					
6	Smelter (PS + FSF) Cooling Tower Evaporation Losses			1,253				
7	Anode Casting Cooling Tower Evaporation Losses			363				
8	Utilities Cooling Tower Evaporation Losses			243				
9	Oxygen Cooling Tower Evaporation Losses			764				
10	FGD Cooling Tower Evaporation Losses			511				
11	Smelter Lime Scrubber & FGD Bleed to ETP				1,570			
12	SMELTER (PS + FSF), Anode Casting and FGD CT Blowdown to ETP - RO					399		
13	Oxygen & Utility Plant CT Blowdown to Slag Granulation		188				188	
14	RMHS - CONC. DUST CONTROL, O2 PLANT, Moisture In Copper Concentrate							699
15	FGD, Smelter (FSF+PSC) WHRB, (FSF+SCF) JCW M/Up and PSC HOOD Cooling M/Up							2,696
Total		**7,795**	**2,771**	**4,947**	**1,570**	**419**	**188**	**3,443**

The total water requirement in the smelter is 10,566 KLD; of these, 7,795 KLD fresh water and 2,771 KLD recycling water from other the plant. A total of 1,570 KLD of wastewater from the smelter and the FGD is treated in the ETP plant.

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EAC OBSERVATION NO.-13



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EAC OBSERVATION NO.-13

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Refinery Water Balance (KLD):

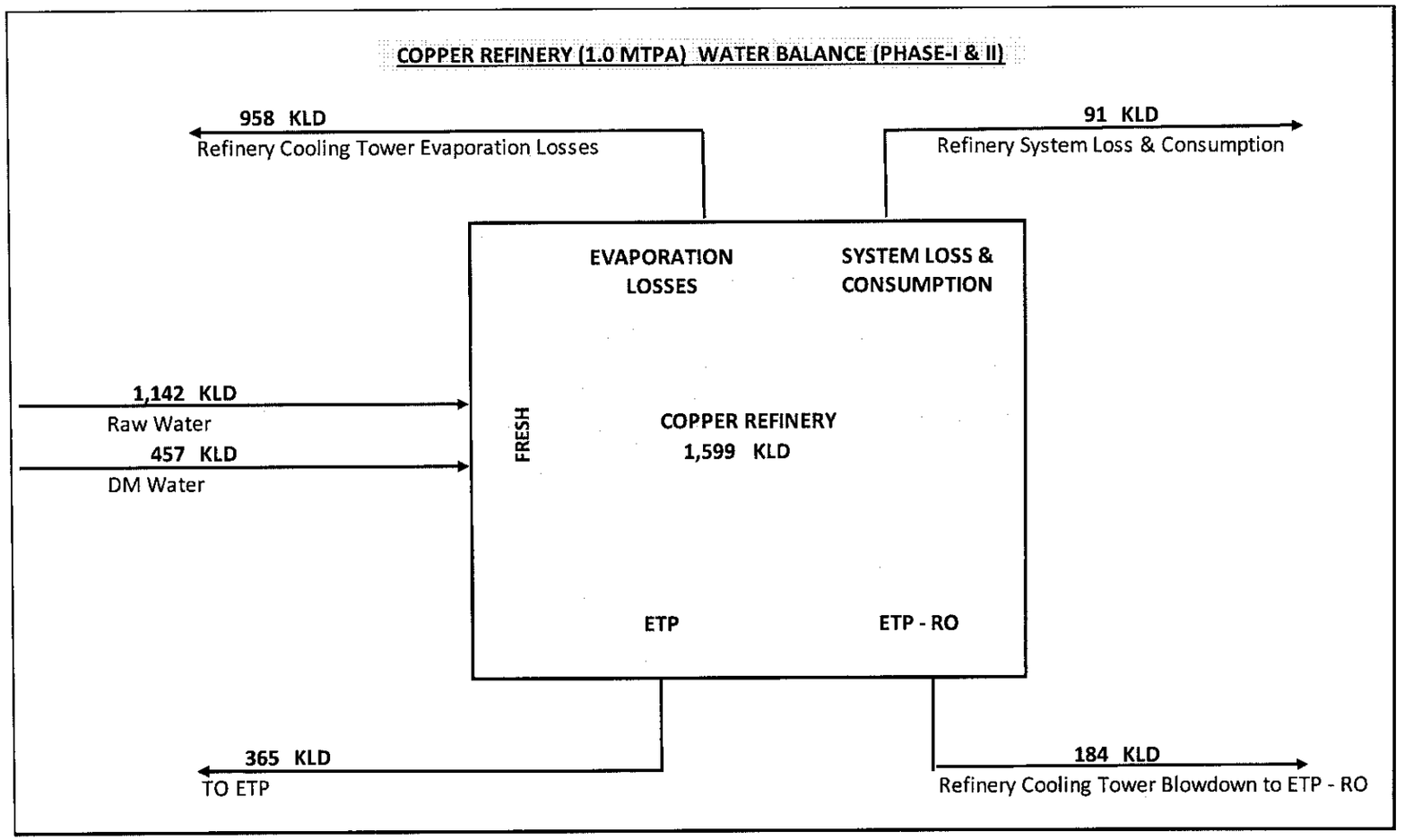
Refinery Water Balance (KLD)						
Sr. No.	Area	INPUT	OUTPUT			
		Fresh	Evaporation losses	ETP	ETP - RO	System Loss & Consumption
1	Raw Water	1,142				
2	DM Water	457				
3	Refinery Cooling Tower Evaporation Losses		958			
4	TO ETP			365		
5	Refinery Cooling Tower Blowdown to ETP - RO				184	
6	Refinery System Loss & Consumption					91
Total		**1,599**	**958**	**365**	**184**	**91**

The total water requirement in the refinery is 1,599 KLD; Fresh water. A total of 365 KLD of wastewater from the refinery is treated in the ETP plant.

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EAC OBSERVATION NO.-13



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EAC OBSERVATION NO.-13

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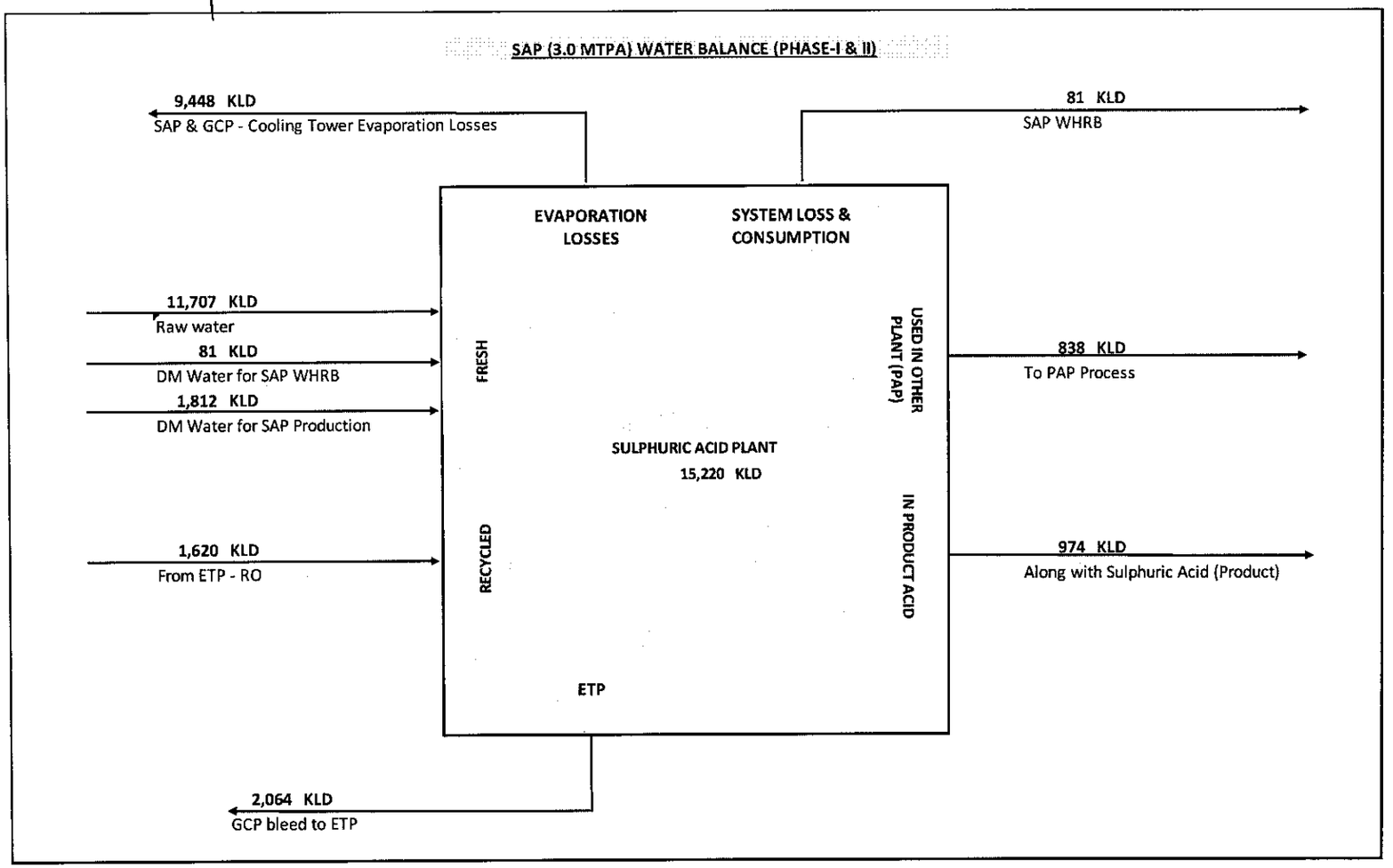
Sulphuric Acid Plant Water Balance (KLD):

SAP Water Balance (KLD)								
Sr. No.	Area	INPUT		OUTPUT				
		Fresh	Recycled	Product Acid	Evaporation losses	ETP	Used in other Plant (PAP)	System Loss & Consumption
1	Raw water	11,707						
2	From ETP - RO		1,620					
3	DM Water for SAP WHRB	81						
4	DM Water for SAP Production	1,812						
5	Along with Sulphuric Acid (Product)			974			838	
6	SAP & GCP - Cooling Tower Evaporation Losses				9,448			
7	GCP bleed to ETP					2,064		
8	SAP & GCP - Cooling Tower Blow Down						1,816	
9	SAP WHRB							81
	Total	**13,600**	**1,620**	**974**	**9,448**	**2,064**	**2,654**	**81**

The total water requirement in the Sulphuric Acid Plant is 15,220 KLD; of these, 13,600 KLD fresh water and 1,620 KLD recycling water from the other plant. A total of 2,064 KLD of wastewater from the Gas Cleaning Plant is treated in the ETP plant.

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EAC OBSERVATION NO.-13



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EAC OBSERVATION NO.-13

Phosphoric Acid Plant Water Balance (KLD):

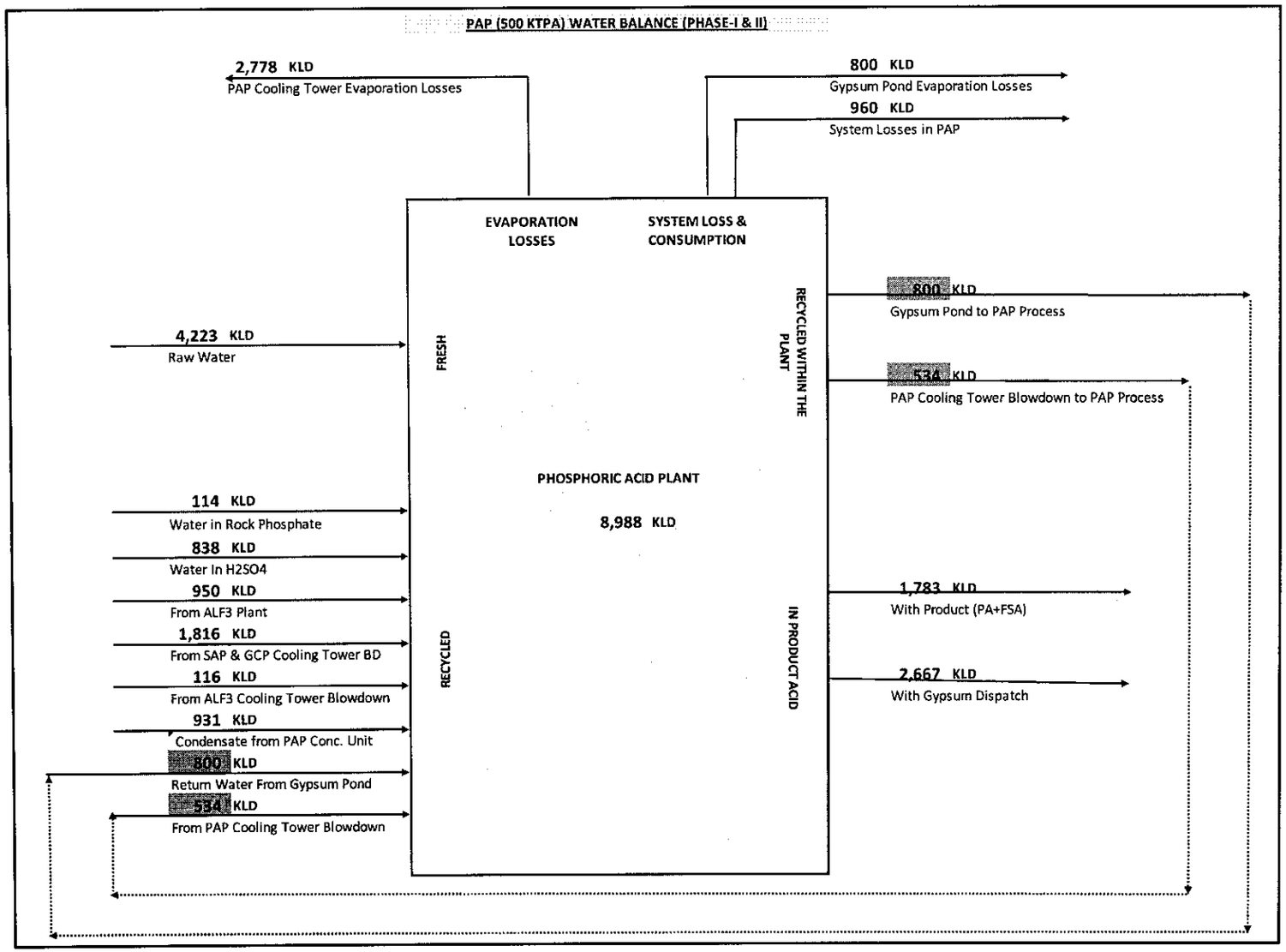
PAP Water Balance (KLD)							
Sr. No.	Area	INPUT		OUTPUT			
		Fresh	Recycled	In Product	Evaporation Loss	System Loss & Consumption	Recycled Within the Plant
1	Raw Water	4,223					
2	Water in Rock Phosphate		114				
3	Water In H2SO4		838				
4	From ALF3 Plant		950				
5	From SAP & GCP Cooling Tower BD		1,816				
6	From ALF3 Cooling Tower Blowdown		116				
7	Condensate from PAP Conc. Unit		931				
8	From PAP Cooling Tower Blowdown		534				
9	Return Water From Gypsum Pond		800				
10	With Product (PA+FSA)			1,783			
11	With Gypsum Dispatch			2,667			
12	PAP Cooling Tower Evaporation Losses				2,778		
13	Gypsum Pond Evaporation Losses					800	
14	System Losses in PAP					960	
15	Gypsum Pond to PAP Process						800
16	PAP Cooling Tower Blowdown to PAP Process						534
Total		**4,223**	**6,098**	**4,449**	**2,778**	**1,760**	**1,334**

The total water requirement in the Phosphoric Acid Plant is 10,322 KLD; of these, 4,223 KLD fresh water and 6,098 KLD recycling water from the other plant.

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EAC OBSERVATION NO.-13



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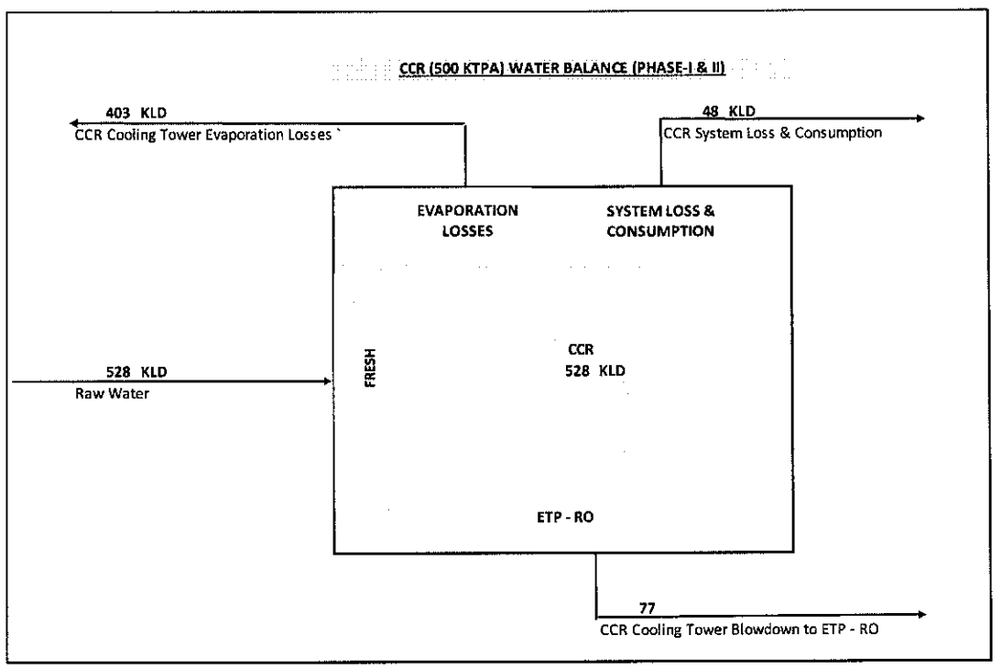
EAC OBSERVATION NO.-13

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CCR Water Balance (KLD):

CCR Water Balance (KLD)					
Sr. No.	Area	INPUT	OUTPUT		
		Fresh Water	Evaporation losses	ETP - RO	System Loss & Consumption
1	Raw Water	528			
2	CCR Cooling Tower Evaporation Losses		403		
3	CCR Cooling Tower Blowdown to ETP - RO			77	
4	CCR System Loss & Consumption				48
Total		**528**	**403**	**77**	**48**

The total water requirement in the CCR is 528 KLD; Fresh water.



4292

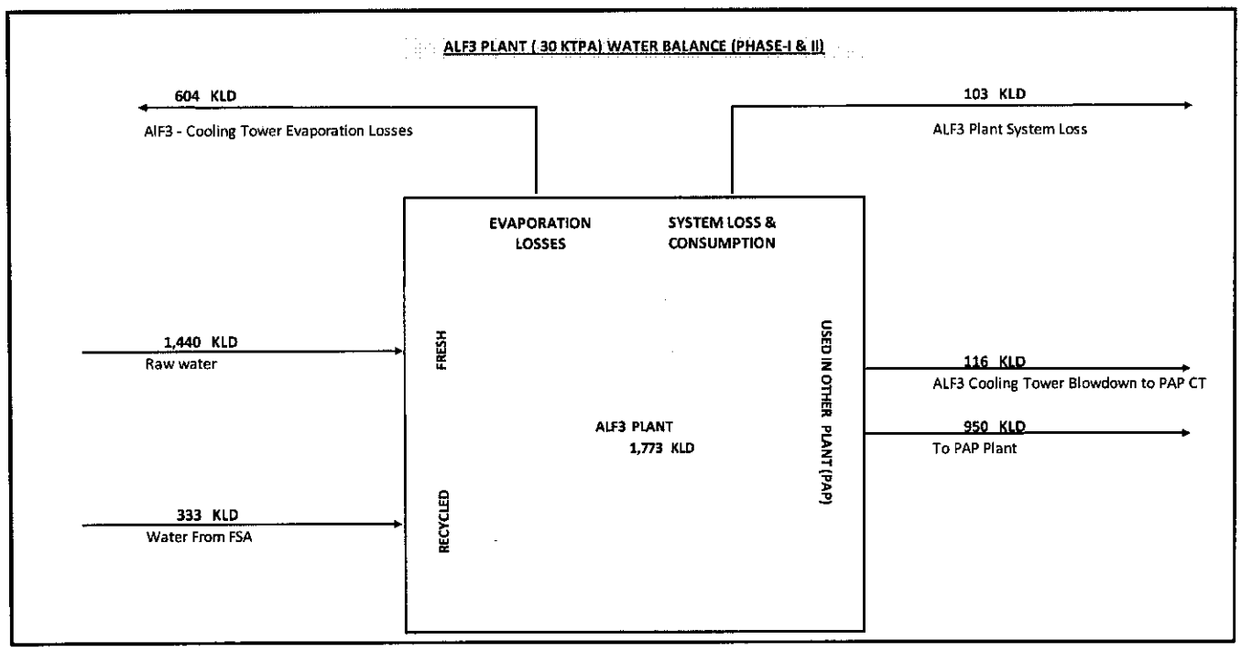
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EAC OBSERVATION NO.-13

ALF_3 Water Balance (KLD):

Sr. No.	Area	INPUT		OUTPUT		
		Fresh	Recycled	Evaporation losses	Used in other Plant (PAP)	System Loss & Consumption
1	Raw water	1,440				
2	Water From FSA		333			
3	AlF3 - Cooling Tower Evaporation Losses			604		
4	To PAP Plant				950	
5	ALF3 Cooling Tower Blowdown to PAP CT				116	
6	ALF3 Plant System Loss					103
Total		**1,440**	**333**	**604**	**1,066**	**103**

The total water requirement in the ALF3 Plant is 1,773 KLD; of these, 1,440 KLD fresh water and 333 KLD recycling water from the other plant.



