BEFORE THE NATIONAL GREEN TRIBUNAL
EASTERN ZONE BENCH, KOLKATA

APPEAL NO. _____ OF 2024
U/s 16(h) R/W SECTION 18(1) OF NGT ACT 2010

IN THE MATTER OF:-

SANJAYA KUMAR MISHRA …APPELLANT

VERSUS

Ministry of Environment, Forest and Climate Change

…RESPONDENT

APPEAL WITH AFFIDAVIT

The Humble appeal of Sanjaya Kumar Mishra, the applicant u/s 16(h) R/W Section 18(1) of the National Green Tribunal Act, 2010.

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Balangir
Dated 29.04.2024

(FILED BY)

Sanjaya Kumar Mishra
Advocate
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SYNOPSIS

The appeal is challenging the **Environmental Clearance dated 06.03.2024 bearing Identification No. EC23A0101OR5745830N** granted by Ministry of Environment, Forest and Climate Change (Respondent) to Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Talcher Sadar and Chhendipada, District Angul (Odisha).

The crux of the challenge lies in the assertion that the Environmental Clearance in question was granted without a proper appraisal of the baseline data concerning the air pollutant 'Benzene'. Notably, this data was reported on a non-NABL accredited test report pad. Furthermore, the issuance of the Environmental Clearance overlooked a relevant complaint, thereby undermining the integrity of the Environmental Impact Assessment and the Environmental Appraisal processes involved. Hence, this appeal.

LIST OF DATES AND EVENTS

15-01-2024	Email to Member Secretary, EAC (Coal) Mining Projects on the Subject "Proposal No. IA/OR/CMIN/445297/2023 regarding EIA Clearance of Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Tachler Sadar and Chhendipada, District Angul (Odisha) - reg.", apprising concerns over results reported in respect of Benzene in the EIA report.
10-02-2024	Reminder/Follow-up Email to Member Secretary, EAC (Coal) Mining Projects on the Subject as mentioned above.
24-02-2024	The Expert Appraisal Committee's Minutes of Meeting (bearing MoM ID: EC/MOM/EAC/880056/2/2024) has deliberated on the subject, however, it does not mention the complainant's name. But it is perceived that it pertains to the above subject/emails.
06-03-2024	**Date of granting Environmental Clearance dated bearing Identification No. EC23A0101OR5745830N to the above project, which was seen by Appellant at a later date, as there was no response to the communication dated 12-03-2024.**
12-03-2024	Counter reply to the deliberations in the Expert Appraisal Committee's Minutes of Meeting (bearing MoM ID: EC/MOM/EAC/880056/2/2024) and sought information on any actions initiated concerning my grievance. No response/reply from authority.
05-04-2024	This Appeal and subsequent revision on 29-04-2024 as per NGT observations

BEFORE THE EASTERN ZONE BENCH OF THE NATIONAL GREEN TRIBUNAL

APPEAL NO. _____ OF 2024

MEMO OF PARTIES

Sanjaya Kumar Mishra, Advocate
Maszid Chowk, Tikrapara
Balangir 767001
(Odisha)
Mobile No. 9818326647
Email: sanjayakmishra@gmail.com

…Appellant

VERSUS

Ministry of Environment, Forest and Climate Change
Indira Paryavaran Bhawan, Jor Bagh
New Delhi - 110003
(Through Member Secretary, Expert Appraisal Committee for Coal Mine Projects)
Email: amit.vashishtha@nic.in

…Respondent

APPEAL WITH AFFIDAVIT

To

THE HONOURABLE NATIONAL GREEN TRIBUNAL
EASTERN ZONE BENCH
KOLKATA

IT IS MOST RESPECTFULLY SHOWETH:

1. The Appellant, an Advocate enrolled under Enrolment No. O-1047/2011 in The Orissa State Bar Council. Although the Appellant maintains a communication address in Gurugram, Delhi/NCR, the aforementioned address and contact details are provided specifically for the service of notices related to the Appeal, Replies, or Rejoinders. Copy of Supporting document annexed as **ANNEXURE-A/6.**
2. The address and contact details of the Respondent(s) as given above for the service of notice of the Appeal.

3. That the present appeal is being filed under the Sections 16, R/W Section 18(1) of the National Green Tribunal Act, 2010. The Appellant is committed to advancing environmental conservation, water resources management, and sustainable development initiatives, as well as promoting environmental awareness and compliance. In line with these objectives, the Appellant contributes to India's First Environmental Weekly Newspaper, 'ENVIRO ANNOTATIONS,' by authoring articles and editorial opinions. These contributions aim to raise awareness of environmental laws, highlight key issues related to pollution and waste management, and identify areas for corrective action to facilitate green growth. Previously, the Appellant has been actively involved in various activities including Environmental Impact Assessment (EIA), environmental audits, monitoring, and protection efforts.

4. The appellant is well acquainted with the facts and circumstances of the case and is competent to file this appeal before the National Green Tribunal and seek justice under the National Green Tribunal Act, 2010. Hence, the appellant has approached this Honorable National Green Tribunal.

5. <u>FACTS OF THIS CASE:</u>

5.1 The Respondent has granted Environmental Clearance (EC) to Mahanadi Coalfield Limited. The EC bears Identification No. EC23A0101OR5745830N, under Fresh EC category, on date 06.03.2024. **The soft copy of the EC downloaded from PARIVESH portal is annexed herewith and marked as ANNEXURE-A/1**. This issuance occurred despite a concern raised to the Respondent regarding potential inaccuracies in the test reports of Benzene within the baseline data. It is significant to note that failure to properly consider this baseline data may result in unjustified determinations regarding the environmental impact of the project.

5.2 According to a report by the World Health Organization (WHO), human exposure to benzene has been linked to a variety of acute and long-term adverse health effects and diseases, including cancer and hematological effects. Due to its high volatility, exposure to benzene primarily occurs through inhalation. The report emphasizes the necessity for public health interventions aimed at reducing benzene exposure among both workers and the general population.

Benzene is classified as an air pollutant, and its concentration in ambient air is regulated by the Central Pollution Control Board (CPCB). According to a notification dated 18.11.2009, the specified concentration of benzene in ambient air is 5 micrograms per cubic meter of air. It's important to note that this standard pertains to an "annual average," which is defined as the mean of a minimum of 104 measurements taken over the course of a year at a specific site. These measurements are taken twice a week, 24 hours apart, at uniform intervals.

5.3 An objection was lodged before the Respondent regarding the veracity of data concerning the Benzene air pollutant in the Environmental Impact Assessment (EIA) report for the Subhadra Open Cast Mine. This mine, managed by M/s Mahanadi Coalfield Limited, is slated for operation with a production capacity of 25 MTPA over an area of 1111.85 hectares in Odisha, specifically within the jurisdictions of Tehsil Talcher Sadar and Chhendipada, District Angul. The challenge raises legal concerns regarding the accuracy and reliability of the information presented in the EIA report, crucial for evaluating the environmental ramifications of the proposed mining activities. **Copies of emails annexed as ANNEXURE-A/2.**

5.4 The purported Test Reports issued on 09.01.2023 downloaded from the PARIVESH website of the Government of India. It has been observed that during the entire monitoring period spanning from 03.10.2022 to 31.12.2022, **the parameter**

Benzene was consistently reported to be below the laboratory's Limit of Quantification, which was declared as 0.5 micrograms per cubic meter. Most importantly, the relevant Indian Standards IS 5182 (Part 11) does not mention any such term as "Limit of Quantification". The villages where the laboratory conducted monitoring include: Pidhakhamana, Tangarsahi, Kosala, Korada, Kalikatta, Golabandha, Kumunda, Malibrahmani, Brahmanbil, Kalamchhuin, and Chho Tagolagadia. **Selected Copies as document stated as Test Reports annexed as ANNEXURE-A/4.**

5.5 The Respondent was duly notified that a review of the reported results concerning Benzene in all villages for December 2022 was warranted. This assertion was made in light of alternative findings indicating that during December 2022, the Benzene concentration in these villages ranged between 2.2 to 6.4 micrograms per cubic meter, with the highest concentration observed in Golabandha.

5.6 (**a)** Documents uploaded on PARIVESH Portal shows that the issue was deliberated upon by the Expert Appraisal Committee (EAC) on 24.02.2024 under the Agenda 7.14. The appellant presumed that the discussion was prompted by the complaint raised. Importantly, no names of the complainant were mentioned in the proceedings. **Copies of relevant pages of the EAC's Minutes of Meeting (MoM) annexed herewith as ANNEXURE-A/3.**

(b) In the MoM of the EAC, it is stated in the third paragraph that "*The Committee noted that the allegation made by the complainant is without any documentary proof to support his argument.*" At this point, it is pertinent to highlight that neither the EAC nor the Respondent made any effort to confirm the availability of any documentary proof supporting the allegation.

(c) At page number 311-of-365 of the EAC's MoM, it is stated that *Vardan EnviroLab a NABL Accredited Lab based in Gurgaon, Haryana was engaged for carrying out the Baseline Monitoring Environmental Study during the period from October to December 2022.* **It is imperative to highlight that the Test Reports issued** by Vardan EnviroLab, which are downloaded from the PAIVESH Portal **(Annexed with this Appeal as ANNEXURE A/4) neither bear the NABL symbol nor claim the issuance of report under NABL accreditation**. Instead the Test Report under question mentions ISO 9001, ISO 14001, and ISO 45001. **This discrepancy renders the validity of the laboratory's test reports under the NABL accreditation null and void, regardless of the laboratory's accreditation status.**

(d) At page number 313-of-365 of the EAC's MoM it is stated that "*As mentioned above, the testing of Benzene was done as per IS: 5182 (P-11): 2006 RA: 2017 Standards using the GC-FID Method. (Indian Standard Methods for Measurement of Air Pollution is attached for reference as Annexure- 2)*". A mere submission of the copy of Indian Standards does not prove compliance to it.

(e) Further, it is crucial to highlight that IS: 5182 (Part 11) specifies three methods. Neither the Test Reports nor the EAC's MoM clearly declares which one out of the three methods was followed. A suo-motu statement alone (as referred to at page number 313) does not ascertain which specific method was employed. **Copy of IS 5182 (Part 11) :2006, Indian Standard, Methods for Measurement of Air Pollution Part 11 Benzene, Toluene and Xylene (BTX) annexed herewith as ANNEXURE-A/5.**

(f) Furthermore, the assertion claiming adherence to the testing of Benzene was done as per IS: 5182 (P-11): 2006 standards lacks merit due to the **absence of specified detection limits**. Instead, the Laboratory has used Limit of Quantification (LOQ). The EAC's MoM also repeats the same. The non-inclusion of the Detection Limit, as mandated by IS: 5182 (Part 11), underscores a clear non-compliance with

the specified method. Consequently, the claim of conformity to approved protocols is unjustified and warrants the rejection of the reports.

(g) To establish the methodology IS: 5182 (P-11): 2006 utilized, it is imperative to scrutinize the sample trail, preservation procedures, time intervals between sampling and testing, as well as pertinent back-end data such as peaks and graphs. Regrettably, these crucial documents were not taken into reference by the Respondent's EAC.

The Test Reports used by the EAC lack essential details such as the precise location of sampling, the duration of sampling for benzene samples, the testing period, and any environmental conditions observed during sampling and testing.

Furthermore, the absence of evidence of sample testing at the site or sample transportation from Odisha to Gurugram, coupled with the lack of documentation regarding sample preservation as per IS: 5182 (Part 11) standards, renders the claim of testing Benzene in accordance with IS: 5182 (Part 11) and by a NABL Accredited Laboratory of zero significance.

(h) In the last para of page number 313-of-365 of the EAC's MoM shows that as per CPCB CAAQMS data Benzene was found in 2 locations, irrespective of the fact that the concentration was with NAAQS. This should have alarmed the Respondent and its EAC to examine the matter rigorously, which they did not.

5.7 The EAC in its MoM has noted that EIA/EMP report is prepared by the NABET Accredited consultant and the Project Proponent also submitted an undertaking in the form-1 that "data and information given in the application and enclosures are true to be best of my knowledge and belief and I am aware that if any part of the data and information is found to be false or misleading at any stage, the project will be rejected and clearance given if any to the project will be revoked at our

risk and cost.” Therefore, in the absence of any proof by the complainant the Ministry may take further necessary action as per recommendation already given by the EAC.