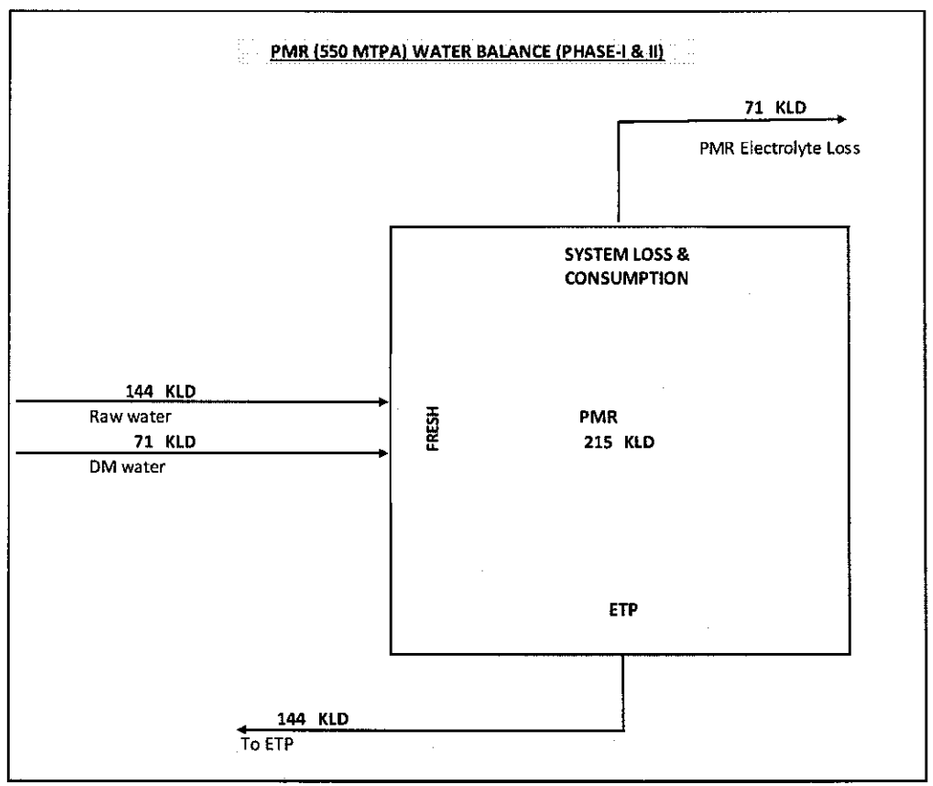
4293

EAC OBSERVATION NO.-13

PMR Water Balance (KLD):

Sr. No.	Area	INPUT	OUTPUT	
		Fresh Water	ETP	System Loss & Consumption
1	Raw water	144		
2	DM water	71		
3	To ETP		144	
4	PMR Electrolyte Loss			71
Total		**215**	**144**	**71**

The total water requirement in the PMR is 215 KLD; Fresh water.



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EAC OBSERVATION NO.-13

ETP Water Balance (KLD):

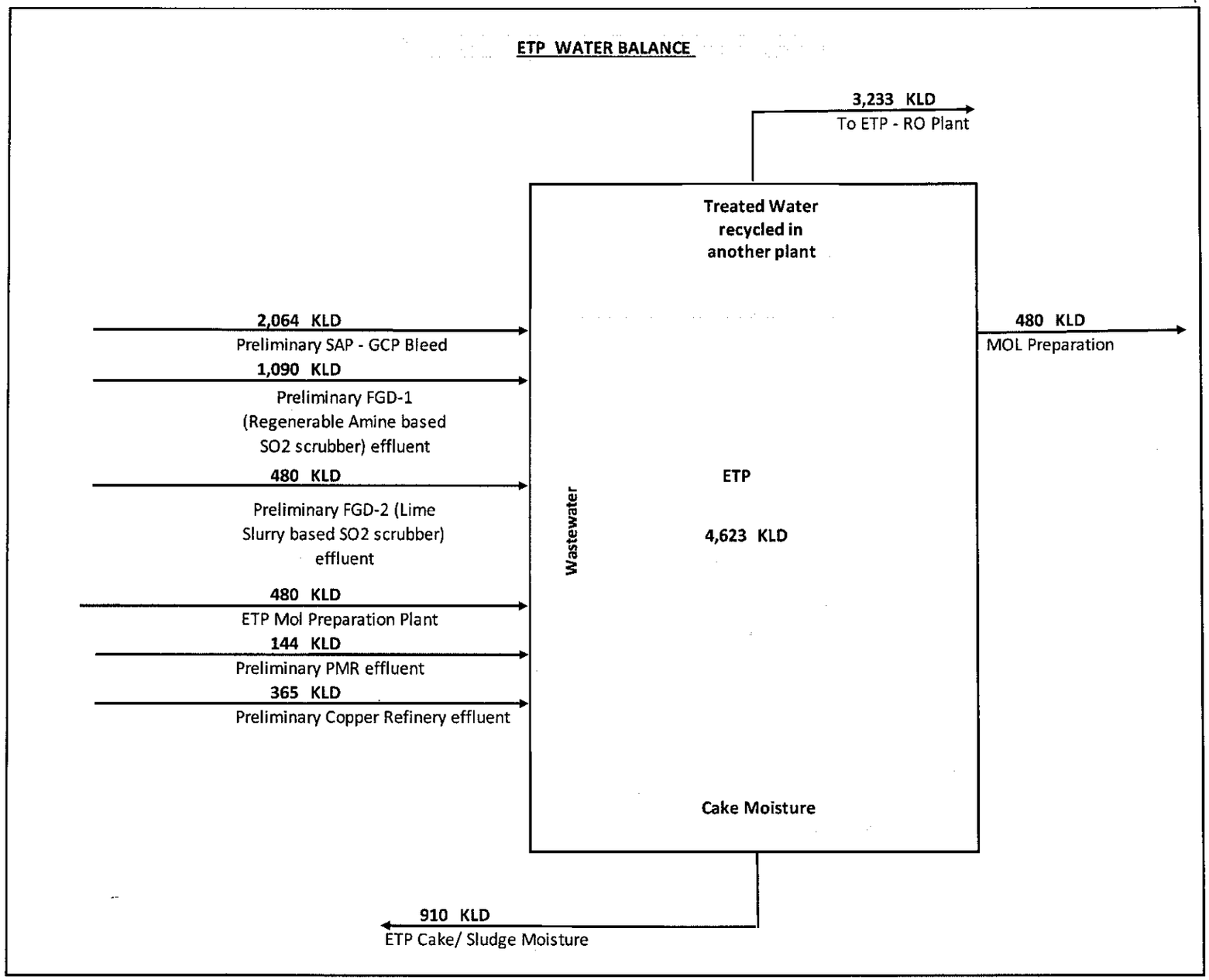
ETP Water Balance (KLD)				
		INPUT	OUTPUT	
Sr. No.	Area	Effluent Generated	Water Lost in Cake/ Sludge Moisture	Treated water generated
1	Preliminary SAP - GCP Bleed	2,064		
2	Preliminary FGD-1 (Regenerable Amine based SO2 scrubber) effluent	1,090		
3	Preliminary FGD-2 (Lime Slurry based SO2 scrubber) effluent	480		
4	ETP Mol Preparation Plant	480		
5	Preliminary PMR effluent	144		
6	Preliminary Copper Refinery effluent	365		
7	ETP Cake/ Sludge Moisture		910	
8	MOL Preparation			480
9	To ETP - RO Plant			3,233
Total		**4,623**	**910**	**3,713**

The total effluent generated by the plant is 4,623 KLD; of these, 3,713 KLD of treated water from the ETP plant were recycled in another plant and 910 KLD of water lost in the moisture of the cakes / sludge.

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EAC OBSERVATION NO.-13

4662



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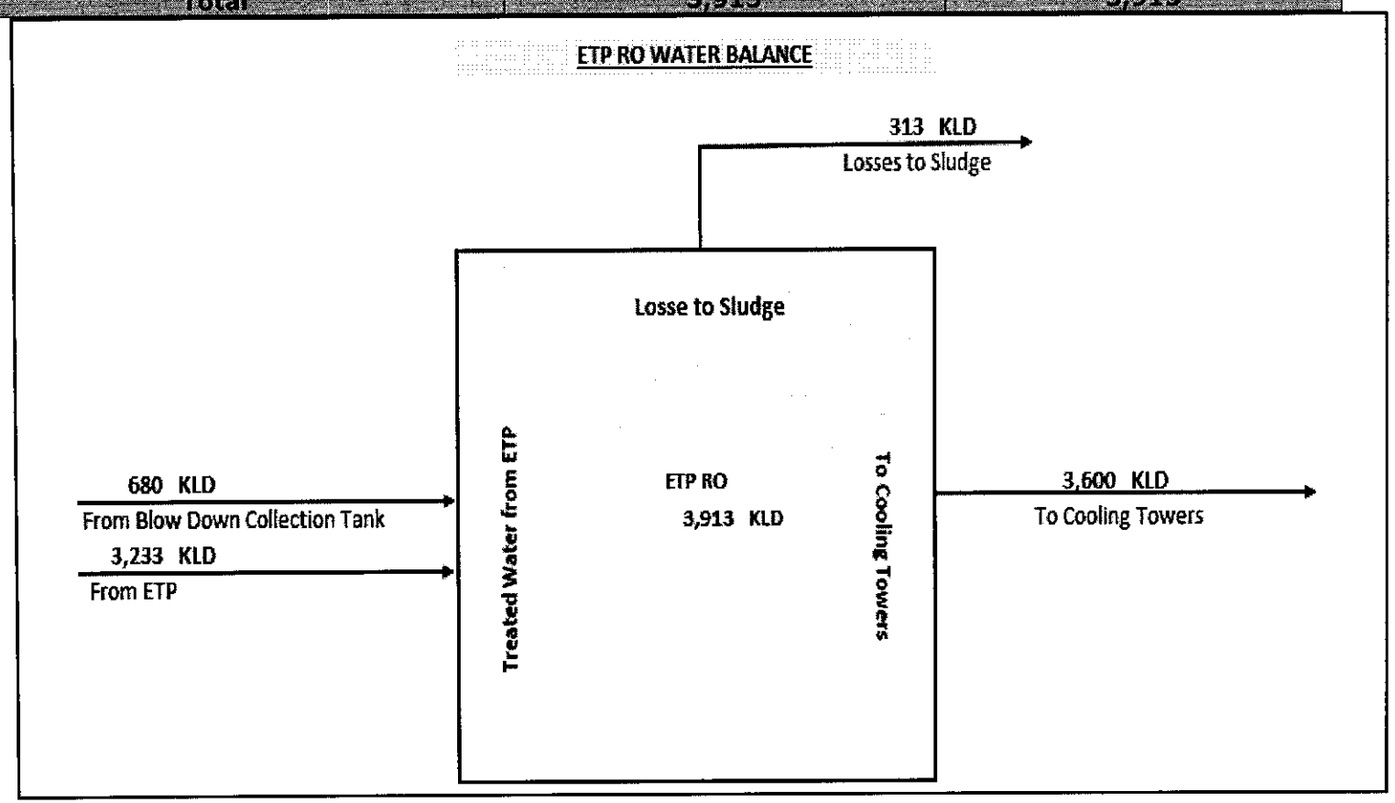
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EAC OBSERVATION NO.-13

ETP RO water balance (KLD).

- ***ETP RO plant is a part of ZLD system.***
- ***ETP RO system will consists of 2 stage RO plant followed by MEE/MVR system.***
- ***The sludge coming out of MEE/MVR system will be disposed in SLF and water recovered will be utilized for the plant operation.***

Sr. No.	Area	Treated Water from ETP	RO Water Generated
1	From Blow Down Collection Tank	680	
2	From ETP	3,233	
3	To Cooling Towers		3,600
4	Losses to Sludge		313
Total		**3,913**	**3,913**



42297

EAC OBSERVATION NO.-14

4664

EAC OBSERVATION:

Stack and process vents to be noted separately and all stack heights to be as per standards.

REPLY:

Details of the preliminary process vents and stacks for the proposed copper project are as below:

Sr. No.	Stacks	Stack/ Vent	H m	Dia m	Temp °C	Velocity m/s	Volume Nm^3/hr	Emission	Material of Construction
	Unit –I & II								
	Flue Emission Through Stack attached to Boiler/Furnace/Heater								
1	Waste Heat Recovery Super heater - I & II	Stack	70	1	150	18	35,000	SO_2	Carbon Steel
2	Sulphuric Acid Pre-Heater-I (Only for plant startup)	Stack	45	1.5	250	17	60,000	SO_2	Carbon Steel
3	Sulphuric Acid Pre-Heater-II (Only for plant startup)	Stack	45	1.5	250	17	60,000	SO_2	Carbon Steel
4	DG Set – I, II, III & IV (4 MVA Standby)	Stack	30	-	-	-	-	SO_2	Carbon Steel
5	Boiler – II (operational only when steam is not available from smelter)	Stack	70	1	150	15	30,000	SO_2	Carbon Steel
6	Shaft Furnace of CCR Plant-I	Stack	36	1.5	200	9	37,000	Dust	Carbon Steel
7	Anode Casting – I, II, III & IV	Vent	20	0.75	100	17	21,000	Water Vapour	Carbon Steel
8	Main Stack Secondary Gas Scrubber- I, II, III & IV (Bi flue) (Convertor Secondary and Anode & scrap melting furnace combustion gases)	Stack	150	2.8	60	17	345,900	SO_2	Carbon Steel with glass Flake/FRP/Rubber Lining
				2.0	60	17	171,823		
	Flue Emission Through Stack attached to Boiler/Furnace/Heater								
9	Electric Furnace and Secondary gases from Smelting – I & II (Bi-Flue)	Stack	150	2.0	150	17	135,000	SO_2	Carbon Steel
				2.2	150	18	168,796		
10	Main Stack Sulphuric Acid Plant-I, II, III & IV (Bi-flue)	Stack	150	2	75	16	150,760	SO_2	Carbon Steel
				2	75	16	150,760		
11	Cathode Stripping MC – I, II, III & IV	Vent	30	0.2	50	14	1,500	Water Vapour	FRP
12	Anode Scrap Washing MC– I & II	Vent	30	0.2	40	14	1,500	Water Vapour	FRP
13	Electro winning Stack – I & II	Stack	45	0.3	40	19	4,500	Mist	FRP
14	Slag Granulation – I & II	Vent	45	1.4	100	18	80,000	Water Vapour	Carbon Steel
15	Steam Dryer for Copper concentrate – I & II	Stack	60	1.4	120	15	62,150	Dust	Carbon Steel
16	Smelting Furnace Area (Emergency Stack-I & II only during process tripping)	Stack	150	2.0	300	18	86,000	SO_2	Carbon Steel
17	PS Convertor Area (Emergency Stack-I & II (only during process tripping)	Stack	150	2.4	300	18	130,000	SO_2	Carbon Steel
18	Dust Extraction – I & II (Rock Phosphate Handling Area)	Stack	45	0.6	40	15	15,000	Dust	Carbon Steel
19	Precious Metal Recovery Plant – I & II	Stack	60	0.6	60	16	15,000	SO_2	Carbon Steel with glass Flake/FRP Lining
20	Phosphoric Acid Plant – I & II	Stack	120	2.1	50	18	206,000	HF	Carbon Steel with glass Flake/FRP/Rubber Lining

EAC OBSERVATION NO.-15

EAC OBSERVATION:

HIRA shall be prepared for worst case scenario of Hydro Fluro Silicic acid storage tank failure. Quantitative Risk Analysis (QRA) leading to FN Curve for storage related risk to be submitted.

REPLY:

The HIRA Study has been prepared for worst case scenario of hydro fluro silicic acid based on the methodology using a comprehensive checklist of hazards guidelines provided by the ISO 17776:2002.

Quantitative Risk Analysis (QRA) leading to FN Curve for acid storage (Sulphuric acid, Phosphoric acid and Hydro fluro silicic acid) has been carried out as enclosed as **Annexure-15(A).**

The findings that emerges from this HIRA study for the same as that mentioned below:

Failure of the Hydro fluro silicic Acid Tank

Handling of Hydro fluro silicic Acid

I. Hydro fluro silicic Acid is mild and less hazardous.

II. There are 2 tanks of the Hydro fluro silicic Acid with a capacity of ~ 1100 m^3 each for both plant 1 and plant 2.

III. Tanks will be with natural Rubber lined Carbon steel material of construction with additionally carbon brick lining at the bottom of the tank as well as 1 meter height along the circumference.

IV. Relevant BIS standard will be used for civil construction as plant is coming in seismic zone – V.

V. Rubber-lined carbon steel pipes are used for handling Hydro Fluro Silicic Acid.

VI. Signage Boards along with DANGER signs with safety measures to be followed are displayed at Acid storage and handling facility.

VII. Storage Tanks are built-in with Dyke, Sump and Pump for collection of acid leakage and transfer the same to other storage tanks.

VIII. Dyke is provided with impervious HDPE liner followed by acid resistant tiles to prevent seepage of the acid into the ground.

IX. Dyke will have capacity of 110% of the largest tank within the dyke.

X. Tanks will be filled with maximum of 80% of the capacity; so that in case of any emergency spilled or leaked acid can be accommodated in the rest of the tanks.

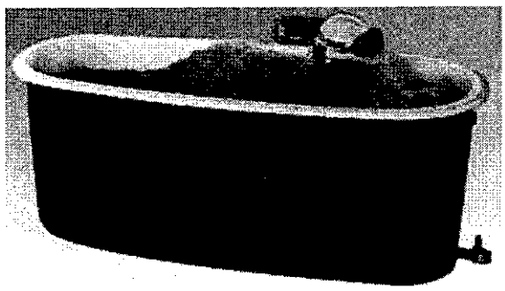
XI. Usage of PPE such as PVC gloves, PVC suit, Face Shield, and Gum boots is ensured while handling Hydro fluro silicic Acid.

XII. Safety showers and Eye Wash Fountains are provided at easily accessible positions near the proposed Acid storage facility and used if persons are affected with acid spray.

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EAC OBSERVATION NO.-15

Dunk Tanks (large bath tub in which a person can be completely immersed) will be provided



xvii. In case of major leaks from failure of storage tanks,

a) Cordon off the area with suitable signage boards.

b) Evacuate the people from affected areas.

c) Check whether the dyke area drain valve is closed or not

d) Allow Hydro fluro silicic Acid flow towards sump line and transfer acid into other storage tanks.

e) Use PVC suit, PVC gloves, and gum boots to handle the Hydro fluro silicic Acid and Airline respirator and PVC hood if acid fumes are pungent.

f) Use portable SS pump to transfer the residual pool of acid into a suitable container

g) Send collected drums / acid containers to the designated area for further action

h) Neutralize residual acid with lime powder/ soda ash.

i) Collect the contaminants and transfer the same to effluent treatment plant.

In case of injury:

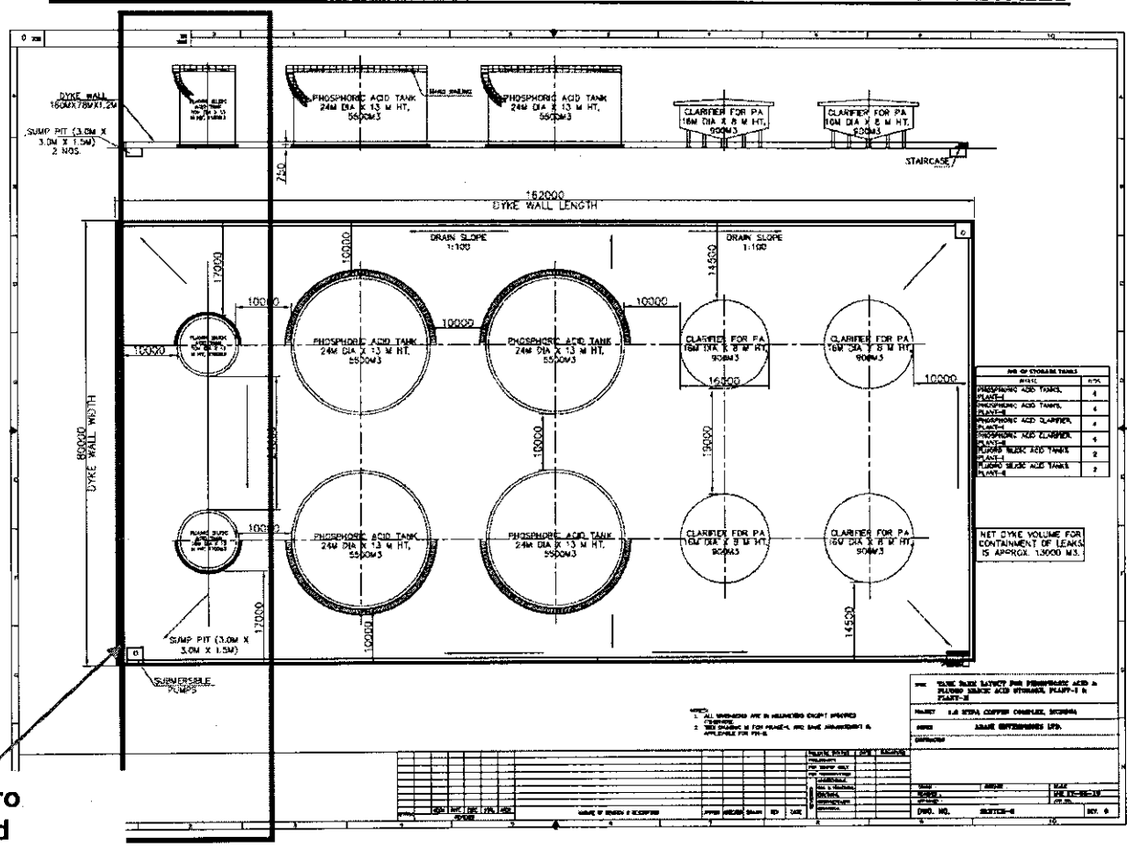
I. First aid will be provided at the Occupational health center

II. Further treatment will be provided at District Hospital.

III. Burn injuries will be treated at burn care unit, Bhuj District Hospital. The budget for the burn care unit is proposed in CER.

EAC OBSERVATION NO.-15

HYDRO FLURO SILICIC ACID & PHOSPHORIC ACID TANK STORAGE DETAILS



Hydro Fluro Silicic Acid Storage Tank, 2 X 1100 M^3

Tank Inspection Protocol

Tank inspection is required to ensure that tanks containing concentrated Hydro fluro silicic Acid are maintained in a safe condition.

Documentation and Records

Proper documentation and records for each tank will be maintained. These records should include the following:

a) Tank design and construction details including shell thickness, weld details, dimensions, etc.

b) Materials of construction

c) Corrosion allowance

d) History of tank contents including acid concentration and temperature

e) Civil engineering details for foundations and supports

f) Record of all maintenance performed on the tank

4668

EAC OBSERVATION NO.-15

g) Record of all previous inspections

h) Details of any incidents the may have occurred to the tank (i.e. leaks)

Routine Inspections

A regular visual inspection of a tank ensures that there has been no obvious damage to the tank due to deterioration of accident. This is accomplished by walking around and on top of the tank. This type of inspection is limited to the exterior of the tank.

Some of the things to look for during an inspection are:

a) Signs of acid leaks

b) Damage to foundation and supports

c) Exterior corrosion

d) Damage to the shell or roof

e) Examination of piping systems for leaks

f) Evidence of sulphate build-up causing deformation of bottom plates and reinforcing pads

g) Damage to insulation and cladding

Frequency of Inspection:

Tanks will be inspected with a minimum frequency of once a week.

In-Service Inspections

In-service inspection of the tank involves both a detailed visual examination of the exterior of the tank as well as ultrasonic thickness measurement of the shell. The in-service inspection should include all the inspection points of the routine inspection as well as ultrasonic thickness measurements of the tank shell and roof as per the procedure.

The readings obtained should be compared to previous data to determine the extent of corrosion on the tank shell, roof and bottom. Where higher than anticipated metal losses are found, more extensive testing is required to confirm and establish the severity and extent of corrosion.

Internal Inspections

Internal inspections are required since there are areas of the tank where corrosion can only be detected by an internal inspection.

Internal inspections should be done at least once every five (5) years.

MSDS for sulphuric acid, phosphoric acid and hydro fluro silicic acid are enclosed as **Annexure-15(B).**

ADANI ENTERPRISES LIMITED (AEL)

1 MTPA COPPER REFINERY - MUNDRA

RISK ASSESSMENT STUDY
FOR
ACIDS STORAGE

4670

ANNEXURE-15(A)

1. INTRODUCTION

Adani Enterprises Limited (AEL) have taken up a project for installation of Copper Refinery with 10,00,000 TPA capacity at Mundra in Gujarat State.

The project includes storage of large inventories of sulphuric acid, phosphoric acid and hydro fluoro silicic acid.

In the process of granting Environmental Clearance for the Project, the Expert Appraisal Committee advised to carry out a risk assessment including FN curve for the acid storage systems.

Accordingly, this document presents the risk assessment study for the storage systems of sulphuric acid, phosphoric acid and hydro fluro silicic acid in the Copper Refinery facility.

2. FACILITY DESCRIPTION

The following major storage tanks for acids are provided in the Copper Refinery facility.

Sr. No.	Chemical Stored	No. of Tanks	Capacity of Each Tank	Total Capacity	Type of tank
1	Sulphuric acid (~98%)	12	5,500 m^3	66,000 m^3	Cone roof tanks. Carbon steel (CS)
2	Phosphoric acid (~54% P_2O_5)	8	5,500 m^3	44,000 m^3	Cone roof tanks. CS with rubber lining, Carbon brick lining at bottom and 1 m height in circumference
3	Hydrofluoro silicic acid (~22% H_2SiF_6)	4	1,100 m^3	4,400 m^3	Cone roof tanks. CS with rubber lining, Carbon brick lining at bottom and 1 m height in circumference

3. OBJECTIVE & METHODOLOGY

The objective of this study is to assess the risk involved in the storage of sulphuric acid, phosphoric acid and hydrofluoro silicic acid in the Copper refinery facility including FN curve for societal risk, with a view to minimizing the risk to as low as reasonably practicable.

The methodology for risk assessment is as follows.

Scenarios for storage tank failures are formulated considering the hazardous properties of acid, type of construction, safeguards provided and likelihood of exposure of people to the hazard.

Frequency of occurrence of the failure is estimated using the data available in generic database published by the International Association of Oil & Gas Producers (OGP) applying suitable adjustment factor for acid storage tanks.

Risk assessment is carried out by evaluating the Societal Risk in the form of FN curve.

Societal Risk parameter considers the number of people who might be affected by hazardous incidents. Societal risk is represented as an F-N (frequency-number) curve, which is a logarithmic plot of cumulative frequency (F) at which events with N or more fatalities may occur, against N.

The tolerability criteria for societal risk as defined by UK-HSE are shown in the following **Figure-1**.

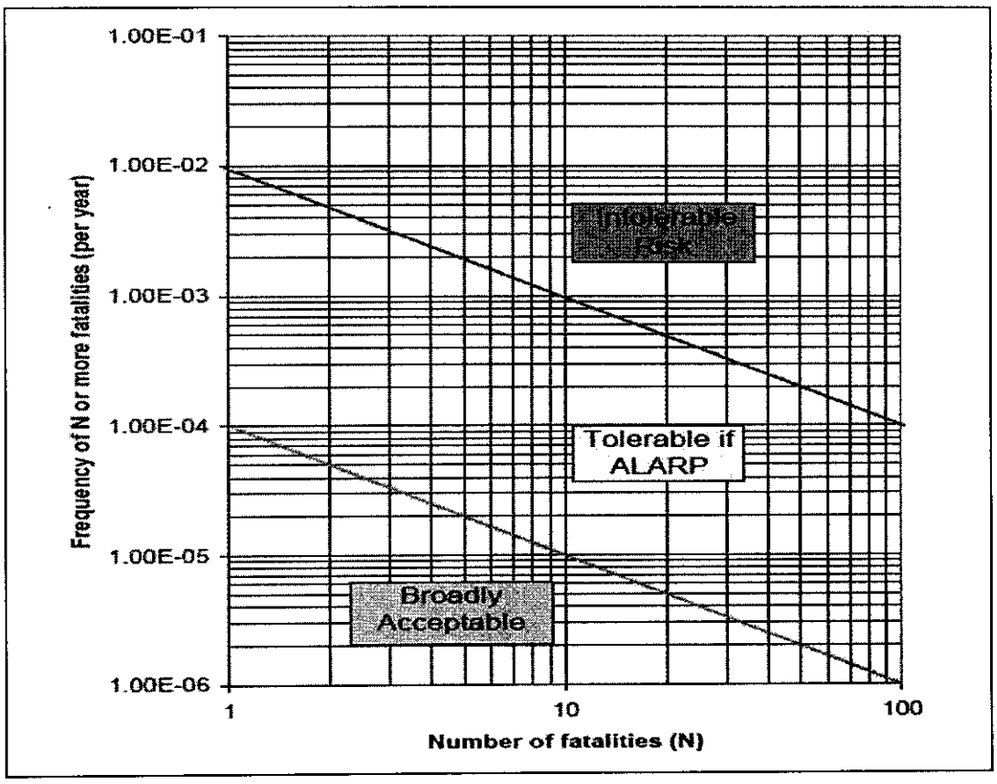


FIGURE-1:
TOLERABILITY CRITERIA FOR SOCIETAL RISK BY UK-HSE

4. RISK ASSESSMENT FOR DAMAGE EFFECTS OF STORAGE TANK FAILURE

a) Sulphuric Acid Tanks:

There are 6 tanks for storage of concentrated Sulphuric Acid with a capacity of 5,500 M^3 each for Plant #1 and Plant #2.

Sulphuric acid is stored as ~98% acid. Contact with concentrated sulphuric acid causes severe acid burn injury.

Concentrated sulphuric acid of ~98% concentration has vapour pressure of only 0.001 mm Hg and does not emit fumes. As such, spillage of large quantity of sulphuric acid is not expected to produce toxic vapour cloud which may cause injury to persons outside the spill area.

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The following safeguards are provided:

- RCC dyke containment with internal acid-resistant tile lining and sump pump for transfer of collected acid
- The acid storage tanks, their foundations and RCC dyke structures shall be designed for seismic zone – V representing the highest seismic activity.
- Sizing of foundations and dyke (length, width & height) will ensure adequate space inside the dyke to prevent spillage of acid outside.

b) Phosphoric Acid Tanks:

There are 4 tanks to store Phosphoric Acid with a capacity of about 5,500 m^3 each and 4 clarifiers with a capacity of about 1800 m^3 each for plant 1 and plant 2.

Tanks and clarifier will be made of carbon steel with natural Rubber lining for the shell, carbon steel material of construction with additionally carbon brick lining at the bottom of the tank as well as 1 meter height along the circumference.

Phosphoric acid is stored as aqueous solution with ~54% P_2O_5 concentration. Contact with phosphoric acid causes acid burn injury but the effects are much less severe compared to concentrated sulphuric acid. The safeguards are similar to those provided for sulphuric acid storage tanks.

Phosphoric acid does not emit any fumes. As such, spillage of large quantity of phosphoric acid is not expected to produce toxic vapour cloud which may cause injury to persons outside the area.

c) Hydrofluoro Silicic Acid Tanks:

There are 2 tanks to store Hydrofluoro Silicic Acid with a capacity of about 1,100 m^3 each for Plant#1 & Plant#2.

Tanks will be made of carbon steel with natural Rubber lining for the shell, carbon steel material of construction with additionally carbon brick lining at the bottom of the tank as well as 1 meter height along the circumference.

Hydrofluoro silicic acid is stored as aqueous solution with ~22% H_2SiF_6 concentration. Contact with hydrofluoro silicicacid causes acid burn injury but the effects are much less severe compared to concentrated sulphuric acid. The safeguards are similar to those provided for sulphuric acid storage tanks.

Hydrofluoro silicic acid does not emit any fumes. It is also not expected to contain any significant concentration of hydrofluoric (HF) acid. As such, spillage of large quantity of phosphoric acid is not expected to produce toxic vapour cloud which may cause injury to persons outside the area.

Risk Assessment for Acid Storage Tanks:

The major failure of sulphuric acid storage tanks is considered in this risk assessment study. The following two scenarios are considered:

1. Acid released from the storage tank is contained inside the dyke; and
2. Acid released from the storage tank flows breaches the dyke and flows outside. In case of tank failure, the acid released from the tank is expected to be contained within the dyke.

Scenario-1: Acid released from storage tank is contained in the dyke area:

a) Estimation of damage severity:

Normally no person is required to be present inside the dyke. However, operation and maintenance personnel may be required to work in the dyke area for a few hours. Considering the presence of maximum of 2 persons in the dyke area during acid release due to tank failure and assuming 50% lethality factor, the event is estimated to result in a **single fatality**.

b) Frequency estimation:

As per the storage incident frequency data published by the International Association of Oil & Gas Producers (OGP), the frequency of catastrophic failure of atmospheric tank is 3.0E-06 per year. For acid storage tanks, the failure rate is taken as double that of oil tanks, that is 6.0E-06 per year.

The six tanks will be operated with 75%-80% acid level. Therefore, the frequency of acid tank failure is estimated as 6 x 6.0E-06 = **3.6E-05 per year**.

Scenario-2: Acid released from storage tank flows outside due to breach in the dyke:

a) Estimation of damage severity:

If the dyke is also breached during tank failure, the acid may flow outside the dyke area and cause serious damage. However, the quantity flowing outside the dyke will be limited by the mitigation measures such as storm water drains and other emergency actions taken by the plant personnel. Release of about 100 MT of acid outside the dyke may be considered for risk assessment.

Considering the presence of maximum of 20 persons in the surrounding dyke area during acid release due to tank failure and assuming 10% lethality factor, the event is estimated to cause **2 fatalities**.

b) Frequency estimation:

The dyke containment made of RCC construction and suitable lining is expected to provide risk reduction factor of 100. On a conservative basis, considering risk reduction factor of only 80% for the dyke, the frequency of release outside the dyke is estimated as **4.5E-07 per year.**

Risk Assessment for Acid Storage:

Based on the estimation of damage severity and frequency for the failure scenarios involving failure of storage tanks, the data for risk analysis are as follows:

Sr. No.	Description	Severity (No. of Fatalities)	Failure Frequency (per year)
1	Tank failure with acid contained in the dyke	1	3.6E-05
2	Tank failure with breach of dyke leading to acid release outside	2	4.5E-07

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The FN curve for societal risk for the case of acid tank failure in comparison with the UK-HSE criteria is shown in the following **Figure-2**.

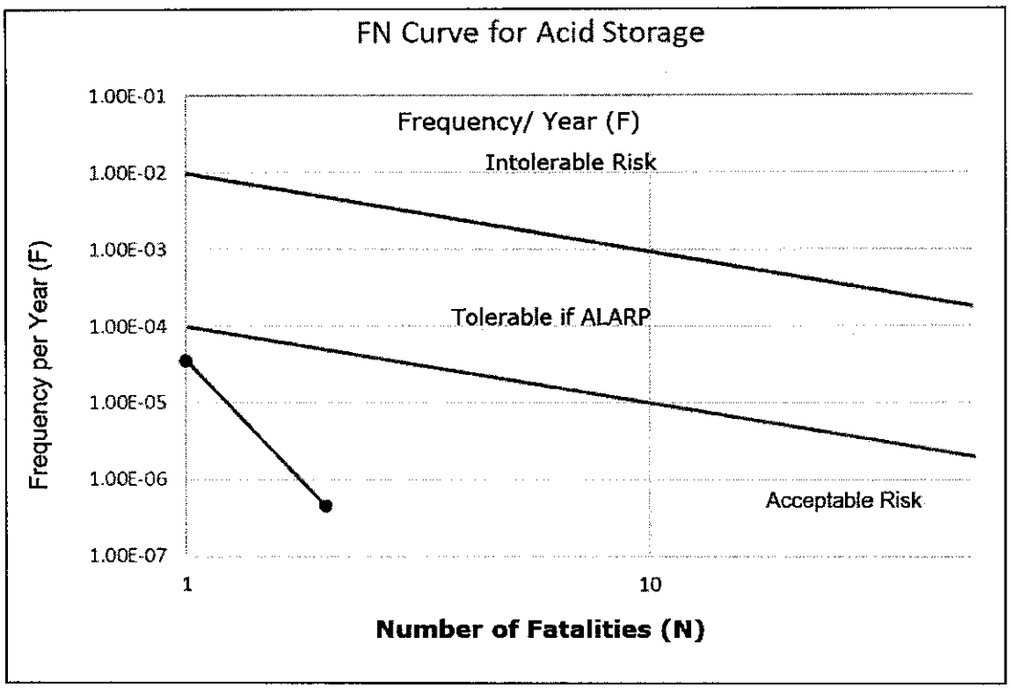


FIGURE-2:
FN CURVE FOR SOCIETAL RISK FOR THE CASE OF ACID TANK FAILURE IN COMPARISON WITH THE UK-HSE CRITERIA

5. CONCLUSION

Based on the risk assessment including FN curve for societal risk for the acid storage systems at Mundra Copper Smelter, it is concluded that the risk is in **Acceptable** level.

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Sulfuric Acid, ACS

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 10/01/1998 Revision date: 02/28/2018 Supersedes: 01/23/2018 Version: 1.3

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Sulfuric Acid, ACS
CAS-No.	:	7664-93-9
Product code	:	LC25550
Formula	:	H2SO4
Synonyms	:	battery acid / brown acid / brown oil of vitriol / dihydrogen sulfate / dipping acid / electrolyte acid / nordhausen acid / oil of vitriol / sulphuric acid

1.2. Recommended use and restrictions on use

Use of the substance/mixture	:	Industrial use Laboratory chemical Battery: component
Recommended use	:	Laboratory chemicals
Restrictions on use	:	Not for food, drug or household use

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin corrosion/irritation, Category 1A	H314	Causes severe skin burns and eye damage.
Serious eye damage/eye irritation, Category 1	H318	Causes serious eye damage.

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labelling

Hazard pictograms (GHS-US) :



GHS05

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H314 - Causes severe skin burns and eye damage.

Precautionary statements (GHS-US) : P260 - Do not breathe mist, vapours, spray.
P264 - Wash exposed skin thoroughly after handling.
P280 - Wear protective gloves, protective clothing, eye protection, face protection.
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 - Immediately call a POISON CENTER/doctor
P363 - Wash contaminated clothing before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container to comply with local, state and federal regulations

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2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Sulfuric Acid, ACS (Main constituent)	(CAS-No.) 7664-93-9	96	Skin Corr. 1A, H314 Eye Dam. 1, H318

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Immediately consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

First-aid measures after eye contact : Rinse immediately with plenty of water for 15 minutes. Take victim to an ophthalmologist. Do not apply neutralizing agents. Remove contact lenses, if present and easy to do. Continue rinsing.

First-aid measures after ingestion : Rinse mouth with water. Do not induce vomiting. Do not give activated charcoal. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Take the container/vomit to the doctor/hospital. Ingestion of large quantities: immediately to hospital. Do not give chemical antidote.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation : Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of pneumonia. Risk of lung oedema. Respiratory difficulties.

Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.

Symptoms/effects after eye contact : Corrosion of the eye tissue. Permanent eye damage.

Symptoms/effects after ingestion : Nausea. Abdominal pain. Blood in stool. Blood in vomit. Burns to the gastric/intestinal mucosa. AFTER INGESTION OF HIGH QUANTITIES: Shock.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Itching. Skin rash/inflammation. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Quick-acting ABC powder extinguisher. Quick-acting BC powder extinguisher. Quick-acting CO2 extinguisher. Class B foam (alcohol-resistant); after consulting specialist.

Unsuitable extinguishing media : Water (quick-acting extinguisher, reel); risk of puddle expansion. Quick-acting class B foam extinguisher. Water.

5.2. Specific hazards arising from the chemical

Fire hazard : DIRECT FIRE HAZARD: Non combustible. INDIRECT FIRE HAZARD: Reactions involving a fire hazard: see "Reactivity Hazard".

Explosion hazard : INDIRECT EXPLOSION HAZARD: Reactions with explosion hazards: see "Reactivity Hazard".

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Reactivity	:	Reacts violently with (some) bases: heat release resulting in increased fire or explosion risk. Reacts with many compounds e.g.: with (strong) reducers, with organic material and with combustible materials: (increased) risk of fire/explosion. Violent exothermic reaction with water (moisture): release of corrosive gases/vapours.

5.3. Special protective equipment and precautions for fire-fighters

Precautionary measures fire	:	Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: seal off low-lying areas. Exposure to fire/heat: have neighbourhood close doors and windows.
Firefighting instructions	:	Cool tanks/drums with water spray/remove them into safety. When cooling/extinguishing: no water in the substance. Dilute toxic gases with water spray.
Protection during firefighting	:	Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Face-shield. Corrosion-proof suit. Large spills/in enclosed spaces: compressed air apparatus. Large spills/in enclosed spaces: gas-tight suit.
Emergency procedures	:	Mark the danger area. No naked flames. Keep containers closed. Avoid ingress of water in the containers. Wash contaminated clothes. Large spills/in confined spaces: consider evacuation. In case of hazardous reactions: keep upwind. In case of reactivity hazard: consider evacuation.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection.
Emergency procedures	:	Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released product, pump into suitable containers. Plug the leak, cut off the supply. Dam up the liquid spill. Hazardous reaction: measure explosive gas-air mixture. Reaction: dilute combustible gas/vapour with water curtain. Take account of toxic/corrosive precipitation water. Heat exposure: dilute toxic gas/vapour with water spray.
Methods for cleaning up	:	Take up liquid spill into inert absorbent material, e.g.: dry sand/earth/vermiculite. Scoop absorbed substance into closing containers. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Keep away from naked flames/heat. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection. Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Keep the substance free from contamination. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Never add water to this product. Never dilute by pouring water to the acid. Always add the acid to the water.
Hygiene measures	:	Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible products	:	Strong bases. metals. combustible materials.
Heat and ignition sources	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: combustible materials. reducing agents. (strong) bases. highly flammable materials. metals. cellulosic materials. organic materials. alcohols. amines. water/moisture.
Storage area	:	Store in a dry area. Ventilation at floor level. Keep locked up. Provide for a tub to collect spills. Unauthorized persons are not admitted. Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: closing. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

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Packaging materials : SUITABLE MATERIAL: stainless steel. carbon steel. polyethylene. polypropylene. glass. stoneware/porcelain. MATERIAL TO AVOID: monel steel. lead. copper. zinc.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Sulfuric Acid, ACS (7664-93-9)		
ACGIH	ACGIH TWA (mg/m³)	0.2 mg/m³ (Thoracic fraction)
OSHA	OSHA PEL (TWA) (mg/m³)	1 mg/m³
IDLH	US IDLH (mg/m³)	15 mg/m³
NIOSH	NIOSH REL (TWA) (mg/m³)	1 mg/m³

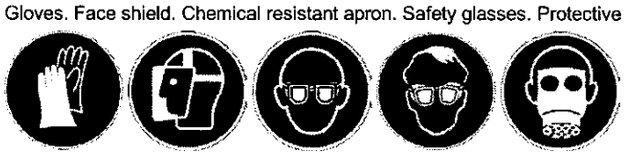
8.2. Appropriate engineering controls

Appropriate engineering controls : Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Gloves. Face shield. Chemical resistant apron. Safety glasses. Protective goggles. Gas mask with filter type E.