5.8 The Respondent did not ask the appellant regarding any proof.

6. GROUNDS:

6.1 The Environmental Clearance dated 06.03.2024, bearing Identification No. EC23A0101OR5745830N and issued by the "Respondent" (Ministry of Environment, Forest and Climate Change), is challenged due to deficiencies in the baseline data in the test results of Benzene utilized for environmental appraisal. The reporting of the test results for "Benzene" does not conform to IS: 5182 (P-11): 2006 standards, as claimed in the Respondent’s EAC MoM.

6.2 Although the Respondent's EAC acknowledges that the laboratory tasked with generating the baseline data holds NABL accreditation, the test results in question have been reported on non-NABL accredited report pads. These results lack any claim of NABL accreditation specific to the tests reported. This also lacks NABL reporting practice.

6.3 The Respondent's EAC has merely relied on the undertaking provided and neglected to dutifully and diligently verify the essential technical aspects as required. Consequently, the appraisal process lacks scientific rigor and has been conducted inappropriately. Therefore, the Environmental Clearance lacks merit and cannot be considered valid.

7. **LIMITATION:**

The appeal challenging the Environmental Clearance issued on 06.03.2024, with Identification No. EC23A0101OR5745830N, was filed on 05.04.2024, duly within the prescribed 30-day window as mandated by Section 16 of the National Green Tribunal Act, 2010. Following the initial filing, defects identified during the scrutiny phase were addressed in accordance with directives from the Hon'ble NGT issued on 11.04.2024. The appeal was initially submitted to the Hon'ble Principal Bench of the Tribunal, due to an inadvertent jurisdictional confusion, which necessitated a fresh filing, as advised by the Hon'ble NGT on 25.04.2024. Further, this appeal draws upon the precedents set in Appeal No. 03/2024 concerning Kisan Sahkari Chini Mills Ltd., Semikhera, Bareilly vs. Uttar Pradesh Pollution Control Board (UPPCB), and Appeal No. 18/2023 in the case of Hafed Sugar Mill vs. Haryana State Pollution Control Board & Anr., wherein the Hon'ble NGT has explicitly declared its discretionary power to condone filing delays extending up to 60 days beyond the initial statutory period. Therefore, this appeal remains timely and is not barred by limitation.

Sanjaya Kumar Mishra

8. PRAYER:

In light of the aforementioned facts and circumstances, it is respectfully prayed that the Hon'ble National Green Tribunal may graciously be pleased to:

1. Quash the Environmental Clearance dated 06.03.2024 bearing Identification No. EC23A0101OR5745830N granted by the Respondent to Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Talcher Sadar and Chhendipada, District Angul (Odisha)..

2. Direct the Respondent to undertake a reappraisal of the project with traceable baseline data for the air pollutant parameter "Benzene" in ambient air. This reappraisal should utilize monitoring and testing reports from a different highly acclaimed environmental laboratory that fulfills requirements of Environment Impact Assessment Guidelines, IS 5182 (Part11) and any other requisite standards.

Balangir
Dated: 29.04.2024

Sanjaya Kumar Mishra
(Appellant)

Verification

I, Sanjaya Kumar Mishra, S/o Shri Nilamani Mishra, the appellant, an Advocate bearing Enrolment No. O-1047/2011, having contact address Maszid Chowk, Tikrapara, Balangir 767001, (Odisha); do hereby declare that what is stated in the appeal is true to the best of my information and belief.

Verified today, the 29th day of April 2024

Sanjaya Kumar Mishra
(Signature of the appellant)

BEFORE THE NATIONAL GREEN TRIBUNAL
EASTERN ZONE BENCH, KOLKATA
APPEAL NO. ____ OF 2024
U/s 16 R/W SECTION 18(1) OF NGT ACT 2010

IN THE MATTER OF

Sanjaya Kumar Mishra ...APPLICANT

VERSUS

Ministry of Environment, Forest and Climate Change

...RESPONDENT

AFFIDAVIT

I, Sanjaya Kumar Mishra, Advocate (Enrolment No. O-1047/2011), S/o Shri Nilamani Mishra, Maszid Chowk, Tikrapara, Balangir 767001 (Odisha), do hereby solemnly affirm and declare as under: -

1) That I am the Appellant in the above noted Appeal filed against the Ministry of Environment, Forest and Climate Change. I am fully conversant with the fact of the case and therefore, I am fully competent to sign and swear this Affidavit.
2) That the accompanying Appeal has been drafted by myself and I, hereby, declare that the same is true and correct.
That the contents of the accompanying Appeal be read as part and parcel of this Affidavit as the same are not repeated herewith for the sake of brevity.

NOTARIAL

DEPONENT

VERIFICATION:

Verified at Gurugram on this 5th Day of April 2024 that the contents of the above Affidavit are true and correct to the best of my knowledge and nothing material has been concealed there from.

DEPONENT

RAM NIWAS MALIK. GGM. (Reg. No. 8224) ★ NOTARY GOVT. OF INDIA ★ 05 APR 2024

ATTESTED

RAM NIWAS MALIK, ADVOCATE
NOTARY, GURUGRAM (HR.) INDIA

Annexure-A/1

Soft copy of the Impugned Environmental Clearance
(EC Identification No. EC23A0101OR5745830N)

सत्यमेव जयते

File No.: IA-J-11015/72/2021-IA-II(M)
Government of India
Ministry of Environment, Forest and Climate Change
IA Division
****

Dated **06/03/2024**

To,

Shital Kumar Sahoo
Mahanadi Coalfields Limited
ANAND VIHAR, BURLA , BURLA SAMBALPUR, SAMBALPUR, ODISHA, , 768020
mcl4cil@gmail.com

Subject: **Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Talcher Sadar and Chhendipada, District Angul (Odisha) – Environmental Clearance – reg.**

Sir/Madam,

This is in reference to your application submitted to MoEF&CC vide proposal number IA/OR/CMIN/445297/2023 dated 12/10/2023 for grant of prior Environmental Clearance (EC) to the project under the provision of the EIA Notification 2006-and as amended thereof.

2. The particulars of the proposal are as below :

(i) EC Identification No.	EC23A0101OR5745830N
(ii) File No.	IA-J-11015/72/2021-IA-II(M)
(iii) Clearance Type	Fresh EC
(iv) Category	A
(v) Project/Activity Included Schedule No.	1(a) Mining of minerals
(vi) Sector	Coal Mining
(vii) Name of Project	Subhadra Open Cast Project
(ix) Location of Project (District, State)	ANUGUL, ODISHA
(x) Issuing Authority	MoEF&CC
(xii) Applicability of General Conditions	No

3. The proposal is for Environmental Clearance for Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Talcher Sadar and Chhendipada, District Angul (Odisha).

4. Terms of Reference (ToR) was granted vide letter no. J-11015/70/2021-IA. II(M) dated 22.11.2021 and Amendment in

ToR vide letter dated **28.02.2022**. Public Hearing was conducted on 25.08.2023 under the Chairmanship of Shree Pratap Pritimaya, O.A.S. (S) ADM, Angul. Proposal for EC with EIA/EMP report was submitted on PARIVESH portal.

5. Project Proponent alongwith QCI NABET consultant (Vardan Environet) made the detailed presentation in the 3rd & 6th EAC meeting held during 16-17 November, 2023 & 17th Jan 2024, respectively and interalia provided the following information to the EAC:

(i) The Subhadra Open Cast Coal Mine of MCL is located in Kankarei, Pirakhaman, Balichandrapur, Raijharan, Kaunsidhipa, Golagadia, Chhotabereni, Kumunda, Bhalugadia, Baghuabol villages and Jaipur RF Tehsil Talcher and Chhendipada, District Angul (Odisha).

(ii) The project area is covered under Survey of India Topo sheet No. F45S13 & F45T1 (RF 1:50000) and is bounded by the geographical coordinates ranging from 20^{0}55'56.225" N and 20°58'47.344" N and longitudes84^{0}58'42.383" E and 85^{0}0'50.476" E. The DGPS coordinates of the ML area are given in Table 2.1 of EIA Report.

(iii) Project does not fall in the Critically Polluted Area (CPA), where the MoEF&CC's vide its OM dated 13thJanuary, 2010 has imposed moratorium on grant of Environment Clearance.

(iv) There are no National Parks, eco-sensitive Zones, within 10 km radius.

(v) The Utkal A (Subhadra) Coal Mine has been allotted by Ministry of Coal vide order no NA-103/1/2021-NA dated 18.11.2021.

(vi) 125.24ha (Reserve Forest Land: 0.75 ha, Govt. Revenue Forest area: 124.49 ha) of forest land have been reported to be involved in the project. Applications for Forest Clearance was submitted vide Proposal No. FP/OR/MIN/150133/2021 dt. 25.01.2022. Stage I FC has been recommended in the FAC meeting held on 20.10.2023. Stage I FC has been granted vide letter no -8-06/2023-FC dated 05.12.2023.

(vii) There is no national park or wildlife sanctuary within the study area. However, due to presence of Schedule-I Fauna application submitted to DFO, Angul for approval of site specific wild life management plan.

(viii) Mining plan (including Progressive Mine closure plan) has been approved by the MCL Board vide letter no. MCL/SBP/CS/BD-257/Exct/2023/13262 dt- 13.05.2023.

(ix) Method of mining will be Open Cast Mechanized Mining. With due consideration to geo-mining characteristics of the deposit, the mine is proposed to be worked by shovel-dumper combination for OB excavation and Surface Miner for coal winning and loading by Front End Loader.

(x) LAND USE DETAILS OF MINE: Pre Mining land use details

S. No	Type of Land	Within ML Area (Area in Ha.)	Outside ML Area (Area in Ha)	Total (Area in Ha)
1	Agricultural	800.50	Nil	800.50
2	Forest	125.24	Nil	125.24
3	Wasteland	NA	NA	NA
4	Grazing land	58.67	Nil	58.67
5	Water bodies	6.28	Nil	6.28
6	Settlements	NA	NA	NA
7	Others (Specify)			
8	Old Excavation Area (East Quarry)	NA	NA	NA
9	Old Excavation Area (West Quarry)	NA	NA	NA

10	Old OB Dumps	NA	NA	NA
11	Roads	0.25	Nil	0.25
12	R & R Colony	NA	NA	NA
13	Staff Colony	NA	NA	NA
14	Green Belt	NA	NA	NA
15	Balance Area	NA	NA	NA
16	Barren land**	92.64	Nil	92.64
17	Township**	Nil	Nil	Nil
18	Community/others use area**	28.27	Nil	28.27
19	Total Project Area	1111.85	Nil	1111.85

**** (As per the above table the total land use area is 1111.85 Ha. The other land use types are Barren land of 92.64, Community/others use area of 28.27 Ha.)**

Post Mining

S. No.	Land Use	Land Use (End of Life)	Land Use (ha)				
			Plantation	Water Body	Public use	Undisturbed	Total
1	External OB Dump	24.17	0	0	0	0	24.17
2	Top Soil Dump	8.97	0	0	0	0	8.97
3	Excavation	881.28	0	0	0	0	
4	Roads, buildings Infrastructure	Roads: 15.72	0	0	15.72	0	118.16
		Township: 27.12	1.26	0	25.86	0	
		Infra: 75.32	0	0	0	0	
5	Green Belt	6.89	0	0	0	0	6.89
6	Undisturbed Area	0	0	0	0	0	0
7	Safety Zone	11.79	11.79	0	0	0	11.79
8	Rationalization Area	25.34	25.34	0	0	0	25.34
9	Diversion / Below River / Nala /Canal	8.42	0	0	8.42	0	8.42
10	Water Harvesting	35.36	0	35.36	0	0	35.36
11	Staff Colony		0	0	0	0	
12	Backfilled Area**	715.24	182.52	0	0	0	715.24
13	Excavated Void Without Plantation**	130.68	0	0	0	0	130.68
14	Coal Stock Yard**	9.76	0	0	0	0	9.76
15	Embankment**	11.49	0	0	11.49	0	11.49
16	Explosive Magazine**	5.58	0	0	0	0	5.58
Total Area		**1111.85**	**220.91**	**35.36**	**61.49**	**0**	**1111.85**

** (As per the above table the total land use area is 1111.85 Ha. The other land use types are Backfilled Area of 715.24Ha., Excavated Void without Plantation of 130.68 Ha., Coal Stock Yard of 9.76 Ha., Embankment of 11.49 Ha., and Explosive Magazine of 5.58 Ha.)

(xi) Total Geological Reserve reported in the mine lease area is 1142.67MT with 790.95MT Mineable Reserves by opencast mining. Out of total mineable reserve of 790.95MT,768.83 MT are available for extraction. Percent of extraction is 67%.

(xii) Thickness of seams to be worked on: Opencast mining method is proposed for extraction of coal seam XI to IID. The effective thickness of the seams XI to IID is varying from 0.06m to 75.90m.
Grade of coal: Wt. Avg. G-13 (GCV – 3690 Kcal/Kg)

(xiii) Stripping Ratio: Only In-situ: 0.80 With Re-handling: 0.93

(xiv) Average gradient: - 3.480(1 in 16.44)

(xv) Maximum thickness of seams: Seam XI to IID varies from 0.06m to 75.90 m

(xvi) The project has 1 external OB dumps (temporary) in an area of 24.17 ha with 88m height and103.72Mm3 of OB.1 internal OB dump in an area of 715.24ha with 613.18 Mm3 (Insitu) 103.72 Mm3 (Re handling) of material is envisaged in the project.

(xvii) Total quarry area is 881.28 ha out of which backfilling will be done in 715.24 ha up to 30m while final mine void will be created in an area of 130.68 ha with a depth of 160 m RL and 35.36 ha water body. Backfilled quarry area 182.52 ha shall be reclaimed with plantation, 495.27 ha agriculture land and 37.45 ha will be returned as forest land.

(xviii) Transportation of coal:
In pit: Initially through Dumper and in Pit Conveyor after few years.
Surface to siding: From surface hopper (20 No.) by belt conveyor (18 Nos.)
Siding to loading: Through two Rapid Loading System (RLS) (02 Nos)
Capacity 5000tonne each
Quantity being transported by Road/Rail/Conveyor: As per approved mining plan
Transportation will be carried out as per Approved Mining Plan.

(xix) Reclamation has been planned in an area of 965.45ha, comprising of 538.17 ha Agricultural use, 220.91 ha Plantation, 35.36 ha Water Body& 125.24 ha Forest Land return Area, Nala diversion, Township &Embankment. &130.68 ha of final void area will be left unplanted.

(xx) Life of mine is 36 Years (including 2 Year of construction)

(xxi) Coal linkage - The mine has been allotted to MCL by the Ministry of Coal vide order no NA-103/1/2021-NA dated 18.11.2021. There shall be no restriction to carry on mining operations for own consumption, sale or for any other purpose.

(xxii) The Primary baseline data for specific micro–meteorology data, ambient air quality, waste quality, noise level, soil and flora & fauna has been collected during Post Monsoon season i.e. October to December, 2022.

(xxiii) Public hearing for the project of 25 MTPA capacity in an area of 1111.85ha was conducted on 25.08.2023 at Ground near Pirakhaman Primary school under Kankarei gram Panchayat of Chhendipada Tehsil of Angul District under the Chairmanship of Shree Pratap Pritimaya, O.A.S. (S) ADM, Angul. Major issues raised in the Public Hearing & appropriate action to address the issues raised in the Public Hearing have already been taken/ proposed to be taken are given in the action plan prepared and mentioned in Chapter -7 in Final EIA/EMP report.

(xixv) No court cases, violation cases are pending against the project of the PP.

(xxv) The project does not involve violation of the EIA Notification, 2006 and amendment issued thereunder since it is a Greenfield project.

(xxvi) Out of the total area of 1111.85 hectares of land to be acquired for the project 696.95 hectares are private land and the remaining areas are Government and Forest lands. While the acquisition of private land has a direct bearing on the personal social and economic status of the land owners. About 1853 families have been identified for displacement due to Subhadra OCP. The R & R benefits will be provided as per norms under R& R policy-2006 of Government of Odisha.

(xxvii) Benefit of the Project: Employment Generation-Proposed coal mine shall provide an opportunity of direct employment to 2108 persons and total indirect employment of approx. 5000 persons. The project is reported to be beneficial in terms of energy security for the development of country. Total cost of the project is Rs. 3955.65 Crore. Cost of production is Rs 678 per tonne., Fund for the CSR will be allocated based on 2% of the average net profit of the Company for the three immediately preceding financial years or Rs. 2.0 per tonne of coal production of previous year

whichever is higher. Different peripheral development and community development works will be taken up. R&R cost Rs 405.46Crore. Environment Management Cost was: Capital Rs 2295 Lakh; & Recurring Rs. 201Lakh.

6. Proposal was earlier considered by the EAC in its 3rd meeting held during 16.11.2023-17.11.2023. EAC after detailed deliberation deferred the project and sought additional information. Project Proponent submitted the information as sought by the EAC on the PARIVESH portal, accordingly proposal was considered by the EAC in its 6th meeting held during 17-18 January 2024. During the meeting the Committee deliberated on various issues related to project including issues raised during PH, EMP, Grazing land, plantation, transportation of mineral, water requirement, diversion of nallha. Mining lease area etc. EAC after detailed deliberation **recommended** the Environmental Clearance for Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Tachler Sadar and Chhendipada, District Angul (Odisha) with the specific conditions and standard EC conditions (Annexure 1) under the provisions of EIA Notification, 2006 and its amendments. Detailed deliberation, observation and recommendation of the EAC are available on the PARIVESH website.

7. Based on the representation received the proposal was again considered in 7th EAC meeting held during 12-14 February, 2024 wherein the Committee recommended that , *the Ministry may take further necessary action as per recommendation already given by the EAC.*

8. The MoEF&CC has examined the proposal in accordance with the provisions contained in the Environment Impact Assessment (EIA) Notification, 2006 & further amendments thereto and based on the recommendations of the EAC hereby **accords** *Environmental Clearance to* **M/s Mahanadi Coalfield Limited** *for* **Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Talcher Sadar and Chhendipada, District Angul (Odisha)** with the specific conditions and standard EC conditions (Refer: Annexure-I) under the provisions of EIA Notification, 2006 and its amendments.

9. The proponent shall obtain all necessary clearances/approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection. The Ministry or any other competent authority may stipulate any further condition for environmental protection.

10. The Environmental Clearance to the aforementioned project is under provisions of EIA Notification, 2006. It does not tantamount to approvals/consent/permissions etc. required to be obtained under any other Act/Rule/regulation. The Project Proponent is under obligation to obtain approvals /clearances under any other Acts/ Regulations or Statutes, as applicable, to the project.

11. The PP is under obligation to implement commitments made in the Environment Management Plan, which forms part of this EC.

12. Any appeal against this environmental 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.

13. The coal company/project proponent shall be liable to pay the compensation against the illegal mining, if any, and as raised by the respective State Governments at any point of time, in terms of the orders dated 2nd August, 2017 of Hon'ble Supreme Court in WP (Civil) No.114/2014 in the matter of 'Common Cause Vs Union of India & others.

14. The concerned State Government shall ensure no mining operations to commence till the entire compensation for illegal mining, if any, is paid by the project proponent through their respective Department of Mining & Geology, in strict compliance of the judgment of Hon'ble Supreme Court. This environmental clearance shall not be operational till such time the project proponent complies with the above said judgment of Hon'ble Supreme Court, as applicable, and other statutory requirements.

15. General Instructions:

(i) The project proponent shall prominently advertise it at least in two local newspapers of the District or State, of which

one shall be in the vernacular language within seven days indicating that the project has been accorded environment clearance and the details of MoEF&CC website where it is displayed.

(ii) The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn must display the same for 30 days from the date of receipt.

(iii) The project proponent shall have a well laid down environmental policy duly approved by the Board of Directors (in case of Company) or competent authority, duly prescribing standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental / forest / wildlife norms / conditions.

(iv) Action plan for implementing EMP and environmental conditions along with responsibility matrix of the project proponent (during construction phase) and authorized entity mandated with compliance of conditions (during operational phase) shall be prepared. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Six monthly progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six-Monthly Compliance Report.

(v) Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.

(vi) The Regional Office of this MoEF&CC shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/monitoring reports.

16. This issue with an approval of the Competent Authority.

Copy To

1. The Secretary, Ministry of Coal, Shastri Bhawan, New Delhi.
2. The Additional Principal Chief Conservator of Forests, Regional office (EZ), Ministry of Environment & Forests, A-31, Chandershekharpur, Bhubaneswar- 751023 (Odisha).
3. The Secretary, Department of Environment & Forests, Government of Orissa, Secretariat, Bhubaneswar (Odisha).
4. The Member Secretary, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32
5. The Chairman, Orissa State Pollution Control Board, Parivesh Bhawan, A/118, Nilkanthanagar, Unit VIII, Bhubaneshwar - 751012 (Odisha).
6. District Collector, Angul, Government of Odisha
7. PARIVESH portal

Annexure 1

Specific EC Conditions for (Mining Of Minerals)

1. Specific Conditions:

S. No	EC Conditions
1.1	*Any activity of the forest land shall only be carried out after obtaining necessary forest clearance.*
1.2	*PP to obtain the CTO for 25 MTPA (peak) capacity after grant of EC.*
1.3	*PP shall deploy electric vehicles to the extent of 50% of transportation fleet for evacuation of coal through road up to Balaram Siding (Approx. 11 KM) till commencement of rail evacuation system with CHP of Subhadra OCP which is likely to commence from the fourth year of mining operations. PP shall monitor the EV usage through installation of adequate number of CCTV cameras. Till such time transportation from a dedicated road and village road shall not be used for the same.*
1.4	*PP shall adopt 6 ponds outside the lease area in different village and carry out the various activities for their protection and maintenance as proposed in the plan submitted for the same to Ministry The budget earmarked for water conservation plan for these ponds is Rs. 1.00 crores shall be kept in a spate account and audited annually. PP while submitting the compliance report to Regional Office and on Parivesh Portal as the case may be also submit evidence of implementation of the plan including geo tagged photographs.*
1.5	*PP shall develop greenbelt on approximately 38% of the lease area, i.e. on 426.15 ha of land as proposed in the plantation plan submitted to the Ministry and maintain a survival rate of at least 70% (after 10 years of the plantation) by carrying out gap plantation in case of mortality. The budget earmarked for the plantation shall be kept in a separate account. PP should annually submit the audited statement of expenditure along with proof of activities viz. photographs (before & after with geolocation date & time), details of expert agency engaged, details of species planted, number of species planted, survival rate, density of plantation etc. to the Regional Office of MoEF&CC and on PARIVESH Portal as the case may be for the activities carried out during previous year. Third party monitoring of the plantation shall be done preferably by an institution of MoEFCC (eg ICFRE).*
1.6	*PP shall maintain atleast10 mtrs width tree plantation of broad leaved species and wind break/greenshield of about 10 mts height along the boundary of coal storage yard.*
1.7	*PP shall implement the activities-wise proposed to address the issues raised during Public Hearing. The budget earmarked for the same is Rs 1235 lakhs and the same shall be kept in a separate account and audited annually. The details of activities undertaken, amount spent along with documentary proof shall be a part of report to be submitted to IRO, MoEF&CC. The maintenance of all activities shall be covered through recurring cost of Public Hearing, and continued as a part of CSR budget.*
1.8	*PP shall ensure that all type of plastic waste generated from the mines shall be stored separately in isolated area and disposed of strictly adhering to the Plastic Waste Management Rules 2016. In pursuant to Ministry's OM dated 18/07/2022 PP shall also create awareness among the people working in the project area as well as in its surrounding area on the ban on Single Use Plastic(SUP) in order to ensure compliance of Ministry's Notification published by the Ministry on 12/08/2021. A report along with photograph on the measures taken shall also be included in the six monthly compliance report being submitted by PP.*
1.9	*All the mitigation measures committed / envisaged in the EIA/EMP report and subsequent submission (ANNEXURE 2) shall be implemented which also includes i) Fog cannon*