Materials for protective clothing:

GIVE EXCELLENT RESISTANCE: butyl rubber. polyethylene. tetrafluoroethylene. GIVE LESS RESISTANCE: neoprene. PVC. viton. GIVE POOR RESISTANCE: natural rubber. nitrile rubber. PVA

Hand protection:

Gloves

Eye protection:

Face shield

Skin and body protection:

Corrosion-proof clothing

Respiratory protection:

Full face mask with filter type E at conc. in air > exposure limit

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Liquid.
Colour	:	Pure substance: colourless Unpurified: yellow to brown
Odour	:	Almost odourless
Odour threshold	:	> 1 mg/m³
pH	:	< 1
Melting point	:	10 °C
Freezing point	:	No data available
Boiling point	:	288 °C
Flash point	:	Not applicable
Relative evaporation rate (butylacetate=1)	:	No data available
Flammability (solid, gas)	:	No data available

Vapour pressure	:	< 1 hPa (20 °C)
Relative vapour density at 20 °C	:	3.4
Relative density	:	1.8
Density	:	1840 kg/m³
Molecular mass	:	98.08 g/mol
Solubility	:	Exothermically soluble in water. Soluble in ethanol. Water: complete
Log Pow	:	-2.2 (Estimated value)
Auto-ignition temperature	:	No data available
Decomposition temperature	:	> 340 °C
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosive limits	:	No data available
Explosive properties	:	No data available.
Oxidising properties	:	No data available.

9.2. Other information

VOC content	:	0 %
Other properties	:	Gas/vapour heavier than air at 20°C. Clear. Hygroscopic. Slightly volatile. Substance has acid reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

Reacts violently with (some) bases: heat release resulting in increased fire or explosion risk. Reacts with many compounds e.g.: with (strong) reducers, with organic material and with combustible materials: (increased) risk of fire/explosion. Violent exothermic reaction with water (moisture): release of corrosive gases/vapours.

10.2. Chemical stability

Unstable on exposure to moisture.

10.3. Possibility of hazardous reactions

Reacts violently with water. Reacts violently with (some) bases: release of heat.

10.4. Conditions to avoid

Incompatible materials. Moisture.

10.5. Incompatible materials

Water. Strong bases. Organic compounds. metals. Halogens. cyanides. combustible materials.

10.6. Hazardous decomposition products

Sulfur compounds.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure	:	Skin and eyes contact
Acute toxicity	:	Not classified

Sulfuric Acid, ACS (7664-93-9)	
LD50 oral rat	2140 mg/kg bodyweight (Rat, Experimental value)
ATE US (oral)	2140 mg/kg bodyweight

Skin corrosion/irritation	:	Causes severe skin burns and eye damage. pH: < 1
Serious eye damage/irritation	:	Causes serious eye damage. pH: < 1
Respiratory or skin sensitisation	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified

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Sulfuric Acid, ACS (7664-93-9)	
Additional information	Strong inorganic acid mists containing sulfuric acid are carcinogenic to humans
National Toxicology Program (NTP) Status	2 - Known Human Carcinogens

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

Potential adverse human health effects and symptoms : Odour threshold is well above the exposure limit. Causes severe skin burns. Irritant to the respiratory organs. Causes serious eye damage.

Symptoms/effects after inhalation : Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of pneumonia. Risk of lung oedema. Respiratory difficulties.

Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.

Symptoms/effects after eye contact : Corrosion of the eye tissue. Permanent eye damage.

Symptoms/effects after ingestion : Nausea. Abdominal pain. Blood in stool. Blood in vomit. Burns to the gastric/intestinal mucosa. AFTER INGESTION OF HIGH QUANTITIES: Shock.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Itching. Skin rash/inflammation. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.

Ecology - air : Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).

Ecology - water : Harmful to crustacea. Harmful to fishes. Groundwater pollutant. Mild water pollutant (surface water). Inhibition of activated sludge. pH shift. Toxic to plankton.

Sulfuric Acid, ACS (7664-93-9)	
LC50 fish 1	42 mg/l (96 h, Gambusia affinis)
EC50 Daphnia 1	29 mg/l (24 h, Daphnia magna)

12.2. Persistence and degradability

Sulfuric Acid, ACS (7664-93-9)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

12.3. Bioaccumulative potential

Sulfuric Acid, ACS (7664-93-9)	
Log Pow	-2.2 (Estimated value)
Bioaccumulative potential	Not bioaccumulative.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Disposal methods

Regional legislation (waste) : LWCA (the Netherlands): KGA category 01.

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Waste disposal recommendations	:	Treat using the best available techniques before discharge into drains or the aquatic environment. Use appropriate containment to avoid environmental contamination. Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle/reuse. Remove to an authorized dump (Class I). Remove for physico-chemical/biological treatment.
Additional information	:	Hazardous waste according to Directive 2008/98/EC, as amended by Regulation (EU) No 1357/2014 and Regulation (EU) No 2017/997.
Ecology - waste materials	:	Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description	:	UN1830 Sulfuric acid (with more than 51 percent acid), 8, II
UN-No.(DOT)	:	UN1830
Proper Shipping Name (DOT)	:	Sulfuric acid with more than 51 percent acid
Transport hazard class(es) (DOT)	:	8 - Class 8 - Corrosive material 49 CFR 173.136
Packing group (DOT)	:	II - Medium Danger
Hazard labels (DOT)	:	8 - Corrosive



DOT Packaging Non Bulk (49 CFR 173.xxx)	:	202
DOT Packaging Bulk (49 CFR 173.xxx)	:	242
DOT Special Provisions (49 CFR 172.102)	:	A3 - For combination packagings, if glass inner packagings (including ampoules) are used, they must be packed with absorbent material in tightly closed metal receptacles before packing in outer packagings. A7 - Steel packagings must be corrosion-resistant or have protection against corrosion. B3 - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks and DOT 57 portable tanks are not authorized. B83 - Bottom outlets are prohibited on tank car tanks transporting sulfuric acid in concentrations over 65.25 percent. B84 - Packagings must be protected with non-metallic linings impervious to the lading or have a suitable corrosion allowance for sulfuric acid or spent sulfuric acid in concentration up to 65.25 percent. IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. N34 - Aluminum construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material. T8 - 4 178.274(d)(2) Normal..... Prohibited TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively. TP12 - This material is considered highly corrosive to steel.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	154
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	1 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	30 L
DOT Vessel Stowage Location	:	C - The material must be stowed "on deck only" on a cargo vessel and on a passenger vessel.

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Sulfuric Acid, ACS

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DOT Vessel Stowage Other	: 14 - For metal drums, stowage permitted under deck on cargo vessels
Other information	: No supplementary information available.

SECTION 15: Regulatory information

15.1. US Federal regulations

Sulfuric Acid, ACS (7664-93-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Not subject to reporting requirements of the United States SARA Section 313 Subject to reporting requirements of United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	1000 lb
SARA Section 311/312 Hazard Classes	Health hazard - Skin corrosion or Irritation Health hazard - Serious eye damage or eye irritation

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Sulfuric Acid, ACS	CAS-No. 7664-93-9	100%

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

National regulations

Sulfuric Acid, ACS (7664-93-9)
Listed on IARC (International Agency for Research on Cancer) Listed as carcinogen on NTP (National Toxicology Program)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

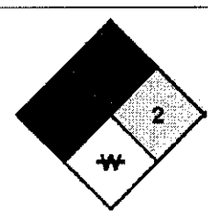
SECTION 16: Other information

Revision date : 02/28/2018

Full text of H-statements: see section 16:

H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.

NFPA health hazard	: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.
NFPA fire hazard	: 0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.
NFPA reactivity	: 2 - Materials that readily undergo violent chemical change at elevated temperatures and pressures.
NFPA specific hazard	: W - Materials that react violently or explosively with water.



Sulfuric Acid, ACS

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Hazard Rating	
Health	: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability	: 0 Minimal Hazard - Materials that will not burn
Physical	: 2 Moderate Hazard - Materials that are unstable and may undergo violent chemical changes at normal temperature and pressure with low risk for explosion. Materials may react violently with water or form peroxides upon exposure to air.
Personal protection	: H H - Splash goggles, Gloves, Synthetic apron, Vapor respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

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ANNEXURE-15(b)

0-52-0 Merchant Grade Phosphoric Acid

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

SECTION 1: Identification

1.1. Identification

Product form : Mixture

Product name : 0-52-0 Merchant Grade Phosphoric Acid

Product code : M12010

1.2. Recommended use and restrictions on use

No additional information available

1.3. Supplier

JR Simplot Company

P.O. Box 70013

Boise, ID 83707

T 1-208-336-2110

1.4. Emergency telephone number

Emergency number : CHEMTREC 1-800-424-9300

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Corrosive to metals, Category 1	H290	May be corrosive to metals
Acute toxicity (oral), Category 4	H302	Harmful if swallowed
Acute toxicity (dermal), Category 4	H312	Harmful in contact with skin
Skin corrosion/irritation, Category 1A	H314	Causes severe skin burns and eye damage

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labelling

Hazard pictograms (GHS-US) :



Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H290 - May be corrosive to metals
H302+H312 - Harmful if swallowed or in contact with skin
H314 - Causes severe skin burns and eye damage

Precautionary statements (GHS-US) : P234 - Keep only in original container
P260 - Do not breathe dust/fume/gas/mist/vapours/spray
P264 - Wash hands, forearms and face thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a poison center/doctor/... if you feel unwell
P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting
P302+P352 - If on skin: Wash with plenty of water/...
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a poison center/doctor/...
P312 - Call a poison center/doctor/... if you feel unwell
P321 - Specific treatment (see supplemental first aid instruction on this label)
P322 - Specific treatment (see ... on this label)
P330 - Rinse mouth
P362+P364 - Take off contaminated clothing and wash it before reuse

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P363 - Wash contaminated clothing before reuse
P390 - Absorb spillage to prevent material damage
P405 - Store locked up
P406 - Store in a corrosion resistant container with a resistant inner liner
P501 - Dispose of contents/container to ...

2.3. Other hazards which do not result in classification

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	GHS-US classification
phosphoric acid (7664-38-2)	(CAS No) 7664-38-2		Met. Corr. 1, H290 Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Dermal), H312 Skin Corr. 1B, H314
Proprietary			Not classified

Full text of hazard classes and H-statements : see section 16

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.

First-aid measures after skin contact : Immediately call a POISON CENTER or doctor/physician. Specific measures (see ... on this label). Wash with plenty of soap and water. Wash contaminated clothing before reuse. Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

First-aid measures after eye contact : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.

First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Call a POISON CENTER or doctor/physician if you feel unwell. Immediately call a POISON CENTER or doctor/physician. Call a poison center or a doctor if you feel unwell.

4.2. Most important symptoms and effects (acute and delayed)

Potential adverse human health effects and symptoms : Based on available data, the classification criteria are not met. Harmful if swallowed. Harmful in contact with skin.

Symptoms/injuries : Causes severe skin burns and eye damage.

Symptoms/injuries after skin contact : Repeated exposure to this material can result in absorption through skin causing significant health hazard. Harmful in contact with skin.

Symptoms/injuries after ingestion : Swallowing a small quantity of this material will result in serious health hazard.

4.3. Immediate medical attention and special treatment, if necessary

Treat symptomatically.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical

Reactivity : Thermal decomposition generates : Corrosive vapours.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

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0-52-0 Merchant Grade Phosphoric Acid

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8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Avoid all unnecessary exposure.

Hand protection:

Wear protective gloves

Eye protection:

Chemical goggles or face shield. Safety glasses

Skin and body protection:

Wear suitable protective clothing

Respiratory protection:

Wear appropriate mask

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Green, viscous liquid.
Colour	:	Green
Odour	:	Odorless when cold; pungent when hot.
Odour threshold	:	No data available
pH	:	< 1
Melting point	:	≈ °C
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	123 °C
Relative evaporation rate (butylacetate=1)	:	No data available
Flammability (solid, gas)	:	Non flammable.
Vapour pressure	:	No data available
Relative vapour density at 20 °C	:	No data available
Relative density	:	No data available
Solubility	:	No data available
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosive limits	:	No data available
Explosive properties	:	No data available
Oxidising properties	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Thermal decomposition generates : Corrosive vapours.

10.2. Chemical stability

Stable.

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Protection during firefighting	:	Do not enter fire area without proper protective equipment, including respiratory protection. Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures	:	Ventilate spillage area. Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment	:	Do not attempt to take action without suitable protective equipment. Equip cleanup crew with proper protection. For further information refer to section 8: "Exposure controls/personal protection".
Emergency procedures	:	Ventilate area.

6.2. Environmental precautions

Avoid release to the environment. Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up	:	Take up liquid spill into absorbent material. Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials. Absorb spillage to prevent material damage.
Other information	:	Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection. For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed	:	May be corrosive to metals.
Precautions for safe handling	:	Ensure good ventilation of the work station. Wear personal protective equipment. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapour. Do not breathe dust/fume/gas/mist/vapours/spray. Avoid contact during pregnancy/while nursing.
Hygiene measures	:	Do not eat, drink or smoke when using this product. Wash hands, forearms and face thoroughly after handling. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Comply with applicable regulations.
Storage conditions	:	Keep only in the original container in a cool, well ventilated place away from : Keep container closed when not in use. Store in a well-ventilated place. Keep cool.
Incompatible products	:	Strong bases. Strong acids.
Incompatible materials	:	Sources of ignition. Direct sunlight.
Packaging materials	:	Store in a corrosion resistant container with a resistant inner liner.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Proprietary		
Not applicable		
phosphoric acid (7664-38-2) (7664-38-2)		
ACGIH	ACGIH TWA (mg/m³)	1 mg/m³
ACGIH	ACGIH STEL (mg/m³)	3 mg/m³

8.2. Appropriate engineering controls

Appropriate engineering controls	:	Ensure good ventilation of the work station.
Environmental exposure controls	:	Avoid release to the environment.

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10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Strong Alkalies. Metals other than stainless steel. Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

Reacts violently with strong alkalies producing heat. Contact with many metals may result in severe corrosion attack of the metal and liberation of hydrogen gas. Strong acids. Strong bases. metals. May be corrosive to metals.

10.6. Hazardous decomposition products

High temperatures will liberate phosphorus oxides. fume. Carbon monoxide. Carbon dioxide. Thermal decomposition generates : Corrosive vapours.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed. Dermal: Harmful in contact with skin.

0-52-0 Merchant Grade Phosphoric Acid	
LD50 oral rat	1530 mg/kg
LD50 dermal rabbit	1260 mg/kg
ATE US (oral)	1530 mg/kg bodyweight
ATE US (dermal)	1260 mg/kg bodyweight

phosphoric acid (7664-38-2) (7664-38-2)	
LD50 oral rat	1530 mg/kg (Rat)
LD50 dermal rat	>= 1260 mg/kg bodyweight
LC50 inhalation rat (mg/l)	>= mg/l/4h
ATE US (oral)	1530 mg/kg bodyweight
ATE US (dermal)	1100 mg/kg bodyweight

Skin corrosion/irritation : Causes severe skin burns and eye damage.
pH: < 1

Serious eye damage/irritation : Not classified
pH: < 1

Respiratory or skin sensitisation : Not classified

Germ cell mutagenicity : Not classified
Based on available data, the classification criteria are not met

Carcinogenicity : Not classified

Reproductive toxicity : Not classified
Based on available data, the classification criteria are not met

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

Potential adverse human health effects and symptoms : Based on available data, the classification criteria are not met. Harmful if swallowed. Harmful in contact with skin.

Symptoms/injuries : Causes severe skin burns and eye damage.

Symptoms/injuries after skin contact : Repeated exposure to this material can result in absorption through skin causing significant health hazard. Harmful in contact with skin.

Symptoms/injuries after ingestion : Swallowing a small quantity of this material will result in serious health hazard.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : The product is not considered harmful to aquatic organisms or to cause long-term adverse effects in the environment.

0-52-0 Merchant Grade Phosphoric Acid	
LC50 fish 1	3 - 3.5 ppm

phosphoric acid (7664-38-2) (7664-38-2)	
LC50 fish 1	138 mg/l (96 h; Pisces; Pure substance)
LC50 other aquatic organisms 1	240 mg/l (96 h; Protozoa; Pure substance)
LC50 fish 2	100 - 1000 mg/l (Pisces; Pure substance)
LC50 other aquatic organisms 2	100 - 1000 mg/l (Pure substance)
TLM fish 1	138 ppm (24 h; Gambusia affinis; Pure substance)
Threshold limit other aquatic organisms 1	240 mg/l (96 h; Protozoa; Pure substance)
Threshold limit other aquatic organisms 2	100 - 1000,Pure substance

12.2. Persistence and degradability

0-52-0 Merchant Grade Phosphoric Acid	
Persistence and degradability	Not established.

Proprietary	
Persistence and degradability	Not established.

phosphoric acid (7664-38-2) (7664-38-2)	
Persistence and degradability	Biodegradability: not applicable. No (test)data on mobility of the components available. Not established.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

12.3. Bioaccumulative potential

0-52-0 Merchant Grade Phosphoric Acid	
Bioaccumulative potential	Not established.

Proprietary	
Bioaccumulative potential	Not established.

phosphoric acid (7664-38-2) (7664-38-2)	
Log Pow	-0.77 (Estimated value)
Bioaccumulative potential	Bioaccumulation: not applicable. Not established.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Effect on the global warming : No known effects from this product.

GWPmix comment : No known effects from this product.

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste treatment methods : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Product/Packaging disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to ...

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1805 Phosphoric acid solution, 8, III

UN-No.(DOT) : UN1805

Proper Shipping Name (DOT) : Phosphoric acid solution

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Class (DOT)	:	8 - Class 8 - Corrosive material 49 CFR 173.136
Packing group (DOT)	:	III - Minor Danger
Hazard labels (DOT)	:	8 - Corrosive



DOT Packaging Non Bulk (49 CFR 173.xxx)	:	203
DOT Packaging Bulk (49 CFR 173.xxx)	:	241
DOT Special Provisions (49 CFR 172.102)	:	A7 - Steel packagings must be corrosion-resistant or have protection against corrosion. IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672). N34 - Aluminum construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material. T4 - 2.65 178.274(d)(2) Normal..... 178.275(d)(3) TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / (1 + a (tr - tf)) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	154
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	5 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	60 L
DOT Vessel Stowage Location	:	A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.
Other information	:	No supplementary information available.

TDG

Transport by sea

Transport document description (IMDG)	:	UN 1805 PHOSPHORIC ACID SOLUTION, 8, III
UN-No. (IMDG)	:	1805
Proper Shipping Name (IMDG)	:	PHOSPHORIC ACID SOLUTION
Class (IMDG)	:	8 - Corrosive substances
Packing group (IMDG)	:	III - substances presenting low danger
Limited quantities (IMDG)	:	5 L

Air transport

Transport document description (IATA)	:	UN 1805 Phosphoric acid, solution, 8, III
UN-No. (IATA)	:	1805
Proper Shipping Name (IATA)	:	Phosphoric acid, solution
Class (IATA)	:	8 - Corrosives
Packing group (IATA)	:	III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

0-52-0 Merchant Grade Phosphoric Acid	
Not listed on the United States TSCA (Toxic Substances Control Act) inventory Not subject to reporing requirements of the United States SARA Section 313	
CERCLA RQ	5000 lb

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

Proprietary	CAS No	%

0-52-0 Merchant Grade Phosphoric Acid

Safety Data Sheet

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phosphoric acid (7664-38-2) (7664-38-2)	
CERCLA RQ	5000 lb

15.2. International regulations

CANADA
No additional information available

EU-Regulations
No additional information available

National regulations
No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

phosphoric acid (7664-38-2) (7664-38-2)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Data sources : REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

Other information : None.

Full text of H-statements:

H290	May be corrosive to metals
H302	Harmful if swallowed
H312	Harmful in contact with skin
H314	Causes severe skin burns and eye damage

SDS US (GHS HazCom 2012)

Disclaimer: This information relates to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty or guarantee is made as to its accuracy, reliability or completeness. NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE CONCERNING THE INFORMATION HEREIN PROVIDED. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use. We do not accept liability for any loss or damage that may occur from the use of this information nor do we offer warranty against patent infringement.