S. No	EC Conditions
	installation: to mitigate dust emissions, ii) Increased greenbelt development budget: aligned with the expanded plan and iii) 02 Continuous Ambient Air Quality Monitoring Stations (CAAQMS): for real-time air quality monitoring. The budget as per revised EMP is Rs 2995 Lakh (Capital) and Rs 201 Lakh (Recurring) shall be kept in a separate account. PP should annually submit the audited statement along with proof of activities carried to the Regional Office of MoEF&CC and PARIVESH Portal as the case may be for the activities carried out during previous year.
1.10	*PP to install 2 continuous ambient air quality monitoring stations at suitable locations preferably on village side with consultation of SPCB. The real time data so generated shall be uploaded on company website and linked with website of CPCB &SPCB. In addition, data should also be displayed digitally at entry and exit gate of mine lease area for public display.*
1.11	*PP shall implement Effluent Treatment Plant for wastewater generated from workshop and Sewage Treatment Plant for its colony. No untreated water shall be discharged from mine boundaries to ponds/nallah/river.*
1.12	*PP to install solar lights along the road used for transportation of minerals also take up installation of solar lights in rural areas with its maintenance within the study area of 10 km radius buffer zone within one year.*
1.13	*Proponent shall appoint an Occupational Health Specialist for Regular and Periodical medical examination of the workers engaged in the Project and maintain records accordingly; also, Occupational health check-ups for workers having some ailments like BP, diabetes, habitual smoking, etc. shall be undertaken once in six months and necessary remedial/preventive measures taken accordingly. The Recommendations of National Institute for ensuring good occupational environment for mine workers shall be implemented. The prevention measure for burns, malaria and provision of anti-snake venom including all other paramedical safeguards may be ensured before initiating the mining activities.*
1.14	*PP shall conduct feasibility studies for assessment of voids for backfilling of ash and mixing of ash with overburden, taking up backfilling ash and OB mixing activities during operations as well as post closure of mines in line with the Fly Ash Utilization Notification, 2021.*
1.15	*Hon'ble Supreme Court in an Writ Petition(s) Civil No. 114/2014, Common Cause vs Union of India &Ors vide its judgement dated 8th January, 2020 has directed the Union of India to impose a condition in the mining lease and a similar condition in the environmental clearance and the mining plan to the effect that the mining lease holders shall, after ceasing mining operations, undertake re-grassing the mining area and any other area which may have been disturbed due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, fauna etc. Compliance of this condition after the mining activity is over at the cost of the mining lease holders/Project Proponent". The implementation report of the above said condition along with geo tagged photographs shall be sent to the Regional Office of the MoEF&CC.*
1.16	*PP shall strengthen the existing Environment Management division of the unit under intimation to the IRO*

Standard EC Conditions for (Mining of minerals)

1. Statutory Compliance

S. No	EC Conditions
1.1	The project proponent shall obtain forest clearance under the provisions of Forest (Conservation) Act, 1986, in case of the diversion of forest land for non-forest purpose involved in the project.
1.2	The project proponent shall obtain clearance from the National Board for Wildlife, if applicable.
1.3	The project proponent shall prepare a Site-Specific Conservation Plan & Wildlife Management Plan and approved by the Chief Wildlife Warden. The recommendations of the approved Site-Specific Conservation Plan / Wildlife Management Plan shall be implemented in consultation with the State Forest Department. TThe implementation report shall be furnished along with the six-monthly compliance report (in case of the presence of schedule-I species in the study area).
1.4	The project proponent shall obtain Consent to Establish / Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from the concerned State pollution Control Board/ Committee prior to start/commencement of mining operations/production
1.5	The project proponent shall obtain the necessary permission from the Central Ground Water Authority
1.6	Solid/hazardous waste generated in the mines needs to addressed in accordance to the Solid Waste Management Rules, 2016/Hazardous & Other Waste Management Rules, 2016.
1.7	Permission of power supply to be taken from the concerned authority for meeting power demand of the project site.
1.8	The maximum production or peak production at any given time shall not exceed the limit as prescribed in the EC.
1.9	Validity of Environment Clearance is as per life of the mine mentioned in EC letter or 30 years as per EIA Notification, 2006 and its amendments therein
1.10	All the conditions stipulated in previous Environment Clearance conditions should be strictly complied within certain timeline

2. Air Quality Monitoring And Mitigation Measure

S. No	EC Conditions
2.1	Continuous ambient air quality monitoring stations as prescribed in the statue be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM10, PM2.5, SO2 and NOx. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/or in consultation with the SPCB. The new CAAQMS should be installed with expansion.

S. No	EC Conditions
2.2	The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 (E) dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/Regional Office and to the CPCB/SPCB.
2.3	Transportation of coal, to the extent, if permitted by road, shall be carried out by covered trucks/conveyors. Effective control measures such as regular water/mist sprinkling/rain gun/ Fog cannon etc shall be carried out in critical areas prone to air pollution (with higher values of PM10/PM2.5) such as haul road, loading/unloading and transfer points. Fugitive dust emissions from all sources shall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central/State Pollution Control Board.
2.4	The transportation of coal shall be carried out as per the provisions and route envisaged in the approved Mining Plan or environment monitoring plan. Transportation of the coal through the existing road passing through any village shall be avoided. In case, it is proposed to construct a 'bypass' road, it should be so constructed so that the impact of sound, dust and accidents could be appropriately mitigated.
2.5	PP to install solar lights along the road used for transportation of coal to avoid the accidents at night and also seek its maintenance.
2.6	Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining 'PUC' certificate from the authorized pollution testing centres.
2.7	Coal stock pile/crusher/feeder and breaker material transfer points shall invariably be provided with dust suppression system. Belt-conveyors shall be fully covered to avoid air borne dust. Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet operated or fitted with dust extractors.
2.8	Coal handling plant shall be operated with effective control measures w.r.t. various environmental parameters. Environmental friendly sustainable technology should be implemented for mitigating such parameters.
2.9	Adequate measures on EMP should be analyzed on annual basis to assess the trend of air pollution data from continuous monitoring station and quarterly report shall be generated and submitted with 6 monthly compliance reports to RO, MoEF&CC.
2.10	Effective safeguard measures for prevention of dust generation and subsequent suppression like regular water sprinkling shall be carried out in areas prone to air pollution. The Fugitive dust emission from all sources shall be regularly controlled by installation of required equipment's. It should be ensured that air pollution level confirm to the standards prescribed by the MOEFCC/CPCB
2.11	Adequate number of Fog canon (mist sprayer) shall be installed to reduce the impact of air pollution at dust generating sources with time bound action plan.
2.12	PP should Install Wind breaker/shield arrangement along the railway siding for reducing the dust propagation in upwind direction.

S. No	EC Conditions
2.13	Post environmental closure third party monitoring by reputed instituted in air quality, water, land & soil etc shall be carried out and analysed with EMP measures at regular interval. A suitable recommendation in this regard, shall be furnished to IRO, MoEF&CC for compliance. The data used for analysis shall be obtained from continuos AQMS, site specific water regime. Also third party shall analyses the implementation of river diversion, meeting to the requirement of project report.
2.14	Comparison of average monthly temperature of pre and post mine operation after obtaining EC shall be elaborated for post three years and a record to be maintain at regular interval.

3. Water Quality Monitoring And Mitigation Measures

S. No	EC Conditions
3.1	The effluent discharge (mine waste water, workshop effluent) shall be monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standards vide GSR 742 (E) dated 25th September, 2000 and as amended from time to time by the Central Pollution Control Board.
3.2	The monitoring data shall be uploaded on the company's website and displayed at the project site at a suitable location. The circular No.J-20012/1/2006-lA.11 (M) dated 27th May, 2009 issued by Ministry of Environment, Forest and Climate Change shall also be referred in this regard for its compliance.
3.3	Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times a year i.e. pre-monsoon, monsoon, post-monsoon and winter. The ground water quality shall be monitored once a year, and the data thus collected shall be sent regularly to MOEFCC/RO.
3.4	Monitoring of water quality upstream and downstream of river including pons, lakes, tanks shall be carried out once in six months and record of monitoring data shall be maintained and submitted to the Ministry of Environment, Forest and Climate Change/Regional Office.
3.5	Ground water, excluding mine water, shall not be used for mining operations. Rainwater harvesting shall be implemented for conservation and augmentation of ground water resources.
3.6	Catch and/or garland drains and siltation ponds in adequate numbers and appropriate size shall be constructed around the mine working, coal heaps & OB dumps to prevent run off of water and flow of sediments directly into the river and water bodies. Further, dump material shall be properly consolidated/ compacted and accumulation of water over dumps shall be avoided by providing adequate channels for flow of silt into the drains. The drains/ ponds so constructed shall be regularly de-silted particularly before onset of monsoon and maintained properly. Sump capacity should provide adequate retention period to allow proper settling of silt material. The water so collected in the sump shall be utilised for dust suppression and green belt development and other industrial use. Dimension of the retaining wall constructed, if any, at the toe of the OB dumps within the mine to check run-off and siltation should be based on the rainfall data. The plantation of native species to be made between toe of the dump and adjacent field/habitation/water bodies.
3.7	Adequate groundwater recharge measures shall be taken up for augmentation of ground water. The project authorities shall meet water requirement of nearby village(s) after due treatment conforming

S. No	EC Conditions
	to the specific requirement (standards).
3.8	Industrial waste water generated from CHP, workshop and other waste water, shall be properly collected and treated so as to conform to the standards prescribed under the standards prescribed under Water Act 1974 and Environment (Protection) Act, 1986 and the Rules made there under, and as amended from time to time. Adequate ETP /STP needs to be provided.
3.9	The water pumped out from the mine, after siltation, shall be utilized for industrial purpose viz. watering the mine area, roads, green belt development etc. The drains shall be regularly desilted particularly after monsoon and maintained properly.
3.10	The surface drainage plan including surface water conservation plan for the area of influence affected by the said mining operations, considering the presence of river/rivulet/pond/lake etc, shall be prepared and implemented by the project proponent. The surface drainage plan and/or any diversion of natural water courses shall be as per the approved Mining Plan/EIA/EMP report and with due approval of the concerned State/GoI Authority. The construction of embankment to prevent any danger against inrush of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.
3.11	The project proponent shall take all precautionary measures to ensure riverine/riparian ecosystem in and around the coal mine up to a distance of 5 km. A rivarine/riparian ecosystem conservation and management plan should be prepared and implemented in consultation with the irrigation / water resource department in the state government.
3.12	Quality of polluted water generated from the operations which include COD and acid mine drainage and metal contamination shall be monitored along with TDS, DO, TSS. The monitored data shall be uploaded on the website of the company as well as displayed at the site in public domain.
3.13	Domestic water shall be providing to the residents/villages which are coming under the zone of influence of the project due to ground water extraction and mining operation by installing adequate number of RO plants with proper supply line and Taps within 2 years
3.14	No obselete technologies for sewage treatment shall be implemented. Construction of Sewage Treatment Plant with latest technology should be completed within 2 years and treated water shall be reused for plantation. CTE and CTO of STP shall be obtained as per the norms.

4. Noise And Vibration Monitoring And Prevention

S. No	EC Conditions
4.1	Adequate measures shall be taken for control of noise levels as per Noise Pollution Rules, 2016 in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc shall be provided with personal protective equipments (PPE) like ear plugs/muffs in conformity with the prescribed norms and guidelines in this regard. Adequate awareness programme for users to be conducted. Progress in usage of such accessories to be monitored.
4.2	Controlled blasting techniques shall be practiced in order to mitigate ground vibrations, fly rocks, noise and air blast etc., as per the guidelines prescribed by the DGMS.

S. No	EC Conditions
4.3	The noise level survey shall be carried out as per the prescribed guidelines to assess noise exposure of the workmen at vulnerable points in the mine premises, and report in this regard shall be submitted to the Ministry/RO on six-monthly basis.

5. Mining Plan

S. No	EC Conditions
5.1	5- Star Rating is mandatory to obtaine certification as per guidelines of Mininstry of Coal
5.2	Mining shall be carried out under strict adherence to provisions of the Mines Act 1952 and subordinate legislations made there-under as applicable.
5.3	Mining shall be carried out as per the approved mining plan (including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).
5.4	No mining shall be carried out in forest land without obtaining Forestry Clearance as per Forest (Conservation) Act, 1980.
5.5	Efforts should be made to reduce energy and fuel consumption by conservation, efficiency improvements and use of renewable energy.
5.6	PP shall adopt mining method by preferably using surface miners for the project and silo loading through in-pit conveyor should be adopted
5.7	Tranportation of coal till Railway Siding shall be developed to avoid transportation through Road

6. Land Recalmation

S. No	EC Conditions
6.1	Digital Survey of entire lease hold area/core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1:50,000 scale or as notified by Ministry of Environment, Forest and Climate Change(MOEFCC) from time to time shall be submitted to MOEFCC/Regional Office (RO).
6.2	The final mine void depth should preferably be as per the approved Mine Closure Plan, and in case it exceeds 40 m, adequate engineering interventions shall be provided for sustenance of aquatic life therein. The remaining area shall be backfilled and covered with thick and alive top soil. Post-mining land be rendered usable for agricultural/forestry purposes and shall be diverted. Further action will be treated as specified in the guidelines for Preparation of Mine Closure Plan issued by the Ministry of Coal dated 27th August, 2009 and subsequent amendments.
6.3	The entire excavated area, backfilling, external OB dumping (including top soil) and afforestation plan shall be in conformity with the “during mining”/”post mining” land-use pattern, which is an integral part of the approved Mining Plan and the EIA/EMP submitted to this Ministry. Progressive compliance status vis-a-vis the post mining land use pattern shall be submitted to the MOEFCC/RO.

S. No	EC Conditions
6.4	Fly ash shall be used for external dump of overburden, backfilling or stowing of mine as per provisions contained in clause (i) and (ii) of subparagraph (8) of fly ash notification issued vide SO 2804 (E) dated 3rd November, 2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from Flue Gas Desulfurization (FGD), if any, along with fly ash for external dump of overburden, backfilling of mines. Compliance report shall be submitted to Regional Office of MoEF&CC, CPCB and SPCB.
6.5	Further, it may be ensured that as per the time schedule specified in mine closure plan it should remain live till the point of utilization. The topsoil shall temporarily be stored at earmarked site(s) only and shall not be kept unutilized. The top soil shall be used for land reclamation and plantation purposes. Active OB dumps shall be stabilised with native grass species to prevent erosion and surface run off. The other overburden dumps shall be vegetated with native flora species. The excavated area shall be backfilled and afforested in line with the approved Mine Closure Plan. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment, Forest and Climate Change/ Regional Office.
6.6	The project proponent shall make necessary alternative arrangements, if grazing land is involved in core zone, in consultation with the State government to provide alternate areas for livestock grazing, if any. In this context, the project proponent shall implement the directions of Hon'ble Supreme Court with regard to acquiring grazing land.
6.7	Top soil should be stored separately at marked area and necessary vegetation shall be maintained to avoid any entrainment of dust
6.8	Progressive backfilling of mine and progressive reclamation of OB dump shall be done
6.9	Active OB Dump should not be kept barren/open and should be covered by temporary grass to avoid air born of particles
6.10	PP shall explore the possibilities of utilization of OB material for different purposes (in construction of roads/ manufacture of artificial sand, aggregates/ use for farmers etc.)
6.11	All approach roads to mine and all other roads which are in regular use should be black topped. The maintenance of road shall be done by PP in collaboration with state government
6.12	Hon’ble Supreme Court in an Writ Petition(s) Civil No. 114/2014, Common Cause vs Union of India & Ors vide its judgement dated 8th January, 2020 has directed the Union of India to impose a condition in the mining lease and a similar condition in the environmental clearance and the mining plan to the effect that the mining lease holders shall, after ceasing mining operations, undertake re-grassing the mining area and any other area which may have been disturbed due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, fauna etc. Compliance of this condition after the mining activity is over at the cost of the mining lease holders/Project Proponent”. The implementation report of the above said condition shall be sent to the Regional Office of the MoEF&CC

7. Green Belt

S. No	EC Conditions
7.1	The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered/endemic flora/fauna, if any, spotted/reported in the study area. The Action plan in this regard, if any, shall be prepared and implemented in consultation with the State Forest and Wildlife Department.
7.2	Greenbelt consisting of 3-tier plantation of width not less than 7.5 m shall be developed all along the mine lease area as soon as possible. The green belt comprising a mix of native species (endemic species should be given priority) shall be developed all along the major approach/ coal transportation roads. And Plantation should also be carried out in nearby area with consent of forest department and gram panchayat within 10 km radius with its proper maintanance

8. Public Hearing And Human Health Issues

S. No	EC Conditions
8.1	Adequate illumination shall be ensured in all mine locations (as per DGMS standards) and monitored weekly. The report on the same shall be submitted to this ministry & it's RO on six-monthly basis.
8.2	The project proponent shall undertake occupational health survey for initial and periodical medical examination of the personnel engaged in the project and maintain records accordingly as per the provisions of the Mines Rules, 1955 and DGMS circulars. Besides regular periodic health check-up, 20% of the personnel identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment, if any, as amended time to time.
8.3	Personnel (including outsourced employees) working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.
8.4	Implementation of the time bound action plan on the issues raised during the public hearing shall be ensured. The project proponent shall undertake all the tasks/measures as per the time bound action plan submitted with budgetary provisions during the public hearing. Land oustees shall be compensated as per the norms laid down in the R&R policy of the company/State Government/Central Government, as applicable.
8.5	The project proponent shall follow the mitigation measures provided in this Ministry's OM No.Z-11013/5712014-IA.I1 (M) dated 29th October, 2014, titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area'.
8.6	PP to conduct need based assessment survey of the area to for in order to decide the activities to be carried under the CSR and to provide detail of the activity carried out with adequate budgetary provision and time bound action plan.
8.7	PP should conduct epidemiology study to (analysis of the distribution, patterns and determinants of health and disease conditions in defined populations).
8.8	Permanent Health care facilities of Hospital should be established within 5 km of project boundary

S. No	EC Conditions
	for the local people.
8.9	PP must ensure an emergency action plan during pandemic in order to provide assistance to the nearby villages located within the 10 km radius buffer zone (If required)
8.10	PP is asked to also identify the rural areas for installation of solar light with its maintenance within the study area of 10 km radius buffer zone within one year
8.11	PP to take measure for installation of Renewable Energy sources in nearby area falling within 10 km radius
8.12	The illumination and sound at night at project sites disturb the villages in respect of both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right for darkness and minimal noise levels at night. PPs must ensure that the biological clock of the villages is not disturbed; by orienting the floodlights/ masks away from the villagers and keeping the noise levels well within the prescribed limits for day light/night hours
8.13	Adequate facility of drinking water, plantation and other social amenities should be provided to established R&R villages.
8.14	Persons of nearby villages shall be given training on livelihood and skill development to make them employable with its proper records.
8.15	Compensation of the land acquired for the project shall be settled as per the R&R Policy within fixed timeline

9. Corporate Environment Responsibility

S. No	EC Conditions
9.1	The company shall have a well laid down environmental policy duly approve by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental/forest/wildlife norms/conditions. The company shall have defined system of reporting infringements/deviation/violation of the environmental/forest/wildlife norms/conditions and/or shareholders/stake holders.
9.2	A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly to the head of the organization.
9.3	Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.
9.4	Self environmental audit shall be conducted annually. Every three years third party environmental

S. No	EC Conditions
	audit shall be carried out.
9.5	PP should establish in house (at project site) environment laboratory for measurement of environment parameter with respect to air quality and water (surface and ground. A dedicated team to oversee environment management shall be setup which should comprise of Environment Engineers, Laboratory chemist and staff for monitoring of air, water quality parameters on routine basis. Any non- compliance or infringement should be reported to the concerned authority

10. Miscellaneous

S. No	EC Conditions
10.1	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.
10.2	The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.
10.3	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.
10.4	The project proponent shall monitor the criteria pollutants level namely; PM10, SO2, NOx (ambient levels) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.
10.5	The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal.
10.6	The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.
10.7	The project authorities shall inform to the Regional Office of the MOEFCC regarding commencement of mining operations.
10.8	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.
10.9	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.
10.10	No further expansion or modifications in the plant shall be carried out without prior approval of the

S. No	EC Conditions
	Ministry of Environment, Forests and Climate Change.
10.11	Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.
10.12	The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.
10.13	The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.
10.14	The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/monitoring reports.
10.15	The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.

Additional EC Conditions

N/A

Annexure 2

Budgetary Provision for Public Hearing issues and EMP

Public Hearing Budget

Proposed Activities under Public Hearing Commitment Scheme		Place of Implementation	Phasing of Allocated proposed PH commitment Budget (Rs. Lakh)					
			Year-1	Year- 2	Year- 3	Year- 4	Year- 5	Total
Air & Water Pollution control measures	Different measures to control Air pollution/Water Pollution like utilization of water sprinklers, fixed sprinklers, fog canon etc.	Kosala village (NW), Sandhapal (NW) Natada (E), Ambapal (E)	80	80	80	80	80	**400**
Infrastructure development	Construction of Road, School, Solar Street lights supply, Cremation ground etc.	Villages - Kusumpal, Mallibandh, Ambapal,	50	50	50	50	50	**250**
Plantation	Plantation - Avenue & Community etc.	Kankarei, Pirakhamana, Raijharan, Balichandrapur	5	5	5	10	10	**35**
Healthcare	Health Care and vaccination,	**Health centres** - Angul DHH,	50	50	50	50	50	**250**

Proposed Activities under Public Hearing Commitment Scheme		Place of Implementation	Phasing of Allocated proposed PH commitment Budget (Rs. Lakh)					
			Year-1	Year- 2	Year- 3	Year- 4	Year- 5	Total
	awareness camp, mobile medical camp, Immunization, medicine etc.	Kosala CHC, Chhendipada CHC, Mandapada PHC **Villages** - Nisha, Kosala, Raijharan, Balichandrapur, Sandhapal						
Water & Sanitation	Drinking Water Supply and Construction of wells, ponds, hand pumps and tube wells	Village - Kumunda, Ambapal, Natada,	30	30	30	30	30	**150**
Education & Livelihood Generation	Skill Development Training, Support to schools and other educational institutions	Kankarei High School, Kosala High School, Raijharan High School	30	30	30	30	30	**150**
Total			**245**	**245**	**245**	**250**	**250**	**1235**

(B) EMP budgetary provision (Capital and Recurring)

	Activity / Item	Units	Unit Cost	Capital Cost	Recurring Cost
1.	**Air Pollution Control**				
a	Truck Mounted Tankers with Mist Spray Sprinkling Arrangement for Haul Roads/Mine/Safety zone etc.	2	35	70	10
b	Mobile Water Mist Spray Sprinkler / truck mounted fog cannon for coal transportation route	1	50	50	6
c	Fixed type Mist spray at Coal stock pile/crusher/Transfer Points etc.	2	15	30	5
d	Wind Barrier Wall & Vertical Greenery System at proposed Railway Siding	LS	LS	30	4
e	Fixed fog cannons at coal stockyard	4	10	40	4
f	CAAQMS	2	15	30	3
Sub Total				**250**	**32**
2.	**Water Pollution Control**				
a	Garland Drain	LS	LS	60	10
b	Effluent Treatment Plant (ETP)	1	LS	90	9
c	Sewage Treatment Plant (STP)	1	LS	40	6
d	Mine Water Sedimentation Pond & Pumps	1	20	20	5
Sub Total				**210**	**30**
3.	**Noise Control**				
a	Noise Pollution Control Measures	LS	LS	100	20
Sub Total				**100**	**20**

4.	**Conservation of Natural Resources**				
a	Solar lighting arrangement	50	0.7	35	2
b	Pond Conservation of 06 ponds outside the lease area	LS	LS	100	5
c	Soil Preservation (Biological Reclamation)	LS	LS	25	2
Sub Total				**160**	**9**
5.	**Reclamation & Nursery Development**				
a	Green Belt Development & Avenue Plantation etc.	LS	LS	500	55
Sub Total				**500**	**55**
6.	**Fire Fighting Equipment**				
a	Fire tender	1	100	100	10
b	Advance Fire fighting equipment, Fire extinguisher, smoke detectors (for office and workshop), fire Automatic Fire Detection and alarm system etc.	10	30	300	30
Sub Total				**400**	**40**
7.	**Occupational Health**				
a	Personnel Protection Equipment (Ear muffs/plugs, Goggles, Gloves, Helmets, Dust Mask, Safety Boots)	1500	LS	50	10
Sub Total				**50**	**10**
8.	**Miscellaneous**				
a	Awareness Programme (Display Boards (Digital) etc.	-	LS	30	2
b	CCTV camera for monitoring loading and transport, mine blast, fire, dust generation monitoring,	LS	LS	10	1

c	Equipment for Plantation O & M like water tanker, tractor with trolley, other equipment	LS	LS	50	2
Sub Total				**90**	**5**
9.	Public Hearing Budget			**1235**	**0**
Total Cost (Rs. Lakhs)				**2995**	**201**

e-KYC
CAF
DSS
e-Processing
e-Payments
e-Compliance
KYA
PARIVESH
CPC GREEN
Nature Protects if She is Protected

ANNEXURE - A/2

Proposal No. IA/OR/CMIN/445297/2023 regarding EIA Clearance of Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Tachler Sadar and Chhendipada, District Angul (Odisha) - reg.