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ANNEXURE-15(b) SAFETY DATA SHEET

FLUOROSILICIC ACID, 23-25%

Revision Date 10/15/2018

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

- Trade name: FLUOROSILICIC ACID, 23-25%
- Synonyms: Hydrofluorosilicic acid, Fluorosilicic acid, Hydrofluosilicic acid, Flousilicic acid, HFS, FSA

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses of the Substance / Mixture

- Chemical intermediate
- Water treatment

1.3 Details of the supplier of the safety data sheet

Company

SOLVAY FLUORIDES, LLC
3737 Buffalo Speedway,
Suite 800,
Houston, TX 77098
USA
Tel: 800-515-6065

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CONTACT CHEMTREC (24-Hour Number): 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

SECTION 2: Hazards identification

Although WHMIS has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects

2.1 Classification of the substance or mixture

Hazardous Products Regulations (WHMIS 2015)

Acute toxicity, Category 4	H302: Harmful if swallowed.
Acute toxicity, Category 4	H332: Harmful if inhaled.
Acute toxicity, Category 3	H311: Toxic in contact with skin.
Skin corrosion, Category 1B	H314: Causes severe skin burns and eye damage.
Serious eye damage, Category 1	H318: Causes serious eye damage.

2.2 Label elements

Hazardous Products Regulations (WHMIS 2015)

Pictogram



Signal Word

- Danger

Hazard Statements

- H302 + H332	Harmful if swallowed or if inhaled.
- H311	Toxic in contact with skin.
- H314	Causes severe skin burns and eye damage.

Precautionary Statements

Prevention

- P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
- P264	Wash skin thoroughly after handling.
- P270	Do not eat, drink or smoke when using this product.
- P271	Use only outdoors or in a well-ventilated area.
- P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response

- P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
- P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
- P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
- P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
- P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
- P361 + P364	Take off immediately all contaminated clothing and wash it before reuse.

Storage

- P405	Store locked up.

Disposal

- P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards which do not result in classification

None identified

SECTION 3: Composition/information on ingredients

3.1 Substance

- Not applicable, this product is a mixture.

3.2 Mixture

- Synonyms: Hydrofluorosilicic acid, Fluorosilicic acid, Hydrofluosilicic acid, Flousilicic acid, HFS, FSA

WHMIS Hazardous Ingredients and Impurities

Chemical name	Identification number CAS-No.	Concentration [% wt/wt or V/V]
Silicate(2-), hexafluoro-, hydrogen (1:2)	16961-83-4	>= 23 - <= 25
Hydrofluoric acid	7664-39-3	<= 1

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

- HF exposures are unique. Serious and potentially life threatening effects can occur immediately or up to 24 hours after exposure.
- Always decontaminate exposure victims before applying first aid or medical treatment.
- Rescuers should wear PPE during rescue and decontamination of victims.
- First aid providers should wear gloves when touching exposed areas or applying calcium gluconate gel to victims.
- In case of splashes to eyes and face, treat eyes first.
- Always seek medical attention if exposed to HF.

In case of inhalation

- Move to fresh air.
- Get immediate medical advice/ attention.
- Administer oxygen by mask at a rate of 12 liters/minute.
- Nebulize 2.5% calcium gluconate solution for 15 to 20 minutes minimum or until the victim reaches medical attention.
- If calcium gluconate is not available, administer oxygen as above until the victim reaches medical attention.
- If respiratory assistance is needed, use indirect methods such as "microshilds" or "AMBU" bag. Do not give mouth to mouth resuscitation.
-
- If exposed to HF vapor, expect to see skin and eye exposure. Follow the decontamination and first aid procedures for skin and eye exposure.
- Be aware to maintain life support if necessary.

In case of skin contact

- In case of HF exposure to skin, go to the nearest source of water or safety shower. Turn water on.
- While washing, remove all clothing, shoes and jewelry.
- Finally, while closing eyes and facing the water flow, remove goggles or respirator face mask.
- HF-resistant gloves should be worn while touching contaminated skin.
- Wash the exposed areas for 5 minutes maximum if first aid treatments are immediately available. Otherwise continue to wash until first aid treatments are available.
- Immediately apply calcium gluconate gel 2.5% and massage into the affected area; continue to massage while repeatedly applying gel until 15 minutes after pain is relieved.
- If fingers/finger nails are touched, even if there is no pain, dip them in a bath of 2.5% calcium gluconate for 15 to 20 minutes.
- Seek medical attention as soon as possible. During transportation to a medical facility or while waiting for a physician to see victim, it is extremely important to continue messaging calcium gluconate gel.
- Be aware to maintain life support if necessary.

In case of eye contact

- Decontamination: Go to the nearest eye wash or clean source of water, open the water valve. Have a trained person remove contact lenses if present (contact lenses should be prohibited), put your eye(s) in the water flow and hold eyelids open while flushing.
- After flushing, irrigate eyes with 1% calcium gluconate solution using a nasal cannula cinched over the bridge of the nose. Dispense 1000 cc of calcium gluconate solution in a continuous flush for a minimum period of 15 minutes, or if necessary until medical aid is available.
-
- During transportation to a medical facility or while waiting for a physician to see the victim, it is extremely important to continue the calcium gluconate irrigation.
-
- Always obtain specialized medical evaluation & treatment as soon as possible.
- Be aware to maintain life support if necessary.

In case of ingestion

- If HF has been ingested, the victim should be immediately transported to a medical facility.
- Do NOT induce vomiting.
- If the victim is able to swallow, give oral calcium containing antacids or solution. The recommended antidote is

calcium gluconate. However, if no calcium gluconate is at hand, the oral administration of small and limited amount of milk or water might be considered if it's consistent with local practice.
- Be aware to maintain life support if necessary.

4.2 Most important symptoms and effects, both acute and delayed

In case of skin contact

Symptoms
- Causes severe burns.
- metabolic imbalances
- Life threatening cardiac arrhythmia

Effects
- HF penetrate very fast any tissue It comes in contact with, and do not remain on its surface.
- Initially, the substances will be locally burning, and afterwards they will penetrate into deeper tissues and might cause the following significant complications:
- In case of lower concentrations, symptoms can be delayed and might appear even 48h after the exposure.
- It is completely absorbed into the body, where it causes acute and severe toxic systemic effects, mainly attributable to a rapid development of serum hypocalcaemia and hypomagnesaemia and to enzymes blocking.

In case of eye contact

Symptoms
- Causes severe burns.
- Blindness

Effects
- HF penetrate very fast any tissue It comes in contact with, and do not remain on its surface.
- Initially, the substances will be locally burning, and afterwards they will penetrate into deeper tissues and might cause the following significant complications:
- In case of lower concentrations, symptoms can be delayed and might appear even 48h after the exposure.
- It is completely absorbed into the body, where it causes acute and severe toxic systemic effects, mainly attributable to a rapid development of serum hypocalcaemia and hypomagnesaemia and to enzymes blocking.

In case of inhalation

Symptoms
- Causes severe burns.
- metabolic imbalances
- pulmonary edema
- Life threatening cardiac arrhythmia

Effects
- Initially, the substances will be locally burning, and afterwards they will penetrate into deeper tissues and might cause the following significant complications:
- In case of lower concentrations, symptoms can be delayed and might appear even 48h after the exposure.
- It is completely absorbed into the body, where it causes acute and severe toxic systemic effects, mainly attributable to a rapid development of serum hypocalcaemia and hypomagnesaemia and to enzymes blocking.

In case of ingestion

Effects
- In case of lower concentrations, symptoms can be delayed and might appear even 48h after the exposure.
- It is completely absorbed into the body, where it causes acute and severe toxic systemic effects, mainly attributable to a rapid development of serum hypocalcaemia and hypomagnesaemia and to enzymes blocking.

4.3 Indication of any immediate medical attention and special treatment needed

- no data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media

- None.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting

- The product is not flammable.
- Not combustible.
- Heating can release hazardous gases.
- Gives off hydrogen by reaction with metals.

Hazardous combustion products:

- Hydrogen
- Hydrogen fluoride

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- Wear self-contained breathing apparatus and protective suit.
- Fire fighters must wear fire resistant personnel protective equipment.
- Wear chemical resistant oversuit
- Protect intervention team with a water spray as they approach the fire.

Further information

- Cool containers/tanks with water spray.
- Approach from upwind.
- Suppress (knock down) gases/vapors/mists with a water spray jet.
- After the fire, proceed rapidly with cleaning of surfaces exposed to the fumes in order to limit equipment damage.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel

- Prevent further leakage or spillage if safe to do so.
- Keep away from incompatible products

Advice for emergency responders

- Approach from upwind.
- Isolate the area.
- Wear self-contained breathing apparatus in confined spaces, in cases where the oxygen level is depleted, or in case of significant emissions.
- Suppress (knock down) gases/vapors/mists with a water spray jet.
- Avoid spraying the leak source.
- Ventilate the area.

6.2 Environmental precautions

- Should not be released into the environment.
- If the product contaminates rivers and lakes or drains inform respective authorities.

6.3 Methods and materials for containment and cleaning up

- Dam up.
- Soak up with inert absorbent material.
- Prevent product from entering sewage system.
- Dilute with water.
- Contact with water may produce heat release and presents risks of splashing.
- When diluting, always add the product to water. Never add water to the product.
- Neutralize with the following product(s):
- soda ash
- lime
- Keep in properly labeled containers.
- Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

- Refer to protective measures listed in sections 7 and 8.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Used in closed system
- Handle small quantities under a lab hood.
- Use only in well-ventilated areas.
- Use only equipment and materials which are compatible with the product.
- Preferably transfer by pump or gravity.
- For further information, please contact:
- Manufacturer, importer, supplier
- Keep away from incompatible products

Hygiene measures

- Ensure that eyewash stations and safety showers are close to the workstation location.
- Take off contaminated clothing and shoes immediately.
- Wash contaminated clothing before re-use.
- May not get in touch with:
- Leather
- Handle in accordance with good industrial hygiene and safety practice.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions

- Do not freeze.

- Keep container tightly closed.
- Keep in a cool, well-ventilated place.
- Keep away from heat.
- Keep in a contained area
- Information about special precautions needed for bulk handling is available on request.

- Provide tight electrical equipment well protected against corrosion.
- For personal protection see section 8.

- Keep away from:
- Incompatible products

Packaging material

Suitable material
- Plastic materials.
- Coated steels.

Unsuitable material
- glass

7.3 Specific end use(s)

- Contact your supplier for additional information

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

Components with workplace occupational exposure limits

Consult local authorities for acceptable exposure limits.

Components	Value type	Value	Basis
Silicate(2-), hexafluoro-, hydrogen (1:2)	TWA	2.5 mg/m3	American Conference of Governmental Industrial Hygienists
	Bone damage, Fluorosis, Substances for which there is a Biological Exposure Index or Indices (see BEI® section), Not classifiable as a human carcinogen, varies Expressed as :Fluorine		
Hydrofluoric acid	TWA	0.5 ppm	American Conference of Governmental Industrial Hygienists
	Upper Respiratory Tract irritation, Lower Respiratory Tract irritation, Eye irritation, Skin irritation, Fluorosis, Substances for which there is a Biological Exposure Index or Indices (see BEI® section), Danger of cutaneous absorption Expressed as :Fluorine		
Hydrofluoric acid	C	2 ppm	American Conference of Governmental Industrial Hygienists
	Upper Respiratory Tract irritation, Lower Respiratory Tract irritation, Eye irritation, Skin irritation, Fluorosis, Substances for which there is a Biological Exposure Index or Indices (see BEI® section), Danger of cutaneous absorption Expressed as :Fluorine		

Biological Exposure Indices

Components	Value type	Value	Basis
Silicate(2-), hexafluoro-, hydrogen (1:2)	BEI	2 mg/l Fluoride Urine Prior to shift (16 hours after exposure ceases)	American Conference of Governmental Industrial Hygienists
Silicate(2-), hexafluoro-, hydrogen (1:2)	BEI	3 mg/l Fluoride Urine End of shift (As soon as possible after exposure ceases)	American Conference of Governmental Industrial Hygienists
Hydrofluoric acid	BEI	2 mg/l Fluoride Urine Prior to shift (16 hours after exposure ceases)	American Conference of Governmental Industrial Hygienists
Hydrofluoric acid	BEI	3 mg/l Fluoride Urine End of shift (As soon as possible after exposure ceases)	American Conference of Governmental Industrial Hygienists

8.2 Exposure controls

Control measures

Engineering measures

- Provide adequate ventilation.
- Apply technical measures to comply with the occupational exposure limits.

Individual protection measures

Respiratory protection

- Use respirator when performing operations involving potential exposure to vapor of the product.
- Respirator with a full face mask.
- Respirator with combination filter for vapor/particulate (EN 141)
- In case of decomposition (see section 10), face mask with combined type B-P3 cartridge.
- In the case of dust or aerosol formation use respirator with an approved filter.
- Self-contained breathing apparatus in confined spaces/insufficient oxygen/in case of large uncontrolled emissions/in all circumstances when the mask and cartridge do not give adequate protection.
- Use only respiratory protection that conforms to international/ national standards.
- Use NIOSH approved respiratory protection.
- Self-contained breathing apparatus in case of: 1) large uncontrolled emissions, 2) insufficient oxygen, 3) the mask and cartridge do not give adequate protection.

Hand protection

- Take note of the information given by the producer concerning permeability and break through times, and of special workplace conditions (mechanical strain, duration of contact).
- Protective gloves - impervious chemical resistant:

Flammability / Explosive limit	Explosiveness: With certain materials (see section 10).
Autoignition temperature	Not applicable
Vapor pressure	22.50 mmHg (30 hPa) (68 °F (20 °C))
Vapor density	> 1 (68 °F (20 °C))
Density	Bulk density: Not applicable
Relative density	1.27 (68 °F (20 °C)) 30 % solution
Solubility	Water solubility: soluble
Partition coefficient: n-octanol/water	Not applicable
Decomposition temperature	No data available
Viscosity	Viscosity, dynamic : 6.5 mPa.s (68 °F (20 °C)) 30 % solution
Explosive properties	No data available
Oxidizing properties	Not considered as oxidizing.

9.2 Other information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

- Risk of violent reaction.
- Risk of explosion.

10.2 Chemical stability

- Stable under recommended storage conditions.
- Corrosive in contact with metals
- Gives off hydrogen by reaction with metals.
- Risk of violent reaction.
- Risk of explosion.

10.3 Possibility of hazardous reactions

Suitable material
- Copolymer VF2-HFP (fluoroelastomer)

Eye protection
- Chemical resistant goggles must be worn.
- Face-shield

Skin and body protection
- Impervious clothing
- Do not wear leather shoes.

- If splashes are likely to occur, wear:
- butyl-rubber
- Boots

Hygiene measures
- Ensure that eyewash stations and safety showers are close to the workstation location.
- Take off contaminated clothing and shoes immediately.
- Wash contaminated clothing before re-use.
- May not get in touch with:
- Leather
- Handle in accordance with good industrial hygiene and safety practice.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

Appearance	Physical state: Color:	liquid colorless
Odor	pungent	
Odor Threshold	No data available	
pH	1.0 (100 g/l)	
Melting point/freezing point	Freezing point: < 4.1 °F (< -15.5 °C)	
Initial boiling point and boiling range	Boiling point/boiling range: Thermal decomposition: yes Not applicable	
Flash point	Not applicable	
Evaporation rate (Butylacetate = 1)	No data available	
Flammability (solid, gas)	Not applicable	
Flammability (liquids)	The product is not flammable.	

- Reacts violently with water., Corrosive in contact with metals, Gives off hydrogen by reaction with metals.

10.4 Conditions to avoid

- To avoid thermal decomposition, do not overheat.

10.5 Incompatible materials

- glass
- Strong oxidizing agents
- Metals

10.6 Hazardous decomposition products

- Hydrogen
- Hydrogen fluoride

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity	
Silicate(2-), hexafluoro-, hydrogen (1:2)	study scientifically unjustified Corrosive
Hydrofluoric acid	study scientifically unjustified
Acute inhalation toxicity	
Silicate(2-), hexafluoro-, hydrogen (1:2)	study scientifically unjustified Corrosive
Hydrofluoric acid	LC50 - 1 h (gas) : 2,240 - 2,340 ppm - Rat , male dry air Humid air
Acute dermal toxicity	
Silicate(2-), hexafluoro-, hydrogen (1:2)	study scientifically unjustified Corrosive
Hydrofluoric acid	NOEC : 2 %(m) - Rabbit Test substance: solution Exposure time 1 min NOEC : 0.01 %(m) - Rabbit Test substance: solution Exposure time 30 min
Acute toxicity (other routes of administration)	No data available

Skin corrosion/irritation

Silicate(2-), hexafluoro-, hydrogen (1:2)	Corrosive
Hydrofluoric acid	Corrosive

Serious eye damage/eye irritation

Silicate(2-), hexafluoro-, hydrogen (1:2)	Corrosive
Hydrofluoric acid	Risk of serious damage to eyes.

Respiratory or skin sensitization

Silicate(2-), hexafluoro-, hydrogen (1:2)	study scientifically unjustified Corrosive
Hydrofluoric acid	By analogy Does not cause skin sensitization. Test substance: Sodium fluoride

Mutagenicity

Genotoxicity in vitro

Silicate(2-), hexafluoro-, hydrogen (1:2)	Ames test Strain: Salmonella typhimurium with and without metabolic activation negative Method: OECD Test Guideline 471
Hydrofluoric acid	By analogy Test substance: Sodium fluoride In vitro tests did not show mutagenic effects

Genotoxicity in vivo

Silicate(2-), hexafluoro-, hydrogen (1:2)	Test substance: Sodium fluoride By analogy In vivo tests did not show mutagenic effects
Hydrofluoric acid	By analogy Test substance: Sodium fluoride In vivo tests did not show mutagenic effects

Carcinogenicity

Silicate(2-), hexafluoro-, hydrogen (1:2)	By analogy Rat Mouse Oral Exposure time: Prolonged exposure NOAEL: 175ppm Test substance: Sodium fluoride drinking water No carcinogenic effects have been observed
Hydrofluoric acid	By analogy Rat Oral NOAEL: 175ppm Test substance: Sodium fluoride drinking water Mouse Oral NOAEL: 175ppm Test substance: Sodium fluoride drinking water No carcinogenic effects have been observed

This product does not contain any ingredient designated as probable or suspected human carcinogens by:
ACGIH

Toxicity for reproduction and development

Toxicity to reproduction / fertility

Silicate(2-), hexafluoro-, hydrogen (1:2)	By analogy Two-generation study - Rat, male and female, Oral Fertility NOAEL Parent: 10 mg/kg Fertility NOAEL F1: 10 mg/kg Test substance, Sodium fluoride, drinking water, The product is not considered to affect fertility.
Hydrofluoric acid	By analogy Two-generation study - Rat, male and female, Oral Fertility NOAEL Parent: 10 mg/kg Fertility NOAEL F1: 10 mg/kg Test substance, Sodium fluoride, drinking water, The product is not considered to affect fertility.

Developmental Toxicity/Teratogenicity

Silicate(2-), hexafluoro-, hydrogen (1:2)	By analogy
	Rat
	Rabbit
	, Oral Teratogenicity NOAEL:14mg/kg Test substance, Sodium fluoride, drinking water, The product is not considered to be toxic for development.
Hydrofluoric acid	By analogy
	Rat
	Rabbit
	, Oral Teratogenicity NOAEL:14mg/kg Test substance, Sodium fluoride, drinking water, The product is not considered to be toxic for development.

STOT

STOT-single exposure

Silicate(2-), hexafluoro-, hydrogen (1:2)	The substance or mixture is not classified as specific target organ toxicant, single exposure according to GHS criteria.
Hydrofluoric acid	The substance or mixture is not classified as specific target organ toxicant, single exposure according to GHS criteria.

STOT-repeated exposure

Silicate(2-), hexafluoro-, hydrogen (1:2)	The substance or mixture is not classified as specific target organ toxicant, repeated exposure according to GHS criteria.
Hydrofluoric acid	The substance or mixture is not classified as specific target organ toxicant, repeated exposure according to GHS criteria.
Silicate(2-), hexafluoro-, hydrogen (1:2)	By analogy
	Oral - Mouse , male and female LOAEL: 50 ppm Test substance: Sodium fluoride Target Organs: Skeleton
	By analogy
	Inhalation 90-day - Rat , male and female NOAEC: 0.72 mg/m3 Test substance: Hydrogen fluoride Target Organs: Respiratory Tract, Bone, Teeth, Kidney
Hydrofluoric acid	By analogy

	Oral - Mouse , male and female LOAEL: 50 ppm Test substance: Sodium fluoride Target Organs: Skeleton Inhalation 90-day - Rat , male and female NOAEC: 0.72 mg/m3 Test substance: Hydrogen fluoride Target Organs: Respiratory Tract, Bone, Teeth, Kidney
Experience with human exposure	No data available
Aspiration toxicity	No data available
Further information Hydrofluoric acid	corrosive effects Liver and kidney injuries may occur.