From: S K Mishra (sanjayakmishra@yahoo.co.in)

To: lk.bokolia@nic.in

Date: Monday, January 15, 2024 at 01:59 PM GMT+5:30

Shri Lalit Bokolia
Member Secretary, Expert Appraisal Committee
Coal Mine Projects
Ministry of Environment, Forest and Climate Change
Govt. of India

Sir,

The Expert Appraisal Committee under your Chairmanship, in the meeting held from 16/11/2023 to 17/11/2023, scrutinized the Online proposal No. IA/OR/CMIN/445297/2023; File No. IA-J-11015/72/2021- IA-II(M) pertaining to Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Tachler Sadar and Chhendipada, District Angul (Odisha).

The EIA/EMP report are found to be prepared by M/s Vardan EnviroNet, Gurugram.

The Committee has deferred the decision.

Looking into the Test Reports issued on 09.01.2023 available at Welcome to PARIVESH it is found that for the entire period of monitoring carried out between 03.10.2022 to 31.12.2022, the parameter Benzene is reported to be below detection limit, which is 0.5 microgram per cubic meter in all the stations. The villages in which the laboratory has carried out monitoring are named as: Pidhakhamana, Tangarsahi, Kosala, Korada, Kalikatta, Golabandha, Kumunda, Malibrahmani, Brah manbil, Kalamchhuin, Chhotagolagadia.

I would like to bring it your kind information that the results reported in respect of Benzene in all the villages for the month of December 2022 needs a review. There are some other findings which show that in December 2022, the Benzene concentration in all these villages found to be varying between 2.2 to 6.4 microgram per cubic meter. The maximum was found in Golabandha.

An improper consideration of baseline data may lead to unjustified decision on environmental impact. **Therefore, my humble submission before Your Committee is to review/reassess the data submitted.**

Best regards,
Sincerely,

Sanjaya Kumar Mishra
AIBE Certified Lawyer | Honourary Editor, Enviro Annotations
Odisha Contact: Priya Nilayam, Maszid Chowk, Balangir 767001 (Odisha)
Delhi NCR Contact: 115, Sagar Enclave, Sector - 104, Near Dwarka Expressway MGF Toyota, Gurugram (Gurgaon) 122006

Proposal No. IA/OR/CMIN/445297/2023 regarding EIA Clearance of Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Tachler Sadar and Chhendipada, District Angul (Odisha) - reg.

From: S K Mishra (sanjayakmishra@yahoo.co.in)

To: amit.vashishtha@nic.in; sharadnegi1957@gmail.com

Cc: enviroannotations@gmail.com

Date: Saturday, February 10, 2024 at 01:41 PM GMT+5:30

Shri Amit Vashishtha, Scientist E
Member Secretary, Expert Appraisal Committee
Coal Mine Projects
Ministry of Environment, Forest and Climate Change
Govt. of India

Sir,

Despite my grievance addressed to the Member Secretary, EAC Coal Mine Projects dated 15.01.2024 (copy attached in pdf) on the Proposal No. IA/OR/CMIN/445297/2023 regarding EIA Clearance of Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Tachler Sadar and Chhendipada, District Angul (Odisha), the EAC has recommended the project for grant of EC in its meeting dated 17/01/2024 to 18/01/2024.

The grievance was as follows:

***
The EIA/EMP report are found to be prepared by M/s Vardan EnviroNet, Gurugram.

The Committee has deferred the decision.

Looking into the Test Reports issued on 09.01.2023 available at Welcome to PARIVESH it is found that for the entire period of monitoring carried out between 03.10.2022 to 31.12.2022, the parameter Benzene is reported to be below detection limit, which is 0.5 microgram per cubic meter in all the stations. The villages in which the laboratory has carried out monitoring are named as: Pidhakhamana, Tangarsahi, Kosala, Korada, Kalikatta, Golabandha, Kumunda, Malibrahmani, Brahmanbil, Kalamchhuin, Chho tagolagadia.

I would like to bring it your kind information that the results reported in respect of Benzene in all the villages for the month of December 2022 needs a review. There are some other findings which show that in December 2022, the Benzene concentration in all these villages found to be varying between 2.2 to 6.4 microgram per cubic meter. The maximum was found in Golabandha.

An improper consideration of baseline data may lead to unjustified decision on environmental impact. **Therefore, my humble submission before Your Committee is to review/reassess the data submitted.**
***

I would appreciate if you let me know about any action initiated on the grievance.

Best regards,
Sincerely,

Sanjaya Kumar Mishra
AIBE Certified Lawyer | Honourary Editor, Enviro Annotations
Odisha Contact: Priya Nilayam, Maszid Chowk, Balangir 767001 (Odisha)
Delhi NCR Contact: 115, Sagar Enclave, Sector - 104, Near Dwarka Expressway MGF Toyota,
Gurugram (Gurgaon) 122006
Mobile: 9818326647

Grievance-1 on MCL 15.01.2024.pdf
101.6kB

Proposal No. IA/OR/CMIN/445297/2023 regarding EIA Clearance of Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Tachler Sadar and Chhendipada, District Angul (Odisha) - reg.

From: S K Mishra (sanjayakmishra@yahoo.co.in)

To: amit.vashishtha@nic.in

Cc: sharadnegi1957@gmail.com

Date: Tuesday, March 12, 2024 at 01:33 PM GMT+5:30

Shri Amit Vashishtha, Scientist E
Member Secretary, Expert Appraisal Committee
Coal Mine Projects
Ministry of Environment, Forest and Climate Change
Govt. of India

Reference / List of Dates:

15/01/2024 - Email from my email id sanjayakmishra@yahoo.co.in to Member Secretary, EAC (Coal) Mining Projects on the Subject “Proposal No. IA/OR/CMIN/445297/2023 regarding EIA Clearance of Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Tachler Sadar and Chhendipada, District Angul (Odisha) - reg.”

10/02/2024 - Email from my email id sanjayakmishra@yahoo.co.in to Member Secretary, EAC (Coal) Mining Projects on the Subject as mentioned above

24/02/2024 - EAC MoM has deliberated on the subject, however, it does not mention complainant’s name

12/03/2024 - No further response/reply

Sir,

I wish to draw your attention to the deliberations under Agenda 7.14, as documented on page 311 of the recent proceedings dated 24/02/2024. It is my presumption that these discussions are pertinent to the concerns outlined in my previous complaint.

In the 3rd paragraph it is stated that "The Committee noted that the allegation made by the complainant is without any documentary proof to support his argument". I have document and I can produce, wherever required. But being a complainant, with limited resources, I have gathered documents, which may be not traceable in terms of quality management. However, as a complainant with limited resources, the documents gathered may not meet the stringent criteria of quality management. In contrast, MCL, being the project proponent, along with the NABET and NABL Accredited organizations, the EIA Consultant and Laboratory, are likely to possess traceable documents. It is imperative to scrutinize their data and information due to its inherent significance.

At page number 313 it is stated that "As mentioned above, the testing of Benzene was done as per IS: 5182 (P-11): 2006 RA: 2017 Standards using the GC-FID Method. (Indian Standard Methods for Measurement of Air Pollution is attached for reference as Annexure- 2)". Sir, please note that IS 5182 Part 11 has given 3 methods. And a suo-moto statement does not clarify which method was followed. It is essential to examine the sample trail, preservation, time between sampling and sample testing, and the related back-end data such as peaks/graphs. If such documents and evidence are enclosed in Annexure-2, as referred, please be requested to provide.

Further, the IS 5182 Part 11 does not mention about Limit of Quantification (LOQ) as reported in Laboratory's reports as well as EAC's MoM. Therefore, claiming "This is to confirm that the baseline data generation and its testing was done as per the approved Protocols for Ambient Air Quality Monitoring." seems to be unconvincing. The method specifies "detection limits". It states that the detection limit for atmospheric monitoring vary depending on several key factors: - (a) Sample storage condition, (b) Injection volume, (c) Minimum artifact levels, (d) GC detector selection, and (e) Volume of air sampled. The volume of air sampled is in turn dependent upon a series of variables including SSVS, pump flow rate limitations and time-weighted-average monitoring time constraints.

I would be grateful if you could provide information on any actions initiated concerning my grievance.

Thank you for your attention to this matter.

Best regards,
Sincerely,

Sanjaya Kumar Mishra
AIBE Certified Lawyer | Honourary Editor, Enviro Annotations
Odisha Contact: Priya Nilayam, Maszid Chowk, Balangir 767001 (Odisha)
Delhi NCR Contact: 115, Sagar Enclave, Sector - 104, Near Dwarka Expressway MGF Toyota, Gurugram (Gurgaon) 122006
Mobile: 9818326647
Alternative Email: sanjayakmishra@gmail.com, sanjayakmishra@hotmail.com

Copy to: Chairman, Expert Appraisal Committee

ANNEXURE - A/3

Additional Agenda:

Agenda:7.14

6th EAC Meeting (Agenda No 6.1) Subhadra Open Cast Mine with production capacity of 25 MTPA in mine lease area of 1111.85 ha of M/s Mahanadi Coalfield Limited located at Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil Tachler Sadar and Chhendipada, District Angul (Odisha) – Reconsideration for Environmental Clearance – reg.

[Proposal No. IA/OR/CMIN/445297/2023; File No. IA-J-11015/72/2021- IA-II(M)]

Member Secretary informed the Committee that after the approval of the MoM for this agenda item a complaint was received against the project on 10/02/2024. The Committee noted that the complaint was addressed previous Member Secretary and now forwarded to the new Member Secretary.

The Committee observed that in the complaint it has mentioned that *"I would like to bring it your kind information that the results reported in respect of Benzene in all the villages for the month of December 2022 needs a review. There are some other findings which show that in December 2022, the Benzene concentration in all these villages found to be varying between 2.2 to 6.4 microgram per cubic meter. The maximum was found in Golabandha."*

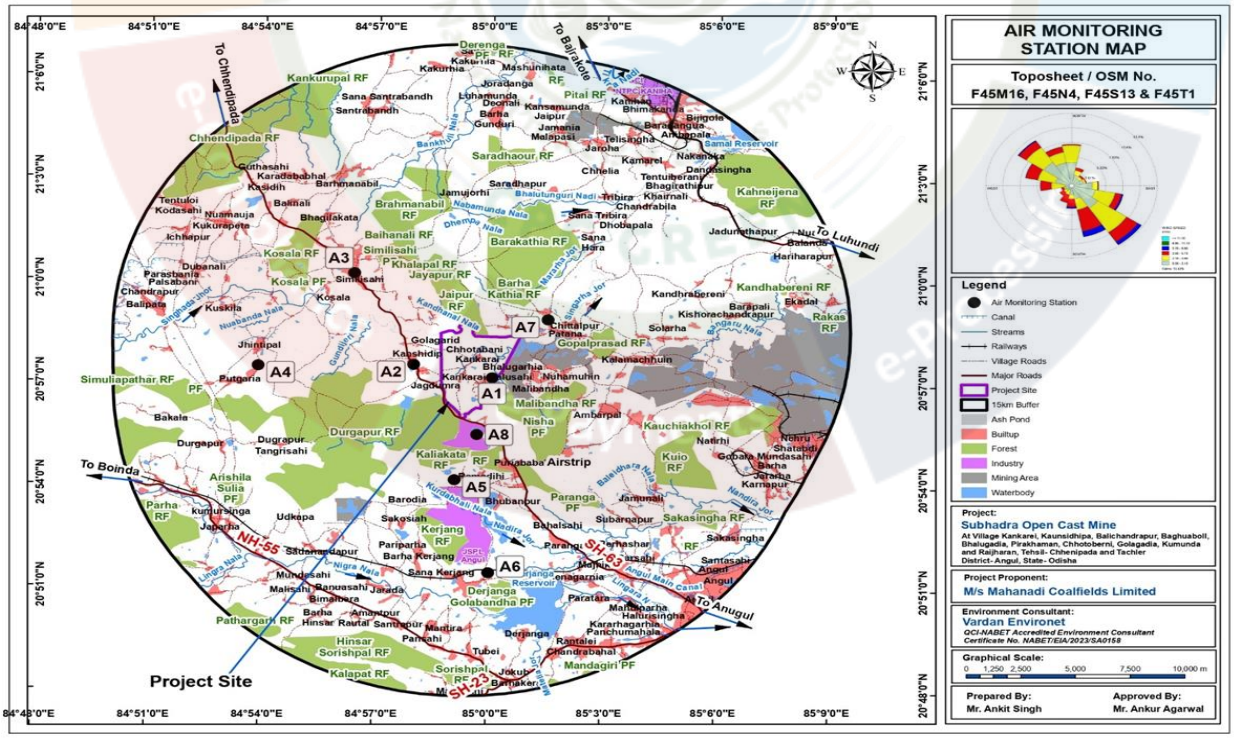
The Committee noted that the allegation made by the complainant is without any documentary proof to support his argument. However, the Committee is of the view that PP may be asked to clarify on this issue. Member secretary informed that, an email in this regard has already been sent to PP on 13/02/2024 as per direction of the EAC.