SECTION 12: Ecological information

12.1 Toxicity

Aquatic Compartment

Acute toxicity to fish

Silicate(2-), hexafluoro-, hydrogen (1:2)	LC50 - 96 h : 50 mg/l - Lepomis macrochirus (Bluegill sunfish) static test Fresh water
Hydrofluoric acid	By analogy LC50 - 96 h : 51 mg/l - Fishes, Salmo gairdneri static test Test substance: Sodium fluoride Fresh water

Acute toxicity to daphnia and other aquatic invertebrates

Silicate(2-), hexafluoro-, hydrogen (1:2)	By analogy EC50 - 48 h : 26 mg/l - Daphnia magna (Water flea) static test Test substance: Sodium fluoride Fresh water By analogy EC50 - 96 h : 10.5 mg/l static test Test substance: Sodium fluoride Marine species salt water
Hydrofluoric acid	By analogy EC50 - 48 h : 26 mg/l - Daphnia magna (Water flea) static test Test substance: Sodium fluoride Fresh water EC50 - 96 h : 10.5 mg/l static test Test substance: Sodium fluoride Marine species salt water

Toxicity to aquatic plants

Silicate(2-), hexafluoro-, hydrogen (1:2)	By analogy EC50 - 96 h : 43 mg/l - algae static test Test substance: Sodium fluoride Fresh water Sea water By analogy EC50 - 96 h : 81 mg/l - algae static test Test substance: Sodium fluoride Fresh water Sea water By analogy NOEC - 7 Days : 50 mg/l - algae static test Test substance: Sodium fluoride Fresh water Sea water
Hydrofluoric acid	By analogy EC50 - 96 h : 43 mg/l - Algae

static test
Test substance: Sodium fluoride
Fresh water

By analogy

EC50 - 96 h : 81 mg/l - Algae
static test
Test substance: Sodium fluoride
Sea water

By analogy

NOEC - 7 Days : 50 mg/l - Algae
static test
Test substance: Sodium fluoride
Fresh water
Sea water

Toxicity to microorganisms No data available

Chronic toxicity to fish

Silicate(2-), hexafluoro-, hydrogen (1:2) By analogy

NOEC: 4 mg/l - 21 Days - Oncorhynchus mykiss (rainbow trout)
static test
Test substance: Sodium fluoride
Fresh water

Hydrofluoric acid By analogy

NOEC: 4 mg/l - 21 Days - Oncorhynchus mykiss (rainbow trout)
static test
Test substance: Sodium fluoride
Fresh water

Chronic toxicity to daphnia and other aquatic invertebrates

Silicate(2-), hexafluoro-, hydrogen (1:2) By analogy

NOEC: 8.9 mg/l - 21 Days - Daphnia magna (Water flea)
static test
Test substance: Sodium fluoride
Fresh water

Hydrofluoric acid By analogy

NOEC: 8.9 mg/l - 21 Days - Daphnia magna (Water flea)
static test
Test substance: Sodium fluoride
Fresh water

12.2 Persistence and degradability

Abiotic degradation

Stability in water

Silicate(2-), hexafluoro-, hydrogen (1:2)	Water/soil ionization/neutralization, Water/soil complexation/precipitation of inorganic materials,

Photodegradation

Hydrofluoric acid	Air neutralization by natural alkalinity

Physical- and photo-chemical elimination — No data available

Biodegradation

Biodegradability

Silicate(2-), hexafluoro-, hydrogen (1:2)	The methods for determining biodegradability are not applicable to inorganic substances.
Hydrofluoric acid	The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water

Silicate(2-), hexafluoro-, hydrogen (1:2)	Not applicable, inorganic substance
Hydrofluoric acid	Not applicable, inorganic substance

Bioconcentration factor (BCF)

Silicate(2-), hexafluoro-, hydrogen (1:2)	Does not bioaccumulate.
Hydrofluoric acid	Does not bioaccumulate.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product Disposal

- In accordance with local and national regulations.
- Refer to manufacturer/supplier for information on recovery/recycling.

Advice on cleaning and disposal of packaging

- Clean container with water.
- The empty and clean containers are to be reused in conformity with regulations.
- To avoid treatments, as far as possible, use dedicated containers.

SECTION 14: Transport information

Transportation status: IMPORTANT! Statements below provide additional data on listed transport classification.
The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

TDG

14.1 UN number	UN 1778
14.2 Proper shipping name	FLUOROSILICIC ACID
14.3 Transport hazard class	8
Label(s)	8
14.4 Packing group	
Packing group	II
ERG No	154
14.5 Environmental hazards	NO
Marine pollutant	

DOT

14.1 UN number	UN 1778
14.2 Proper shipping name	FLUOROSILICIC ACID
14.3 Transport hazard class	8
Label(s)	8
14.4 Packing group	
Packing group	II
ERG No	154
14.5 Environmental hazards	NO
Marine pollutant	

NOM

12.4 Mobility in soil

Adsorption potential (Koc)

Silicate(2-), hexafluoro-, hydrogen (1:2)	Air mobility as solid aerosols Solubility(ies) Water Mobility Soil/sediments potential adsorption pH Test substance fluoride
Hydrofluoric acid	Air mobility as solid aerosols Water Solubility(ies) Mobility Soil/sediments potential adsorption pH Test substance fluoride
Known distribution to environmental compartments	No data available

12.5 Results of PBT and vPvB assessment

Silicate(2-), hexafluoro-, hydrogen (1:2)	According to Annex XIII of regulation (EC) 1907/2006 a PBT and vPvB assessment shall not be conducted for inorganic substances. Not applicable, inorganic substance
Hydrofluoric acid	Not applicable, inorganic substance According to Annex XIII of regulation (EC) 1907/2006 a PBT and vPvB assessment shall not be conducted for inorganic substances.

12.6 Other adverse effects

Ecotoxicity assessment

Short-term (acute) aquatic hazard Hydrofluoric acid	Harmful to aquatic organisms.
Long-term (chronic) aquatic hazard Hydrofluoric acid	. low chronic toxicity.

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14.1 UN number	UN 1778
14.2 Proper shipping name	FLUOROSILICIC ACID
14.3 Transport hazard class Label(s)	8 8
14.4 Packing group Packing group ERG No	 II 154
14.5 Environmental hazards **Marine pollutant**	NO

IMDG

14.1 UN number	UN 1778
14.2 Proper shipping name	FLUOROSILICIC ACID
14.3 Transport hazard class Label(s)	8 8
14.4 Packing group Packing group	 II
14.5 Environmental hazards **Marine pollutant**	NO
14.6 Special precautions for user EmS	 F-A , S-B

For personal protection see section 8.

IATA

14.1 UN number	UN 1778
14.2 Proper shipping name	FLUOROSILICIC ACID
14.3 Transport hazard class Label(s):	8 8
14.4 Packing group Packing group	 II
Packing instruction (cargo aircraft) Max net qty / pkg Packing instruction (passenger aircraft) Max net qty / pkg	855 30.00 L 851 1.00 L
14.5 Environmental hazards	NO

14.6 Special precautions for user
For personal protection see section 8.

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1 Notification status

Inventory Information	Status
United States TSCA Inventory	- Listed on Inventory
Canadian Domestic Substances List (DSL)	- Listed on Inventory
Australia Inventory of Chemical Substances (AICS)	- Listed on Inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- Listed on Inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- Listed on Inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- Listed on Inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	- Listed on Inventory
Taiwan Chemical Substance Inventory (TCSI)	- Listed on Inventory
EU. European Registration, Evaluation, Authorisation and Restriction of Chemical (REACH)	- When purchased from a European Solvay legal entity, this product is compliant with the registration provisions of the REACH Regulation (EC) No. 1907/2006 as all its components are either excluded, exempt, and/or registered. When purchased from a legal entity outside of Europe, please contact your local representative for additional information.

15.2 National Regulations

Canada. CEPA 1999 Significant New Activity (SNAc) List:

- No substances are subject to a Significant New Activity Notification.

SECTION 16: Other information

Revision Date:

10/15/2018

Key or legend to abbreviations and acronyms used in the safety data sheet

- C Ceiling limit

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ANNEXURE-15(b) SAFETY DATA SHEET

-	PEL	Permissible exposure limit
-	STEL	Short term exposure limit
-	TWA	8-hour, time-weighted average
-	ACGIH	American Conference of Governmental Industrial Hygienists
-	OSHA	Occupational Safety and Health Administration
-	NTP	National Toxicology Program
-	IARC	International Agency for Research on Cancer
-	NIOSH	National Institute for Occupational Safety and Health

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

EAC OBSERVATION:

Reporting system of non-compliances/ violations to be submitted as per TOR 9(iii) and (iv).

9(iii) What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details for this system may be given.

REPLY:

The hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions has defined as below

Role & Responsibility for Reporting mechanism of Environmental Non-compliance and Emergencies:

Site Environmental Head:

- Developing effective Environment Management System;
- To monitor the Environmental Compliance Conditions;
- To monitor the progress of the Environmental Targets set for the year; and
- To report all the environmental non-compliance as and when it happens to the Location Head.

Location Head:

- Effective implementation of the Environment Management System;
- Monthly review of the Environmental Compliance Conditions;
- Monthly review of the progress of the Environmental Targets set for the year;
- To report all the environmental non-compliance to the Business CEO within 24 hrs; and
- To report any environmental emergencies to the Business CEO on immediate basis.

Business CEO:

- Quarterly review of the Environment Management System;
- Quarterly review of the Environmental Compliance Conditions;
- Quarterly review of the progress of the Environmental Targets set for the year;
- To report all the environmental non-compliance to the Board of Directors on Quarterly Basis; and
- To report any environmental emergencies to the board of Directors on immediate basis.

Risk Management Committee:

- Quarterly review of the Environmental Compliance Conditions.
- Compliance of escalation and review system on environment non-compliance as per Environment Management System.
- Provide a summary of the Annual Environmental Performance Statement to concerned Stakeholders.
- Reporting to board on quarterly basis and providing the compliances and non-compliances with respect to environmental clearance condition

EAC OBSERVATION NO.-16

4683

adani

CERTIFIED TRUE COPY OF THE RESOLUTION PASSED AT THE MEETING OF THE BOARD OF DIRECTORS ("BOARD") OF ADANI ENTERPRISES LIMITED ("COMPANY") HELD ON 12TH NOVEMBER, 2019.

"**RESOLVED THAT** in continuation to the earlier resolution passed by the Board of Directors, existing terms of reference of Risk Management Committee be and is hereby modified to include the process of monitoring & reporting mechanism of non-compliance of any environmental laws pertaining to Copper Refinery Plant at Mundra, Gujarat, as per the following details:

Reporting mechanism of Environmental Non Compliance and Emergencies:

Site Environmental Head is responsible for:
- Developing effective Environment Management System.
- To monitor the Environmental Compliance Conditions.
- To monitor the progress of the Environmental Targets set for the year.
- To report all the environmental non-compliance as and when it happens to the Location Head.

Location Head is responsible for:
- Effective implementation of the Environment Management System.
- Monthly review of the Environmental Compliance Conditions.
- Monthly review of the progress of the Environmental Targets set for the year.
- To report all the environmental non-compliance to the Business CEO within 24 hrs.
- To report any environmental emergencies to the Business CEO on immediate basis.

Business CEO is responsible for:
- Quarterly review of the Environment Management System.
- Quarterly review of the Environmental Compliance Conditions.
- Quarterly review of the progress of the Environmental Targets set for the year.
- To report all the environmental non-compliance to the Chairman of Risk Management Committee on Quarterly basis.
- To report any environmental emergencies to the Chairman of Risk Management Committee and all the members of the board on immediate basis.

Risk Management Committee is responsible for:
- Quarterly review of the Environmental Compliance Conditions.
- Compliance of escalation and review system on environment non-compliance as per Environment Management System.
- Provide a summary of the Annual Environmental Performance Statement to concerned Stakeholders.
- Reporting to Board on quarterly basis and providing the compliance and non-compliances with respect to environmental clearance conditions.

Certified True Copy,
For Adani Enterprises Limited

J. R. Jalundhwala

Jatin Jalundhwala
Company Secretary &
Joint President (Legal)

Adani Enterprises Ltd
Adani House,
Nr Mithakhali Circle, Navrangpura
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Registered Office : Adani House, Nr. Mithakhali Circle, Navrangpura, Ahmedabad 380 009, Gujarat, India

9(iv) Does the company have system of reporting of Non-compliances/ violations of environmental norms to Board of Directors of the Company and/ or shareholders or stakeholders at large? This Reporting mechanism shall be detailed in EIA Report.

REPLY:

Company will have system of reporting of Non-compliances/ violations of environmental norms to Board of Directors of the Company and/ or shareholders or stakeholders at large.
AEL Board has empowered "Risk Management Committee" to manage health, safety & environment risks and achieve compliance with sustainable development responsibilities. A board resolution in this regards is attached as **Annexure-16.**

The current scope of Risk Management Committee is as follows:
"The Committee is required to lay down the procedures to inform to the Board about the risk assessment and minimization procedures & the Board shall be responsible for framing, implementing & monitoring the risk management plan of the company."

Additional Scope of Risk Management Committee will be as follows:

"The Committee will also oversee management processes, standards and strategies designed to manage Health, Safety & Environment and Social risks and ensure maintaining the highest standards and compliance with applicable statutory provisions."

The risk management committee will review all the environmental compliance if any on quarterly basis along with its corrective and preventive measures. This will be the permanent agenda point for all board meetings.

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EAC OBSERVATION NO.-17

EAC OBSERVATION:

Provide details about reduction in acid mist formation in Sulphuric acid plant.

REPLY:

Sulphuric Acid Mist Control Mechanisms:

Mist is the term used to describe a phenomenon of small finely divided liquid aerosol droplets suspended or dispersed in air or process gases.

Mist can be formed in the manufacturing processes in three different ways:

Ways	Nature of Generation
Mechanical	Mechanical forces may break up or "atomize" a liquid to form a mist with a mean size of ~ 2.5 Micron
Condensation	Cooling of a gas stream may result in the condensation of vapor to form a mist with a mean size of ~ 1.0 Micron.
Chemical Reaction	Chemical reaction of two or more gases may take place at temperatures and pressures where the reaction products are mists with a mean size of ~ 0.3 Micron.

Formation of the acid Mists in the Sulphuric acid plant:

Larger acid mist particles are created in sulfuric acid drying and absorbing towers. They generally form when acid is re-entrained due to localized high velocity gas tearing droplets away from a liquid film or from the splashing or spray generated from a liquid distribution device.

More difficult to collect small acid particles are formed by the reaction of sulfur trioxide with any water vapor present and by the condensation of acid from the gaseous or vapor phase.

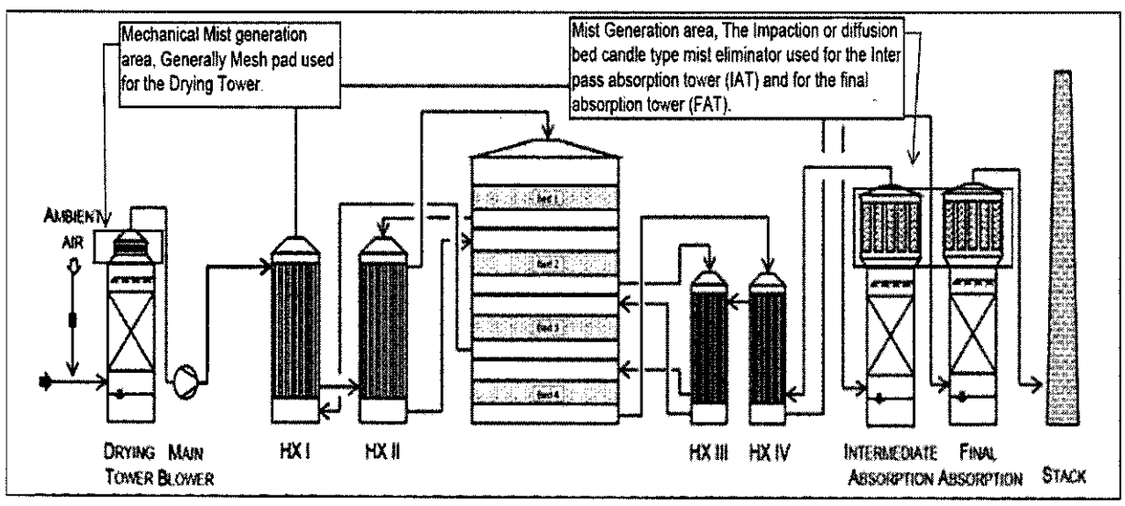


FIGURE-1:
THE ACID MISTS IN THE SULPHURIC ACID PLANT

4686

EAC OBSERVATION NO.-17

Impact of the acid mist on the plant and environment:

These acid particles can corrode blowers, ductwork and heat exchangers, damage catalyst and cause atmospheric pollution.

Importance of Mist Removal in Critical Absorption Tower			
Safeguard	**Drying Tower**	**Intermediate Absorption Tower**	**Final Absorption Tower**
Prevents corrosion to heat exchange and economizer tubes; and avoids catastrophic and expensive damages to the downstream equipment.	✓	✓	N/A
Prevent instrumentation corrosion.	✓	✓	✓
Protects catalyst (Vn_2O_5) from Sulfuric acid poisoning.	✓	✓	N/A
Meets environmental stack emission regulations.	✓	✓	✓
Type of mist eliminator	Mesh pad	Candle filter	Candle filter

Mist Eliminators Selection Guide (Metallurgical Sulphuric Acid Plant):

The droplets produced by sulfuric acid plant operations are quite small.

Unit Operation	Mist Load (mg/m^3)	Mist Mean Size	Mesh Pad	Impaction Candle Filters	Brownian Diffusion Candle Filters
Drying Tower	175 to 3,530	~ 2.5µm	✓	✓	
Interpass Absorption Tower (IAT)	500 to 700	~ 1.5µm		✓	✓
Final Absorption Tower (FAT)	500 to 700	~ 1 µm			✓

Collection Efficiency for the different mist eliminators:

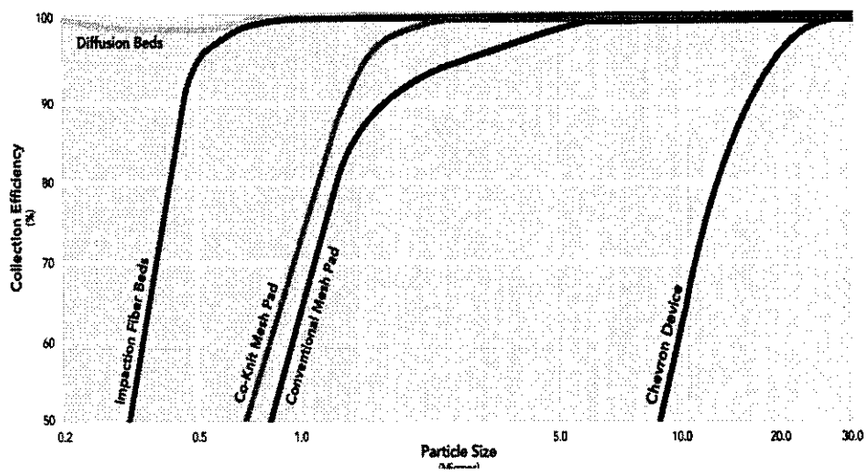


FIGURE-2:
COLLECTION EFFICIENCY FOR THE DIFFERENT MIST ELIMINATORS

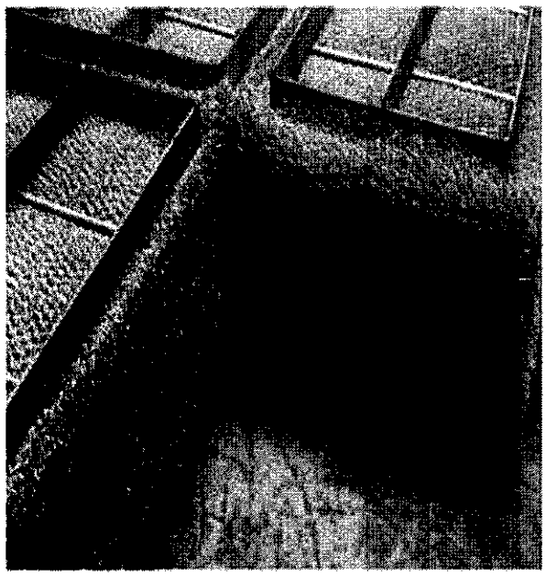
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EAC OBSERVATION NO.-17

In the sulfuric acid industry, for the drying tower, generally use co- knit mesh pads as they have an efficiency of almost 100% at ~ 3 µm for capturing, collecting and returning acid mist in the tower.

Whereas, in the Interpass and final absorption tower, generally use Impaction beds & Diffusion beds Mist Eliminators: 100% efficiency at > 1 µm and Diffusion beds: 99.95 % efficiency at < 1 µm

Mesh Pad for the Drying Tower:



Fine mist, created by mechanical shearing forces through tower packing, can pass through conventional mesh pads and cause downstream corrosion of valuable equipment. This above configuration mesh pads capture, collect and return the acid mist to the tower. This mesh pad made with co-knit fibers provide larger surface areas for the capture of slower and smaller droplets.

FIGURE-3:
CO KNIT MESH PAD

The Fiber Bed Candle Mist Eliminator for Interpass and final absorption tower:

1. **Standing Type**
2. **Hanging Type**

EAC OBSERVATION NO.-17

Standing Type:

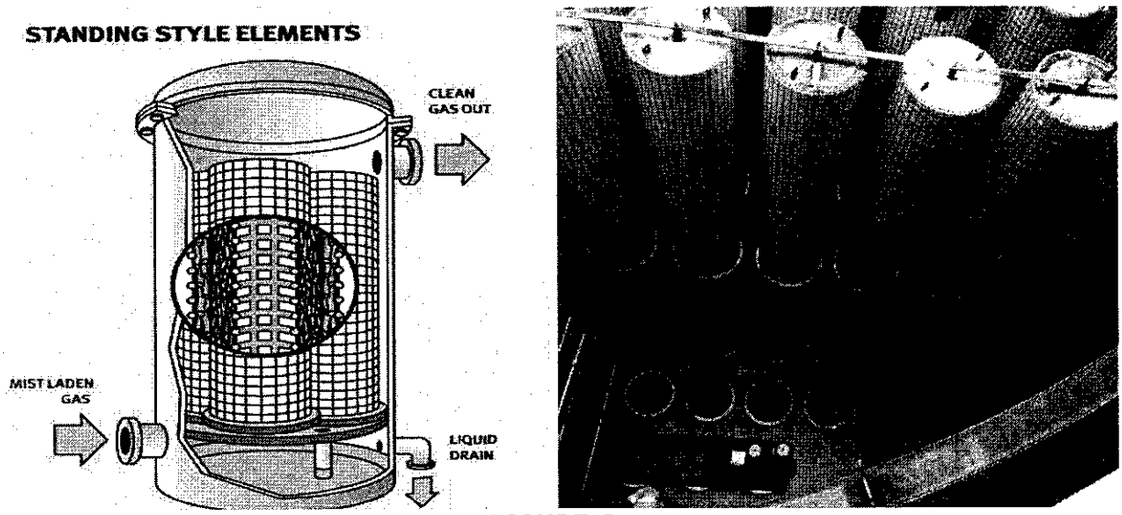


FIGURE-3:
STANDING TYPE CANDLE MIST ELIMINATORS

Reverse Flow, stand vertically on the tube sheet/vessel division plate. In this style, the dirty gas goes into the center core of the element and the clean gas exits through the outside. Acid mist Captured, collected and returned in the tower.

Hanging Type (With Seal Leg):

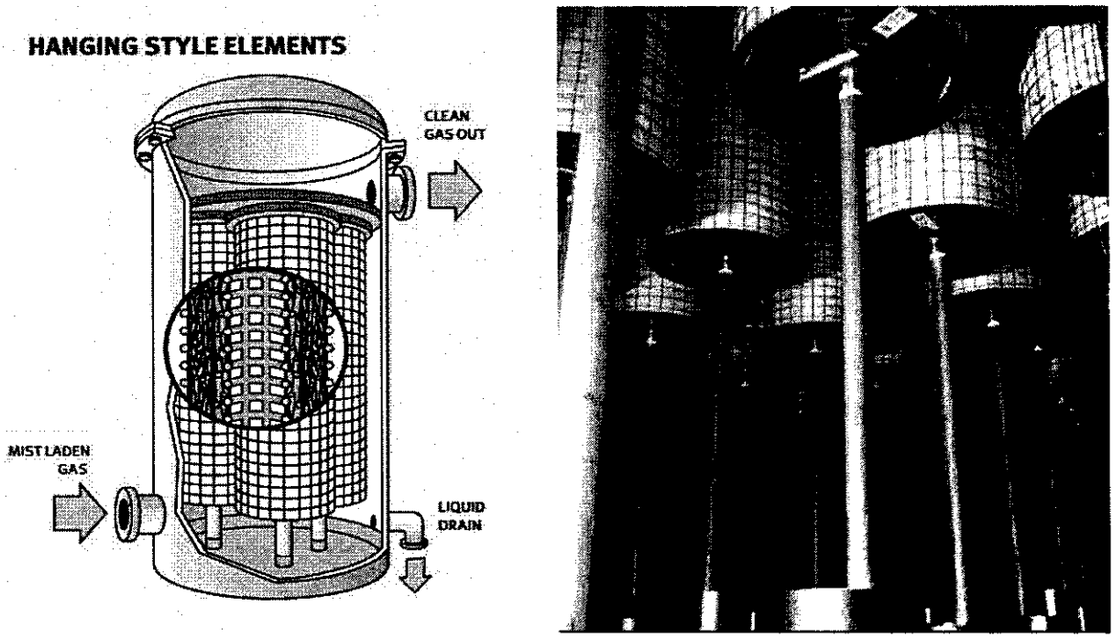


FIGURE-4:
HANGING TYPE CANDLE MIST ELIMINATORS

4.689

EAC OBSERVATION NO.-17

Forward Flow, hang from the tube sheet/vessel division plate and is configuration features ease of installation and maintenance. In this style, the dirty gas goes in the outside of the element and the clean gas exits through the center core. Acid mist Captured, collected and returned in the tower. Acid mist Captured, collected and returned in the tower.

Conclusion:

In the proposed sulfuric acid plant, for the removal of sulfuric acid mists, we will provide suitable acid mist eliminators as advised technology supplier, such as a mesh pad for the drying tower and the candle type mist eliminator for the Interpass absorption tower (IAT) and for the final absorption tower (FAT). The emission of acid mist **through the stack will be less than 25 mg/Nm^3, which is well within the limit stipulated as per CPCB.**

EAC OBSERVATION NO.-18

EAC OBSERVATION:

Provide details of interlocking system envisaged for copper smelter and Sulphuric acid

REPLY:

Procedures to Control SO_2 emissions:

a. Start Up:

To control SO_2 emissions during startup or following a shutdown during which converter bed temperatures have fallen below catalyst auto-ignition temperature, the converter beds need to be heated before the Smelter Off-Gases can be fed to Acid Plant, using Preheater.

The converter heat exchanger and preheater valves are set for converter preheating with gas circulating through the preheater to the converter heat exchangers. The valves are set to uniformly heat all five converter beds to catalyst ignition temperature and to minimize startup SO_2 emissions.

Continue preheating until all the bed temperatures are as near to 400°C as possible. The 1st, 4th, and 5th pass inlet temperatures should be over 390°C, while the 2nd and 3rd pass inlet temperatures should be at least 400°C as a minimum before accepting off gases from the smelter. After converter preheating is complete, prepare for normal operation on SO_2 feed gas from the furnaces.

The acid plant should be started at a reduced rate with the smelter furnaces at about 50% turndown. Starting the plant at the reduced rate will allow the following:

- Provide time for the middle converter passes to gain additional heat prior to reaching full gas flow (full load), which should limit any fugitive SO_2 emissions due to low catalyst temperature.
- Allow the plant time to stabilize.

The final Interlocks will be decided during overall HAZOP of the plant (Smelter + Acid Plant) as the operating conditions of Smelter and Sulphuric Acid plant need to be looked into before deciding on the interlocks. Process technology licensers will advice necessary interlocks to operate the plant within the prescribed environmental limits for SO_2 emission.

Following preliminary interlocks will be put in place to avoid SO_2 emission to remain within the statutory norms:

a) Smelter ID Fan and PS Converter ID Fan will be enabled to start only after satisfying conditions of the bed temperatures as mentioned above.
b) Smelter feed start enabling only after satisfying process interlocks as defined by the process licensors of Smelter and Sulphuric acid Plant.

b. Normal Plant Operations:

During Normal Plant Operations, surge in SO_2 emissions can occur. This can be controlled by adopting following measures;

i. **Low SO_2 Strength:** This can lead to Poor converter reaction and Loss of temperature control to converter passes. Possible causes can be Poor smelter operation Or excessive Dilution air due to controller malfunction.

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EAC OBSERVATION NO.-18

Remedies:

- Increase SO_2 concentration from smelter, If possible.
- Check dilution air controller function.
- If converter continues to cool, supply supplemental heat from preheater if possible.

Interlocking Arrangements:

a) Roll out PS Converter operation and disable PS Converter ID fan after evacuating gases in the ducts connected to sulphuric acid plant, as per standard operating procedures provided by process technology Licensor.

ii. **High SO_2 Strength:** This can lead to Poor converter reaction and High Stack Emissions. Possible causes can be Poor smelter operation Or less Dilution air due to controller malfunction.

Remedies:

- Decrease SO_2 concentration from smelter by reducing Oxygen enrichment.
- Check air filter.
- Check instrumentation and controller functions.

Interlocking Arrangements:

a) Roll out PS Converter operation and disable PS Converter ID fan after evacuating gases in the ducts connected to sulphuric acid plant, as per standard operating procedures provided by process technology Licensor.
b) Reduction in concentrate feed to smelter by 20% and observe for 30 minutes.
c) If no improvement post item b); further reduction in concentrate feed to smelter by 20% and observe for 30 minutes.
d) If no improvement post item c); suspension of the concentrate feed to smelting furnace as per standard operating procedures provided by process technology Licensor.

iii. **Poor Converter Reaction**: This can lead to inadequate Temperature rise in converter and high stack emissions possible causes can be High or Low SO_2 strength, Low Converter pass Inlet temperatures.

Remedies:

- Confirm gas strength by analytical methods.
- Correct operating conditions so that $\%SO_2$ and $\%O_2$ are within specs.
- Preheat converter in start-up to 400°C for 2^{nd} & 3^{rd} passes and for 1^{st}, 4^{th} & 5th pass inlet temperatures should be over 390°C

Interlocking Arrangements:

a) Roll out PS Converter operation and disable PS Converter ID fan after evacuating gases in the ducts connected to sulphuric acid plant, as per standard operating procedures provided by process technology Licensor.
b) Reduction in concentrate feed to smelter by 20% and observe for 30 minutes.
c) If no improvement post item b); further reduction in concentrate feed to smelter by 20% and observe for 30 additional minutes.
d) If no improvement post item c); suspension of the concentrate feed to smelting furnace as per standard operating procedures provided by process technology Licensor.

EAC OBSERVATION NO.-19

EAC OBSERVATION:

Define the precaution to be taken during construction stage

REPLY:

- All infrastructure facilities such as sanitation, fuel, restroom, drinking water, domestic toilets and shelters sheds etc. will be provided to the labour force during construction.
- Use of firewood for cooking and also open air burning of any kind of wastes will be avoided.
- Awareness camp will be organized for diseases and cleanliness.
- Harm to the local species strictly prohibited.
- Safety training will be provided for workers and mock drill will be conducted.
- Proper maintenance of vehicles, equipment and machines is carried out to reduce noise pollution
- Enforce deployment of good condition vehicles with speed restrictions inside the project boundary
- Deploy mobile water tankers to moist the vehicle movement paths to suppress dust
- Provision of earmuff to the worker in high noise area and enforcement of required PPE.

Proposed mitigation measures to be implemented during construction phase:

1) Water sprinkling in vulnerable areas.
2) Proper maintenance of vehicles & construction equipment.
3) Transportation of construction material in covered trucks, wherever possible.
4) Proper maintenance of vehicles, equipment and machinery.
5) Provision of accoustic covers/ enclosures on equipment and machinery, wherever possible.
6) Provision of earmuffs/ earplugs to the workers in high noise areas and enforcement of its use.
7) Channelization and construction of temporary sedimentation tanks for effluents from construction area through network of drains.
8) Provision of environmentally safe camping area for the migrant laborers.
9) Arrangements for water supply and sanitation.
10) Disposal of surplus earth and construction debris.
11) Reclaiming of un-built area with appropriate vegetation/ land scaping.

Environmental monitoring during project construction phase:

a) Air Emissions:

- All equipments are operated within specified design parameters
- Vehicle trips to be optimized to the extent possible
- Maintenance of DG set emissions to meet stipulated standards
- Ambient air quality within the premises of the proposed unit to be monitored

b) Noise:

- List of all noise generating machinery onsite along with age to be prepared.
- Equipment to be maintained in good working order.
- Night working is to be minimized.

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EAC OBSERVATION NO.-19

- Noise to be monitored in ambient air within the plant premises.
- No untreated discharge to be made to surface water, groundwater or soil.

c) Soil Erosion:

- Protect topsoil stockpile where possible at edge of site.
- Implement waste management plan that identifies and characterizes every waste arising associated with proposed activities and which identifies the procedures for collection, handling & disposal of each waste arising.
- Re-vegetation as per Forest guidelines

d) Drainage & Wastewater Management:

- Ensure drainage system and specific design measures are working effectively.
- The design to incorporate existing drainage pattern and avoid disturbing the same

4694

EAC OBSERVATION NO.-19

PROPOSED MITIGATION MEASURES TO BE IMPLEMENTED DURING CONSTRUCTION PHASE

Sr. No.	Proposed Mitigation Measures	Responsibility for Implementation	Targets to Achieve	Risks and Consequence of Failure, if any
1	**Air Pollution Control**			
	Water sprinkling in vulnerable areas	AEL + Contractor	Control of fugitive dust from construction areas	Increase in PM emissions
	Proper maintenance of vehicles & construction equipment	AEL + Contractor	Control of CO & NOx emissions	Increase in gaseous pollutant
	Transportation of construction material in covered trucks, wherever possible	AEL + Contractor	Control of fugitive dust during transportation	Increase in PM emissions
2	**Noise Pollution Control**			
	Proper maintenance of vehicles, equipment and machinery	AEL + Contractor	Control of ambient and site noise levels	Increase in noise levels
	Provision of accoustic covers/ enclosures on equipment and machinery, wherever possible	AEL + Contractor	Control of ambient and site noise levels	Increase in noise levels
	Provision of earmuffs/ earplugs to the workers in high noise areas and enforcement of its use	AEL + Contractor	Protection of workers	Health effects on individual workers
3	**Water Pollution Control**			
	Channelization and construction of temporary sedimentation tanks for effluents from construction area through network of drains.	AEL + Contractor	Control of suspended solids and oil & grease in effluents from construction area	Increase in total suspended solids and oil & grease in effluents
4	**Socio-Economic Environment**			
	Provision of environmentally safe camping area for the migrant laborers	AEL + Contractor	To provide clean & healthy living environment to work force	Unhealthy living conditions, spread of diseases
	Arrangements for water supply and sanitation	Contractor	To reduce stress on surrounding population	Stress on existing utilities, conflicts with local people
5	**Solid Waste Management**			
	Disposal of surplus earth and construction debris	Contractor + AEL	Control of pollution	Air/ water pollution
	Reclaiming of un-built area with appropriate vegetation/ land scaping	AEL	Create a good visual environment. Aesthetics improvement.	Unpleasant surroundings

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4695

EAC OBSERVATION NO.-19

ENVIRONMENTAL MONITORING DURING PROJECT CONSTRUCTION PHASE

Sr. No.	Potential Impact	Action to be Followed	Parameters for Monitoring	Frequency of Monitoring
1	Air Emissions	All equipments are operated within specified design parameters	Random checks of equipment logs/ manuals	Periodic
		Vehicle trips to be optimized to the extent possible	Vehicle logs	Periodic during site clearance & construction activities
		Maintenance of DG set emissions to meet stipulated standards	Gaseous emissions (SO_2, HC, CO, NOx)	Periodic emission monitoring
		Ambient air quality within the premises of the proposed unit to be monitored	The ambient air quality shall conform to the standards for PM_{10}, $PM_{2.5}$, SO_2, NO_x, and CO	As per CPCB / GPCB requirement or on monthly basis whichever is earlier
2	Noise	List of all noise generating machinery onsite along with age to be prepared. Equipment to be maintained in good working order.	Equipment logs, noise reading	Regular during construction activities
		Night working is to be minimized.	Working hour records	Daily records
		Generation of vehicular noise.	Maintenance of records of vehicles	Daily records
		Noise to be monitored in ambient air within the plant premises.	Spot noise recording	As per CPCB/ GPCB requirement or on quarterly basis whichever is earlier.
3	Wastewater Discharge	No untreated discharge to be made to surface water, groundwater or soil.	No discharge hoses shall be in vicinity of watercourses.	Periodic during construction activities
4	Soil Erosion	Protect topsoil stockpile where possible at edge of site.	Effective cover in place.	Periodic during construction activities
5	Drainage and wastewater Management	Ensure drainage system and specific design measures are working effectively. The design to incorporate existing drainage pattern and avoid disturbing the same.	Visual inspection of drainage and records thereof	Periodic during construction activities
6	Waste Management	Implement waste management plan that identifies and characterizes every waste arising associated with proposed activities and which identifies the procedures for collection, handling &	Comprehensive Waste Management Plan should be in place and available for inspection on-site. Compliance with MSW Rules, 2016 and Hazardous Wastes	Periodic check during construction activities

EAC OBSERVATION NO.-19

Sr. No.	Potential Impact	Action to be Followed	Parameters for Monitoring	Frequency of Monitoring
		disposal of each waste arising.	(Management, Handling and Transboundary Movement) Rules, 2016	
7	Health	Employees and migrant labour health check ups	All relevant parameters including HIV	Regular check ups
8	Loss of flora and fauna	Re-vegetation as per Forest guidelines	No. of plants, species	During site clearance

ANNEXURE - R7


Moti Khakhar
Moti Bhujpar
Mota Kapaya
Mangra
Mota Kanuagra
Tragadi gham
Navinal
Nanakpaya
Mundra
Jarpara
Vandh
NH - 6
F
G
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ANNEXURE - R8

4697

Recommendations of FAC:

1. FAC after through deliberation & discussion with Nodal Officer (FCA) of the state and APCCF, Regional Office recommended to clarify that the **'Gramya Jungle JogyaJamin'** should not be treated as recorded forest land (unless they actually have natural forest growth thereon) for the purpose of provisions of Forest (Conservation) Act 1980.

[Shri Shrawan Kumar Verma, DIGF (FC)]

Agenda No. 1

File No. 8-04/2016-FC

Sub: Diversion of 1576.81 ha of Reserved forest land for the development of Special Economic Zone and Industrial Park at Village – Siracha, Navinal, Dhrub, Mundra, Baroi, Gorasama, Luni, Bhadreshwar, Ta. Mundra, Dist. Kutch in favour of Adani Port and Special Economic zone (APSEZ).

The above stated agenda item was considered by FAC in its meeting held on 20.09.2018. The details of the background may be seen at the corresponding agenda item of the FAC meeting for 20.09.2018, in the Ministry's website.

The State Government of Gujarat submitted the proposal seeking prior approval of Central Government in accordance with section-2 of the FC Act, 1980 vide their letter No. FCA-1014/10-11/14/S.F-66/F dated 21.01.2016. The proposal was earlier considered by the FAC in its meeting held on 25.01.2018 recommending the grant of In-principal approval for the diversion of 1552.81 ha (1576.81 – 24 = 1552.81 ha) of the Forest Land subject to general and specific conditions. The User Agency submitted the representation requesting to modify the FAC conditions. With the approval of competent authority, the matter was referred to the State Government for comments. The State Government submitted their reply vide letter No. FCA-1014/10-11/14/S.F-66/F dated 26.07.2018. The proposal in the light of the comments received from State Government, was again placed before FAC in its meeting on 30.08.2018 as an agenda item. The FAC after thorough deliberation and discussion constituted a Sub-Committee to visit APSEZ site and submit a report to FAC for further action within 10 days.

The sub-committee visited the site on 6-7 September, 2018 and had on-site discussions with User agency and officials of State Forest Department. The report of the sub-committee was submitted to FAC. The details of the report are as follows:

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Report of the Sub-Committee of FAC based on its Field Visit to APSEZ area on 6th and 7th September 2018, in connection with diversion of 1576.81 ha of forest land

A. The forest land of 1576.81 ha, as proposed for diversion, consists of eight disjunct land parcels within the approved APSEZ area. Each parcel of forest land is surrounded by non-forest lands most of which form part of the SEZ. The vegetation of the forests is predominantly *Prosopis juliflora,* in bushy form, with occasional occurrence of *Acacia nilotica*particularly in the forest patch around Sirocha village. The vegetation is thus typical of semi arid climatic area. The forest density ranges from 0.1 to 0.5.

As per the latest report of CWLW, Government of Gujarat, the area is not important from wildlife point of view. During the visit the Sub-Committee observed that most of the forest area consists of *Prosopis juliflora* in bushy form. Moreover, as observed by the Sub-Committee, the forest areas are not a continuous patch and after the whole 10000 ha area is developed more like an industrial area, the forest patches will hold still less value as true forests.

As informed by the State Government, for the purpose of Compensatory Afforestation, the user agency has to transfer 3154 ha of non-forest land, to be mutated in the name of State Forest Department (besides the payment towards CA over the double the non-forest land to be transferred to Forest Department and NPV as applicable). Accordingly, from a conservation viewpoint this should be acceptable to the Government.

B. However, while processing the proposal for diversion, certain issues have come up which seem inconsistent with certain guidelines framed under FC Act and certain standard norms that are followed. These are:

i. The developer, i.e. APSEZ will transfer/sub-lease areas within the SEZ, including the forest areas under diversion, without seeking any approval from GoI. (*Where transfer of lease on forestland, from one user agency to another for the same purpose for which the forestland was diverted, becomes necessary, prior permission of the Central Government would be required).*

In the opinion of the Sub-Committee, this requirement of SEZ, which is special in nature and necessary for the establishment of any SEZ or a cluster of industries, requires to be addressed by MOEF&CC by suitable modification in the existing guidelines. **Accordingly, taking into account special requirement of SEZ and also Industrial corridor, FAC may like to take a decision whether any specific guideline needs to be framed or suitable modification of concerned Guidelines need to made.**

ii. It is not possible to furnish, at this stage, the detail land use of each parcel of forest area to be diverted. (*As per standard norms, User agency has to furnish detail land use plan along with diversion proposal.*)

The UA has furnished broad land use plan. In the opinion of the Sub Committee, it is not possible for a developer of an SEZ (the UA) to give detailed land use over any land parcel at the

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developmental stage. In an SEZ, project proponents for specific activities come at a later stage and only then detailed land use plan can be given. Moreover, in an SEZ, project proponents of specific activities expect that all statutory clearances have already been obtained. It would not be attractive to seek Forest clearance before setting up any activity.

iii) As per the SEZ Act, it would prevail over any provision under any other act under force. *(It is not clear if diversion is allowed, whether SEZ Act, 2005 will have overriding effect on FC Act and Rules?)*

In the opinion of the Sub-Committee the supremacy of the FC Act over the use of forest land be made clear while giving the permission for diversion.