Committee noted that PP vide email date 20/02/2024 submitted its justification wherein it has mentioned that:

Vardan EnviroLab a NABL Accredited Lab based in Gurgaon, Haryana was engaged for carrying out Baseline Monitoring Environmental Study during the period from October to December 2022. The environmental study conducted was in accordance with the guidelines of EIA issued by the Ministry of Environment Forests and Climate Change, Govt. of India and Central Pollution Control Board, New Delhi.

The locations of the Air Monitoring were as follows:

Stations	Name	Distance in Km	Latitude	Longitude
A1	Project Site	-	20° 57' 36.707" N	84° 59' 28.969" E
A2	Village Tangarasahi	1.27	20° 57' 33.378" N	84° 57' 59.721" E
A3	Village Kosala	1.02	20° 58' 49.664" N	84° 58' 15.542" E
A4	Village Korada	8.4	20° 57' 29.610" N	84° 53' 53.934" E
A5	Village Kaliakata	3.34	20° 54' 11.191" N	84° 59' 6.014" E
A6	Golabandha	8.45	20° 51' 27.956" N	85° 0' 1.713" E
A7	Village Kumunda	1.40	20° 58' 53.749" N	85° 1' 31.201" E
A8	Malibrabmani	1.02	20° 55' 31.211" N	84° 59' 40.727" E



*Laboratory analysis of the test samples collected during the period as stated above in all the location for Benzene were found to be within the prescribed NAAQS Limit. (Lab Report is attached as **Annexure-1**)*

The different techniques Adopted/Protocols for Ambient Air Quality Monitoring are as follows.

S. No	Parameters	Techniques	TechnicalProtocol
1	SulphurDioxide(SO_2)	West&Gaeke	IS:5182(P2)
2	Nitrogen Dioxide(NO_2)	Jacob& Hochheiser	IS:5182(P6)
3	ParticulateMatterPM$_{10}$	Gravimetric	IS:5182(P23)
4	ParticulateMatterPM$_{2.5}$	Gravimetric	IS:5182 (P24)
5	Carbon-monoxide as CO	NDIR	IS:5182(P-10)
6	Ammonia	Spectrophotometric Method	IS 5182 (P-25): 2018
7	Arsenic	ICPMS/AAS Method	VEL/ENV/STP/110, Issue No. 01 dated on 01/11/2021
8	Benzene	GC-FID Method	IS: 5182 (P-11): 2006 RA: 2017
9	Benzo(a)pyrene	GC-FID Method	IS: 5182 (P-12): 2004, RA: 2019
10	Lead	ICPMS/AAS Method	IS: 5182 (P-22):2004 RA: 2019
11	Nickel	ICPMS/AAS Method	IS: 5182 (P-26), 2020
12	Ozone	Spectrophotometric Method	IS 5182 (P-9):1974 RA: 2019
13	Mercury as Hg	ICPMS/AAS Method	VEL/ENV/STP/129, Issue No. 01 dated on 01/11/2021

*As mentioned above, the testing of Benzene was done as per IS: 5182 (P-11): 2006 RA: 2017 Standards using the GC-FID Method. (Indian Standard Methods for Measurement of Air Pollution is attached for reference as **Annexure- 2**)*

The test results show that the level of Benzene in all the locations was BLQ (Below Limit of Quantification, Limit of Quantification (LOQ) is 0.5 µg/m^3) and was as per NAAQS prescribed limits for Benzene i.e. 5.0µg/m^3 (https://cpcb.nic.in/upload/NAAQS_2019.pdf) both within the core and buffer zone of Subhadra OCP of MCL.

Besides, the study results at 02 below mentioned locations (which are nearer to Subhadra OCP of MCL) of Central Control Room for Air Quality Management - All India, Govt of India (https://airquality.cpcb.gov.in) during the period from October to December 2022, for

*Benzene vide CAAQMS (CPCB) were found within the NAAQS Standards. (Reports Attached for Reference as **Annexure-3 & 4**).*

Locations of CAAQMS (CPCB) monitoring stations:

1) *Hakimapada Angul (Distance of 15 Km from Project Site and 5 Km from Buffer Zone)*
2) *Talcher Coalfields,Talcher (Distance of 17 Km from Project Site and 7Km from Buffer Zone)*

Location Positions

This is to confirm that the baseline data generation and its testing was done as per the approved Protocols for Ambient Air Quality Monitoring.

Hence, *the Benzene concentration in all these villages found to be as per the study and as per CPCB reports (reference CPCB station-Hakim pada Station nearer to Golabandha Village which is approx. 11 km) found to be within prescribed limits during the period October-December 2022.*

The Committee noted that EIA/EMP report is prepared by the NABET Accredited consultant and PP also submitted an undertaking in the form-1 that "data *and information given in the application and enclosures are true to be best of my knowledge and belief and I am aware that if any part of the data and information is found to be false or misleading at any stage, the project will be rejected and clearance given if any to the project will be revoked at our risk and cost."*Therefore, in the absence of any proof by the complainant the Ministry may take further necessary action as per recommendation already given by the EAC.

*****

ANNEXURE - A/4.

® Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/01-026	Report No:	VEL/AA/001-026
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenlpada, District- Angul, State- Odisha	Reporting Date:	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
Sample Collected By:	Vardan Envirolab Representative	Protocol Used:	IS-5182& CPCB Guidelines
Sample Description:	Ambient Air Quality Monitoring	Parameter Required:	As per TOR Letter
Location:	Project Site (Pidhakhamana) (A1)		

RESULTS

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	SO_2 (µg/m³)	CO (mg/m³)	Ozone (µg/m³)	NH_3 (µg/m³)	Benzene (µg/m³)	B(a) P (ng/m³)	Arsenic (ng/m³)	Nickel (ng/m³)	Lead (µg/m³)	Mercury (ng/m³)
07.10.2022	67.5	42.6	36.8	41.3	0.89	24.3	33.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.10.2022	66.9	45.1	37.2	40.9	0.92	23.1	32.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
11.10.2022	64.2	44.7	35.9	39.8	0.86	21.5	35.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.10.2022	65.8	43.9	34.1	38.6	0.99	24.6	36.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
18.10.2022	68.0	46.2	36.6	42.5	1.03	25.2	31.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.10.2022	69.3	45.1	33.2	40.7	0.87	26.7	34.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
25.10.2022	71.4	44.7	32.7	43.7	0.93	22.1	32.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.10.2022	70.8	43.9	31.9	44.3	1.04	23.9	33.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
01.11.2022	66.8	42.1	38.4	42.6	0.95	24.6	34.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
04.11.2022	67.2	44.7	36.5	41.9	0.89	22.9	35.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.11.2022	72.3	45.0	37.8	40.8	1.03	21.2	36.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
11.11.2022	70.9	42.9	33.9	43.6	0.86	24.6	33.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.11.2022	65.8	43.7	32.8	39.4	1.03	23.7	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
18.11.2022	66.0	44.6	31.6	38.6	1.10	25.4	34.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.11.2022	67.2	45.5	34.5	40.8	0.94	24.6	35.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
25.11.2022	68.9	46.2	35.7	42.3	0.87	26.1	36.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.11.2022	71.2	43.7	36.4	41.3	1.02	25.0	32.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
02.12.2022	70.5	42.1	38.6	44.5	1.09	24.7	31.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
06.12.2022	72.6	45.9	37.0	40.9	0.90	23.8	32.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.12.2022	69.3	44.6	33.9	39.5	0.86	21.9	33.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
13.12.2022	68.4	46.7	32.8	38.6	1.05	24.6	34.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
16.12.2022	67.2	43.8	31.6	41.2	0.93	22.7	35.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
20.12.2022	66.6	44.0	34.6	44.6	0.87	26.1	36.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
23.12.2022	65.1	42.9	35.8	43.7	1.06	25.0	34.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
27.12.2022	64.6	45.1	36.7	42.5	0.86	24.3	35.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
30.12.2022	68.7	46.8	38.0	41.0	0.94	22.5	32.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	–

Note- Arsenic (LOQ- 0.1ng/m³), Benzene (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³)*BLQ- BelowLimit of Quantification, *LOQ- Limit of Quantification

VARDAN ENVIROLAB (Checked By) Kusum

VARDAN ENVIROLAB (Approved By) Pratap Singh

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VEL/E-03/1/1R/PM23750

® Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/027-052	Report No:	VEL/AA/027-052
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	Reporting Date:	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
		Protocol Used:	IS-5182& CPCB Guidelines
Sample Collected By:	Vardan Envirolab Representative	Parameter Required:	As per TOR Letter
Sample Description:	Ambient Air Quality Monitoring		
Location:	Tangarasahi (A2)		

RESULTS

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	SO_2 (µg/m³)	CO (mg/m³)	Ozone (µg/m³)	NH_3 (µg/m³)	Benzène (µg/m³)	B(α) P (ng/m³)	Arsenic (ng/m³)	Nickel (ng/m³)	Lead (µg/m³)	Mercury (ng/m³)
07.10.2022	62.3	38.4	31.6	35.9	0.83	19.6	31.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.10.2022	61.8	41.2	30.8	36.2	0.91	21.5	30.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
11.10.2022	67.4	40.6	29.5	34.7	0.79	18.3	32.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.10.2022	65.9	42.7	32.9	33.8	0.83	22.4	33.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
18.10.2022	66.3	39.5	27.6	38.9	0.96	20.8	28.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.10.2022	64.7	38.4	29.4	37.5	0.87	19.5	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
25.10.2022	59.8	36.7	31.5	35.6	0.88	21.3	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.10.2022	65.3	37.5	28.9	36.4	0.79	20.5	29.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
01.11.2022	67.1	39.5	32.4	33.8	0.93	18.0	32.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
04.11.2022	64.9	41.8	27.5	32.9	0.95	22.6	33.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.11.2022	65.2	40.3	30.6	38.4	0.85	19.4	30.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
11.11.2022	61.8	39.5	31.8	39.5	0.92	18.8	29.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.11.2022	62.7	38.4	29.5	35.2	0.97	21.2	32.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
18.11.2022	63.8	36.2	32.6	34.7	0.91	22.6	31.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.11.2022	64.5	38.4	30.8	33.6	0.80	20.7	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
25.11.2022	65.7	40.5	31.6	35.8	0.79	18.4	33.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.11.2022	62.9	41.2	27.8	36.7	0.94	22.6	32.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
02.12.2022	59.4	42.7	29.4	39.2	0.86	21.5	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
06.12.2022	61.9	38.9	28.5	37.4	0.93	20.5	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.12.2022	60.8	36.7	32.7	36.5	0.97	19.3	29.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
13.12.2022	62.7	38.7	31.2	33.8	0.92	22.7	32.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
16.12.2022	66.3	39.0	29.7	35.6	0.88	21.5	33.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
20.12.2022	65.8	41.6	31.6	34.7	0.95	18.9	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
23.12.2022	64.2	40.7	30.8	32.8	0.85	21.2	28.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
27.12.2022	62.9	42.2	32.9	37.6	0.96	19.5	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
30.12.2022	61.5	39.1	27.3	39.4	0.79	20.1	29.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	--

Note- Arsenic (LOQ- 0.1ng/m³), Benzène (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³)*BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Checked By) Kushal Sharma