C. During the visit, the comments of the State Government of Gujarat on the justification of the User agency against certain conditions of FAC recommended in its meeting on 25.01.2018 were examined. Out of 15 such conditions, the submissions of the state Government on 12 points are acceptable. The views of the sub-committee on the comments on remaining three conditions (i.e. no. 2, 6 and 14) are as follows:

Sl.no.	Condition as recommended by FAC	Comments of Govt. of Gujarat	Views of the sub-committee of FAC
2	The diverted forest land measuring 1576.81ha shall be maintained as green area and diversion for non-forestry purpose will be considered only on case to case basis.	The UA has already submitted details regarding proposed land use plan which may kindly be considered. As this is going to be part of the SEZ, the permission on case to case basis proposals under FCA may be relooked. It is felt that the condition may be modified. If the entire area under diversion is asked to be maintained as green area, then the purpose of making diversion application under FCA is not served.	The UA has furnished broad land use plan (not detailed land use, as required for processing). As understood, it is not possible for a developer of an SEZ (the UA) to give detailed land use over any land parcel at development stage. In an SEZ, project proponents for specific activities come at a later stage and only then detailed land use plan can be given. Moreover, in an SEZ, project proponents of specific activities expect that all statutory clearances have already been obtained. It would not be attractive to seek Forest clearance before setting up any activity there. **Hence this condition may be modified as follows.** *The entire forest area of 1576.81*

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			ha, being diverted, should not be cleared off the vegetation in one go after diversion. As and when a specific project / industry is to come up in the SEZ, a corresponding area shall be marked on the ground and cleared off vegetation. Till then the area shall be maintained as green cover. It shall be ensured that the cleared up area to be utilised for specific project/industry is started within six months of clearing the vegetation. A detailed landuse for the marked area, on which clearing of vegetation is proposed shall be submitted to Regional Office of MoEF&CC, before start of work on the area, for information. The regional Office shall ensure that the user agency carries out the work which is in conformity with the broad land use submitted by it. It shall be ensured that minimum number of trees are cleared. The user agency will explore the possibility that trees of 10 cm diameter at breast height,, and above, proposed for felling/ clearing are translocated to suitable location within or outside the SEZ in consultation with State Forest department .
6	100m green shelter belt along the sea coast except in the water front areashall be included in the Master plan of APSEZ.	The UA had represented that some part of the proposed diversion is located on sea coast and water front. Upon scrutinizing the map for the proposed diversion, it is observed that areas proposed of Mundra survey no. 141/P, Baroi survey no. 207/P, Goversama survey no. 52/P, Luni survey no.	The view of the State Government may be accepted.

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		468/P and Bhadreswar survey no. 733/P are having sea front. Hence, condition of 100mt green belt in above villages only may be insisted, excluding stretches where use of water front is inevitable.	
14	The State Government will inform about the status of the land admeasuring 122ha in village Jarapara and 683ha of land belonging to GMB transferred to APSEZ. The area need to be deducted from the proposed forest land diversion as recommended by State Government.	The FAC.s recommendation of deduction of 122 ha will be applicable only if 122 ha. land in village Jarapara is transferred by State Government to APSEZL.As per the report of state revenue department total 836.888 ha. land has been transferred to APSEZ for notified SEZ area in form of sale in village Jarapara. In this report it is not clear that the 122.00 ha. Land is part of above 836.888 ha. Area of land. The same will be clarified before final approval. At present the condition may be retained. As per user agency claim that the 683 ha. of land will never be transferred to APSEZ as it is belonging to GMB. The user agency has also claimed that the 683 ha of land has been given to the user agency on lease by GMB till FY-2031. GMB is yet to clarify the matter. Moreover, user agency has given undertaking that if any controversy regarding this land occurs, they undertake that they will reduce the same area from their proposal before final allotment. At present the condition may be retained.	The stand of the State Government in this regard that *"at present the condition may be retained"* be accepted. The condition reads as follows: *"If 122 ha land of village-Jarapara, 683 ha land of GMB or any other revenue land is allotted for this SEZ then equivalent land from the forest land shall be reduced from the demanded forest land for this SEZ."*

		The map of Entire SEZ notified area, GMB land leased to APSEZ, 683 ha. reclaimed land, 2008.41 ha. previously diverted forest area in the year 2009 and applied forest land area 1576.81 ha. area is attached .	

In view of the above, the FAC may like to take an appropriate view on the said diversion of 1576.81ha of forest land subject to the conditions outlined.

Recommendations of FAC:

FAC in course of its deliberation heard the User agency and also considered the comments received from Conservation Action Trust. Further after discussion with Officials of Regional Office, MoEF&CC and Government of Gujarat and thorough deliberation on the matter, including over the comments of the State Government submitted vide its letter dt. 26.07.2018, and report of the sub-committee of the FAC that visited the site, recommended for according In-principle approval for diversion of 1576.81 ha of forest land in favour of APSEZ Ltd. subject to general, standard and following specific conditions:

1. Ministry may suitably modify the Para 2.8 of the Guidelines, 2003, to address the issue of transfer of lease, which is special requirement for establishment of SEZ and Industrial corridors involving diversion of forest land.

2. FAC in its meeting held on 25.01.2018, had imposed following as condition no. 2.
"The diverted forest land measuring 1576.81 ha shall be maintained as green area and diversion for non-forestry purpose will be considered only on case to case basis."

   FAC accepted the recommendation of the sub-committee in this regard, which reads as follows:

   "The entire forest area being diverted, should not be cleared off the vegetation in one go after diversion. The UA may clear vegetation for the purpose of basic/essential infrastructure to be developed in the SEZ. Thereafter, as and when a specific project / industry is to come up in the SEZ, the corresponding area shall be marked on the ground and cleared off vegetation. Till then the remaining areas shall be maintained as green cover. It shall be ensured that the lease agreement is made within six months of such clearing. A detailed landuse for the marked area, on which clearing of vegetation is proposed shall be submitted to the Regional Office of MoEF&CC before start of work on the area, for information. The Regional Office of MoEF&CC shall ensure that the user agency carries out the work which is in conformity with the broad land use submitted by it. It shall be ensured that minimum number of trees are cleared. The user agency shall

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explore the possibility of trees of 10 cm dia at breast height, proposed for felling/clearing are translocated to suitable location within or outside the SEZ in consultation with State Forest department.

3. FAC in its meeting held on 25.01.2018, had imposed following as condition no. 6.

   100m green shelter belt along the sea coast except in the water front area shall be included in the Master plan of APSEZ.

   FAC accepted the recommendation of the sub-committee in this regard, which is also based on the corresponding recommendations of the Government of Gujarat, vide its letter dated 21.01.2016. The same reads as follows:

   "Forest areas proposed within of Mundra survey no. 141/P, Baroi survey no. 207/P, Goversama survey no. 52/P, Luni survey no. 468/P and Bhadreswar survey no. 733/P are having sea front. 100mt shelter belt/green belt in above villages be included in the Master plan of the SEZ, excluding stretches where use of water front is inevitable."

4. FAC in its meeting held on 25.01.2018, had imposed following as condition no. 14:

   The State Government will inform about the status of the land admeasuring 122ha in village Jarapara and 683ha of land belonging to GMB transferred to APSEZ. The area need to be deducted from the proposed forest land diversion as recommended by State Government.

   FAC recommended to modify the above condition as below:

   i. *The State Government shall clarify whether any non-forest land situated in and around the SEZ but not forming part of the SEZ at present, can be acquired by/allotted to the APSEZ before Stage-II approval.*
   ii. *If 683ha land of GMB or any other non-forest land is allotted for this SEZ, then the equivalent forest land shall be reduced from the forest land diverted/being diverted for the SEZ.*
   iii. *The State Government and the UA shall make effort to include 122 ha of non-forest land in village Jarapara in the SEZ. Accordingly, it is recommended that 122 ha of forest land in Bhadreswar Block be maintained as green belt at the cost of UA.*

5. Only site-specific activities, permissible under the Rules and guidelines framed under the FC Act, shall be taken up in the forest land to be diverted.

6. The recommendation of the FAC is subject to the condition that in case of conflicts, the provisions of FC Act, 1980, shall prevail over those of SEZ Act.

7. All other conditions/recommendations made by FAC on this proposal in its meeting on 25.01.2018, not in conflict with the recommendations of FAC on 20.09.2018 shall remain unchanged.

8. The User agency shall identify and mutate in the name of State Forest Department of Government of Gujarat, 3154 ha of suitable non-forest land for CA adjacent to notified Forest in the State.

9. The User agency shall identify suitable land for Compensatory Afforestation over double the forest area being diverted. The land shall be mutated in the name of State Forest Department before the Stage-II approval.

10. The User Agency shall deposit in the designated account the estimated amount towards compensatory afforestation to be carrying out by the State Forest Department.

Agenda No. 2

F.No.8-6/2007-FC

Sub: Diversion of 1283.570 hectares of forest land for Coal Mining in Amelia Coal Block by M/s. THDC limited, in Singrauli District of Madhya Pradesh.

1) The above stated agenda item was considered by FAC in its meeting on 20.09.2018.

2) The proposals to obtain prior approval of the Central Government under the Forest (Conservation) Act, 1980, for diversion of 1283.57 hectares of forest land was submitted by the APCCF (Land Management) & Nodal Officer, FCA, 1980, Madhya Pradesh vide his letter No. F-1/437/06/10-11/281 dated 01.02.2007 in Amelia Coal Blocks in favour of M. P. State Mining Corporation Limited (MPSMCL) in Singrauli District of Madhya Pradesh. The Sainik Mining & Allied Services Limited (SMASL) had entered in to the joint venture with MPSMCL. The FAC in its meeting held on 09.08.2007 recommended the proposal with specific and general conditions. The proposal was cancelled by the MOEF vide letter dated 02.03.2009 due to the Hon'ble Supreme Court order dated 20.02.2009 as per recommendation of CEC. The proposal was reconsidered after several request from the Government of MP and placed in FAC meeting held on 29-30 April 2014. The same area was part of 204 mining proposals cancelled by the Supreme Court and which were later reallocated to the various agencies. This block was allotted to the THDC India Limited for Khurja Super Thermal Power Project (STPP), Bulandsahar, UP vide order of Ministry of Coal, Govt of India F. No. 103/11/2016-NA dated 17.01.2017. The THDC India Limited submitted the revised maps and KML files after resurveying the area along with the MP Forest Department for which APCCF (LM), Govt of MP submitted the letter dated 02.07.2018. This was put up in FAC meeting 26.07.2018but due to insufficient data and records the proposal was recommended to be put again in next FAC. The FAC in its meeting

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S. No. 65737 2020

VIJAY C. SHAH
NOTARY
GOVT. OF INDIA

12 NOV 2020

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
AT ITS WESTERN ZONE BENCH AT PUNE

I.A. NO. 68 OF 2020
IN
APPEAL NO. 35 OF 2020 (WZ)

IN THE MATTER OF:

Kheti Vikas Seva Trust ... Applicant

Versus

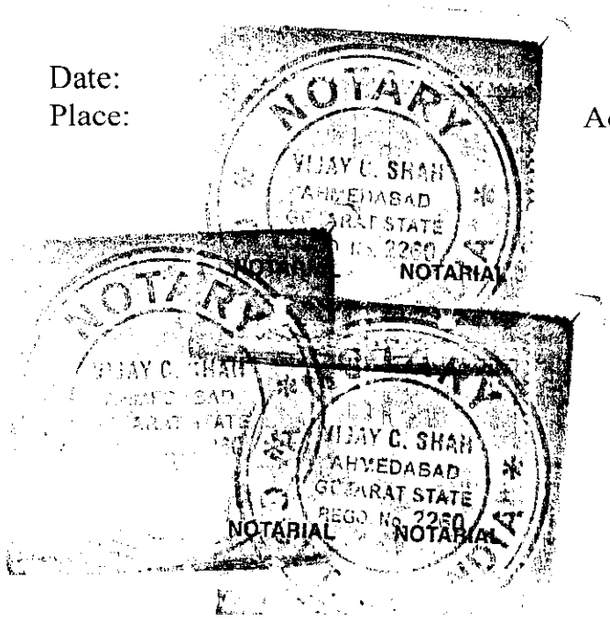
Adani Enterprises Limited and others ... Respondents

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Date:
Place:

Advocate of the Respondent No.1



For, Adani Enterprises Limited

Authorised Signatory

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
AT ITS WESTERN ZONE BENCH AT PUNE

I.A. NO. 68 OF 2020
IN
APPEAL NO. 35 OF 2020 (WZ)

IN THE MATTER OF:

Kheti Vikas Seva Trust ... Applicant

Versus

Adani Enterprises Limited and others ... Respondents

AFFIDAVIT IN REPLY ON BEHALF OF THE RESPONDENT NO. 1 – ADANI ENTERPRISES LIMITED TO THE I.A. NO. 68 OF 2020

I, Santosh Kumar Singh, son of Shri Bhuwaneshwar Singh, aged about 50 years, Indian inhabitant, having my office at Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S.G. Highway, Khodiyar, Ahmedabad – 382 421, do hereby solemnly affirm and state as under:

1. I am the Authorized Representative of Adani Enterprises Limited – the Respondent No.1 (hereinafter referred to as the 'answering

NOTARY VIJAY C. SHAH AHMEDABAD GUJARAT STATE

For, Adani Enterprises Limited

Authorised Signatory

respondent') in the aforesaid I.A. No. 68 of 2020 filed by the Appellant in Appeal No.35 of 2020 (hereinafter referred to as the 'said application'). I have perused the said application, and I am conversant with the facts of the present case. I am duly authorized to file the present affidavit in reply to the said application.

2. At the outset, I deny all the statements, averments, contentions and allegations raised/made in the said application. My not dealing with any of the statements, averments, contentions or allegations raised/made in the said application and my not dealing with the said application paragraphwise may not be construed as an admission on my part or on the part of the answering respondent, and I deny the same as if the same are specifically set out herein and traversed in seriatim.

3. Admittedly, there is a delay of 52 days in filing Appeal No.35 of 2020 (hereinafter referred to as the 'main appeal') by the Appellant. I state and submit that the Appellant in the said application has not

For, Adani Enterprises Limited

Authorised Signatory

explained each day's delay, but has made vague averments claiming as follows:

"*3. That it is submitted that the Appellant received information about the project on 15.05.2020 after a copy of the EC was published in the vernacular (gujarati) newspaper. That it is submitted that the Appellant got a copy of the EC from the MoEFCC website and thereafter, the Appellant took immediate steps towards collecting all relevant documents for the project.*

4. That this information was received when the entire country was under lockdown from 21.03.2020 and due to lockdown and the ensuing pandemic, he was severely curtailed from carrying out activities pertaining and incidental to the filing of the Appeal.

5. That furthermore, the Appellant being located outside city of Pune, had difficulty in contacting the Advocates, arranging the transfer of files, and ensuring action in a time bound manner as nearly all services were disrupted and no commercial activity was taking place. The Appellant was prevented from undertaking any sort of transport and communication, and were unable to communicate with the Advocates owing to nationwide COVID 19 lockdown and lack of proper means of communication in the villages wherein the Appellant resides."

4. I state and submit that the aforesaid averments of the Appellant are vague, without particulars, and mere excuses. The Appellant is using the COVID-19 pandemic as an excuse for delay in filing of the main appeal. The Appellant is claiming that "*he*" was curtailed from

NOTARY

For, Adani Enterprises Limited

Authorised Signatory

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carrying out activities pertaining and incidental to the filing of the main appeal due to the lock-down and the pandemic. It may also be pertinent to note that all the documents that have been produced by the Appellant in the main appeal are available in the public domain and available on the internet. The Appellant has himself claimed in the said application that "*the Appellant got a copy of the EC from the MoEFCC website*". I state and submit that there was no disruption in telephone or internet services in view of the pandemic or lock-down. In fact, majority of the population has continued with their work/profession during the lock-down through telephone and internet services. Therefore, there could not have been any issues in procuring the necessary documents from the internet and sending the same to the Advocates of the Appellant by way of e-mail. In any case, the unlocking process had commenced in the State of Gujarat had commenced from 1.6.2020. I state and submit that barring a few sectors like movie halls, clubs, gymnasiums, etc. all other activities had restarted from 1.6.2020. Thus, the reference to lockdown and pandemic in the said application is only an excuse.

NOTARY
AJAY C. SHAH
AHMEDABAD
GUJARAT STATE

For, Adani Enterprises Limited

Authorised Signatory

5. It may also be pertinent to note that the affidavit in support of the main appeal as well as the said application has been affirmed on behalf of the Appellant on 25.6.2020, but the main appeal was admittedly filed only on 29.7.2020. In view of the same, it becomes clear that the affidavit has been affirmed on behalf the Appellant without knowing or verifying the contents of the main appeal or the said application. Therefore, it is clear that the Appellant has not only made false statements on oath in the verification clause and affidavit of the said application and the main appeal, but it is also evident that someone else is driving the proceedings and the Appellant, who has animosity with the Adani Group, has merely lent his name to institute the main appeal. Assuming for the sake of argument that the said application and main appeal have been affirmed by Mr. Naran Bharubhai Gadhvi after perusing the said application and main appeal, then there is a complete lack of explanation as to (i) why was the main appeal, which was affirmed on 25.6.2020, filed only on 29.7.2020, and (ii) how did the Appellant envisage that the main appeal would be filed on 29.7.2020, and accordingly made averments in the said application.

NOTARY

For, Adani Enterprises Limited

Authorised Signatory

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6. I state and submit that the reliance placed by the Appellant on the order dated 23.3.2020 of the Hon'ble Supreme Court of India in Suo Moto Writ Petition (Civil) No.3 of 2020 is misconceived. I state and submit that the Hon'ble Supreme Court of India in a subsequent judgment has clarified that above order was passed by the Hon'ble Court to benefit vigilant litigants who were prevented due to the pandemic and the lockdown from initiating proceedings within the period of limitation prescribed by general or special law. However, as is evident from the foregoing submissions, the Appellant is neither a vigilant litigant nor was it prevented due to pandemic and/or lockdown from filing the main appeal.

7. I state and submit that in fact the Appellant is not aggrieved by the said EC, but has filed the said appeal only with a view to harass the Respondent No.1. The said application and the main appeal are an abuse of process of law.

For, Adani Enterprises Limited

Authorised Signatory

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8. In light of the aforesaid submissions, I state and submit that the said application may not be entertained and that the main appeal is required to be dismissed as barred by the limitation prescribed under Section 16 of the National Green Tribunal Act, 2010 with costs. I state and submit that the Appellant is not entitled to any reliefs, much less the relief sought either in the said application and/or the main appeal.

What is stated in paragraph 1 is true to my knowledge and belief, what is stated in paragraphs 3(part), 4(part), 5(part), and 6(part) is based on information and record which I believe to be true and what is stated in paragraphs 2, 3(part), 4(part), 5(part), 6(part), 7, and 8 are legal submissions.

Solemnly affirmed at Ahmedabad this 12th day of November 2020.

Identified by

Adv. for R-1.

For, Adani Enterprises Limited

Authorised Signatory

DEPONENT

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BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
AT ITS WESTERN ZONE BENCH AT PUNE

I.A. NO. 68 OF 2020
IN
APPEAL NO. 35 OF 2020 (WZ)

IN THE MATTER OF:

Kheti Vikas Seva Trust ... Applicant

Versus

Adani Enterprises Limited and others ... Respondents

VERIFYING AFFIDAVIT IN SUPPORT OF THE REPLY FOR AND ON BEHALF OF THE RESPONDENT NO. 1 – ADANI ENTERPRISES LIMITED TO I.A. NO. 68 OF 2020

I, Santosh Kumar Singh, son of Shri Bhuwaneshwar Singh, aged about 50 years, being the Authorized Representative of Adani Enterprises Limited, having address at Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S.G. Highway, Khodiyar, Ahmedabad – 382 421, do hereby on solemn affirmation state and declare as follows:

1. I state that I am the Authorized Representative of Adani Enterprises Limited – the Respondent No.1 in the aforesaid I.A. No. 68 of 2020.

For, Adani Enterprises Limited

Authorised Signatory

4714

I am fully aware of the facts of the case and have been authorized to swear this affidavit on behalf of the Respondent No.1.

2. I hereby verify and state that what is stated in paragraph 1 of the accompanying reply is true to my knowledge and belief, what is stated in paragraphs 3(part), 4(part), 5(part), and 6(part) of the accompanying reply is based on information and record which I believe to be true and what is stated in paragraphs 2, 3(part), 4(part), 5(part), 6(part), 7, and 8 of the accompanying reply are legal submissions.

For, Adani Enterprises Limited

Place: Ahmedabad
Date: 12th November 2020

DEPONENT
Authorised Signatory

VERIFICATION

I, Santosh Kumar Singh, son of Shri Bhuwaneshwar Singh, aged about 50 years, being the Authorized Representative of Adani Enterprises Limited,

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having address at Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S.G. Highway, Khodiyar, Ahmedabad – 382 421, do hereby state that what is stated in the aforesaid affidavit is true and correct to the best of my knowledge, belief, and information.

For, Adani Enterprises Limited

Place: Ahmedabad
Date: 12th November 2020

DEPONENT
Authorised Signatory

Identified by

Adv. for R-1.

SOLEMNLY AFFIRMED
BEFORE ME

VIJAY C. SHAH
NOTARY
GOVT. OF INDIA

12 NOV 2020

NOTARY
VIJAY C. SHAH
AHMEDABAD
GUJARAT STATE
REGD.NO. 2260
GOVT. OF INDIA