(Approved By) Pratap Singh

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VEL/E-03/1/TR/PN23715

® Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/053-078	**Report No:**	VEL/AA/053-078
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	**Reporting Date:**	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
		Protocol Used:	IS-5182& CPCB Guidelines
Sample Collected By:	Vardan Envirolab Representative	**Parameter Required:**	As per TOR Letter
Sample Description:	Ambient Air Quality Monitoring		
Location:	Kosala (A3)		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)	Ozone ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	Benzène ($\mu g/m^3$)	B(α) P (ng/m^3)	Arsenic (ng/m^3)	Nickel (ng/m^3)	Lead ($\mu g/m^3$)	Mercury (ng/m^3)
03.10.2022	63.8	41.6	31.9	37.6	0.79	23.6	31.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
06.10.2022	64.9	40.8	33.5	35.9	0.85	21.2	30.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.10.2022	67.3	43.7	30.9	39.4	0.92	19.5	32.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
13.10.2022	66.2	42.6	29.6	33.9	0.76	20.8	29.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.10.2022	68.4	39.5	31.6	35.7	0.88	20.6	28.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
20.10.2022	69.3	38.7	32.7	36.1	0.92	22.7	33.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.10.2022	65.3	43.6	34.5	39.4	0.76	21.6	32.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
27.10.2022	64.7	40.8	33.9	36.7	0.91	23.4	30.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
31.10.2022	63.8	41.7	31.6	35.2	0.87	19.5	34.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
03.11.2022	69.3	38.4	30.5	40.5	0.93	21.6	32.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
07.11.2022	68.1	37.6	29.0	41.6	0.77	20.5	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.11.2022	66.7	39.2	32.4	38.9	0.84	22.9	30.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.11.2022	65.3	41.7	31.6	39.4	0.91	23.4	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.11.2022	62.9	42.5	33.5	36.4	0.79	21.5	32.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.11.2022	61.5	40.5	34.2	37.5	0.88	20.6	29.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.11.2022	64.3	38.0	31.6	41.3	0.94	19.8	31.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.11.2022	65.7	41.9	32.8	40.8	0.86	21.5	30.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
01.12.2022	66.8	42.2	29.5	38.4	0.93	20.6	33.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
05.12.2022	68.3	43.7	32.7	35.6	0.78	22.8	34.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.12.2022	69.4	38.4	33.4	36.7	0.80	23.9	31.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.12.2022	63.8	39.6	29.6	34.8	0.92	21.2	32.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.12.2022	64.5	40.7	32.5	39.5	0.78	20.5	29.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.12.2022	63.8	41.8	31.2	41.6	0.93	19.8	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.12.2022	65.2	42.3	30.0	40.5	0.88	22.6	32.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.12.2022	66.3	37.6	29.6	38.0	0.94	21.2	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.12.2022	61.0	42.3	33.7	39.4	0.78	20.8	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	--

Note- Arsenic (LOQ- 0.1ng/m³), Benzène (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³)*BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

VARDAN ENVIROLAB GURUGRAM (Checked By) Kushal

VARDAN ENVIRO (Approved By) Pradeep Singh

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VEL/E-03/1/TR/PH25714

® Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/079-104	**Report No:**	VEL/AA/079-104
Name & Address of the Project:	M/s Subhadra Open Cast Mine, At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	**Reporting Date:**	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
		Protocol Used:	IS-5182& CPCB Guidelines
Sample Collected By:	Vardan Envirolab Representative	**Parameter Required:**	As per TOR Letter
Sample Description:	Ambient Air Quality Monitoring		
Location:	Korada (A4)		

RESULTS

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	SO_2 (µg/m³)	CO (mg/m³)	Ozone (µg/m³)	NH_3 (µg/m³)	Benzène (µg/m³)	B(α) P (ng/m³)	Arsenic (ng/m³)	Nickel (ng/m³)	Lead (µg/m³)	Mercury (ng/m³)
03.10.2022	53.6	28.1	23.9	26.4	0.63	16.2	28.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
06.10.2022	51.2	29.6	21.2	23.8	0.59	15.1	29.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.10.2022	55.7	30.5	20.8	21.2	0.61	18.4	27.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
13.10.2022	54.9	32.4	24.6	30.6	0.57	17.6	25.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.10.2022	56.1	31.6	23.5	28.4	0.60	16.1	26.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
20.10.2022	52.7	29.4	25.1	27.6	0.58	17.5	29.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.10.2022	53.4	32.8	22.9	26.9	0.62	18.9	25.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
27.10.2022	56.8	31.5	24.2	22.6	0.50	15.7	27.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
31.10.2022	55.2	30.9	23.6	21.8	0.61	16.8	26.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
03.11.2022	54.2	29.1	21.5	24.5	0.54	18.4	25.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
07.11.2022	51.9	28.4	20.8	23.9	0.63	16.6	29.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.11.2022	52.7	32.6	25.9	25.7	0.59	15.9	28.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.11.2022	53.8	31.7	24.6	26.8	0.62	17.2	26.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.11.2022	54.6	30.8	23.7	27.2	0.57	18.0	25.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.11.2022	55.6	28.9	22.5	28.4	0.62	17.3	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.11.2022	53.8	29.4	21.2	29.3	0.59	16.5	29.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.11.2022	52.9	32.5	23.6	21.6	0.63	15.9	26.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
01.12.2022	56.1	30.6	24.7	30.5	0.52	17.1	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
05.12.2022	54.3	31.1	25.1	25.6	0.60	18.6	29.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.12.2022	52.8	29.4	20.6	27.2	0.55	15.9	26.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.12.2022	51.6	32.5	22.8	29.4	0.63	17.7	25.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.12.2022	53.0	31.0	24.6	30.0	0.50	16.2	28.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.12.2022	52.9	30.9	23.0	22.6	0.63	18.0	27.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.12.2022	55.4	29.4	22.9	23.7	0.55	16.6	29.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.12.2022	51.6	28.6	20.5	24.9	0.61	15.9	26.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.12.2022	56.4	32.5	21.8	25.1	0.59	18.4	25.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	–

Note- Arsenic (LOQ- 0.4ng/m³), Benzène (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³), *BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Reviewed By)

(Approved By)
Gaurav Pratap Singh

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VEL/E-037/TR/PN23715

® Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	**VEL/SOCM/AA/105-130**	**Report No:**	**VEL/AA/105-130**
Name & Address of the Project:	**M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha**	**Reporting Date:**	**09/01/2023**
		Ref. No:	**NIL**
		Monitoring Period:	**October 2022 to December 2022**
		Equipment Used:	**RDS & FPS with all accessories**
		Protocol Used:	**IS-5182& CPCB Guidelines**
Sample Collected By:	**Vardan Envirolab Representative**	**Parameter Required:**	**As per TOR Letter**
Sample Description:	**Ambient Air Quality Monitoring**		
Location:	**Kalikatta (A5)**		

RESULTS

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	SO_2 (µg/m³)	CO (mg/m³)	Ozone (µg/m³)	NH_3 (µg/m³)	Benzène (µg/m³)	B(a) P (ng/m³)	Arsenic (ng/m³)	Nickel (ng/m³)	Lead (µg/m³)	Mercury (ng/m³)
03.10.2022	63.4	38.4	28.6	35.9	0.86	20.3	28.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
06.10.2022	61.2	39.6	29.4	33.6	0.76	21.2	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.10.2022	60.9	35.4	30.9	37.8	0.82	19.4	30.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
13.10.2022	59.4	34.2	26.3	36.2	0.75	18.5	26.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.10.2022	61.0	37.6	25.8	34.8	0.81	17.6	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
20.10.2022	64.3	36.8	28.4	33.9	0.73	21.2	32.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.10.2022	65.8	40.5	30.5	32.5	0.89	18.3	31.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
27.10.2022	62.9	38.9	27.9	37.6	0.77	19.4	30.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
31.10.2022	63.6	39.1	25.4	36.7	0.84	20.4	27.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
03.11.2022	64.1	36.7	29.1	35.2	0.75	21.0	26.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
07.11.2022	62.8	35.2	31.2	34.9	0.88	18.6	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.11.2022	60.9	34.6	26.7	32.8	0.76	17.5	32.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.11.2022	59.8	38.1	29.4	35.7	0.82	19.3	30.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.11.2022	58.3	37.6	28.3	36.2	0.76	21.5	29.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.11.2022	62.7	38.1	26.0	37.9	0.80	20.0	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.11.2022	63.4	39.2	30.7	32.8	0.76	18.6	32.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.11.2022	64.7	40.5	29.1	34.9	0.84	19.4	30.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
01.12.2022	65.0	38.8	27.3	35.6	0.79	21.2	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
05.12.2022	61.9	36.7	25.1	34.8	0.83	17.3	29.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.12.2022	58.6	37.2	29.3	32.5	0.77	21.2	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.12.2022	62.9	40.2	31.6	33.7	0.82	20.6	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.12.2022	63.7	39.6	28.3	37.6	0.76	18.5	32.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.12.2022	64.2	35.4	29.7	35.4	0.81	19.7	26.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.12.2022	61.9	34.6	28.4	34.9	0.75	21.2	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.12.2022	60.0	38.7	25.6	32.5	0.89	20.6	27.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.12.2022	59.3	39.1	31.8	33.6	0.74	18.6	29.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	--

Note- Arsenic (LOQ- 0.1ng/m³), Benzene (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³) *BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Checked By) Kushal Sharma

(Approved By) Pratap Singh

VEL/E-03/11/TR/PN 23712

® Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/131-156	**Report No:**	VEL/AA/131-156
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	**Reporting Date:**	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
		Protocol Used:	IS-5182& CPCB Guidelines
Sample Collected By:	Vardan Envirolab Representative	**Parameter Required:**	As per TOR Letter
Sample Description:	Ambient Air Quality Monitoring		
Location:	Golabandha (A6)		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)	Ozone ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	B(α) P (ng/m^3)	Arsenic (ng/m^3)	Nickel (ng/m^3)	Lead ($\mu g/m^3$)	Mercury (ng/m^3)
07.10.2022	68.4	49.3	35.7	42.6	1.00	26.4	33.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.10.2022	69.5	48.4	36.1	46.2	0.91	24.9	34.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
11.10.2022	71.3	46.5	39.4	44.1	1.04	27.8	35.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.10.2022	70.9	45.7	38.7	43.6	1.12	28.1	37.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
18.10.2022	72.4	50.2	41.2	42.9	0.96	29.6	36.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.10.2022	73.4	51.9	40.6	44.7	1.09	27.1	35.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
25.10.2022	68.0	49.3	38.4	45.1	1.07	24.5	39.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.10.2022	71.2	48.7	39.1	46.7	1.13	25.3	37.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
01.11.2022	70.9	46.6	36.2	45.6	0.91	26.8	36.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
04.11.2022	66.7	47.9	35.7	43.5	1.12	27.8	35.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.11.2022	69.4	48.2	41.2	42.8	1.08	29.1	38.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
11.11.2022	72.5	51.6	40.8	45.9	1.00	26.0	34.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.11.2022	73.4	50.4	39.9	46.2	0.90	25.8	33.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
18.11.2022	70.9	48.5	38.5	42.5	1.08	24.6	37.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.11.2022	71.2	46.5	36.4	44.6	1.14	27.3	36.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
25.11.2022	68.4	49.7	35.1	45.7	0.99	27.4	35.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.11.2022	69.5	51.3	34.5	46.7	1.02	28.6	34.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
02.12.2022	72.5	50.5	38.4	46.9	1.10	29.4	37.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
06.12.2022	68.7	46.3	39.6	45.0	1.03	28.8	36.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.12.2022	69.3	45.0	41.2	43.7	1.14	25.6	38.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
13.12.2022	67.4	49.8	40.0	42.5	0.90	24.7	39.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
16.12.2022	71.0	47.5	38.4	46.0	1.06	28.5	37.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
20.12.2022	70.5	51.2	37.6	44.9	1.11	29.4	35.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
23.12.2022	68.4	50.8	36.2	43.3	0.90	26.8	34.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
27.12.2022	69.5	49.6	35.4	44.1	1.12	27.2	33.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
30.12.2022	72.3	48.4	39.4	45.9	0.98	26.6	37.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	--

Note- Arsenic (LOQ- 0.1ng/m³), Benzene (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 2ng/m³)*BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Checked By) Kushal Sharma

(Approved By) Pratap Singh

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VEL/E-037/YR/PN23711

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Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/157-182	**Report No:**	VEL/AA/157-182
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raljharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	**Reporting Date:**	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
		Protocol Used:	IS-5182& CPCB Guidelines
Sample Collected By:	Vardan Envirolab Representative	**Parameter Required:**	As per TOR Letter
Sample Description:	Ambient Air Quality Monitoring		
Location:	Kumunda (A7)		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)	Ozone ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	B(α) P (ng/m^3)	Arsenic (ng/m^3)	Nickel (ng/m^3)	Lead ($\mu g/m^3$)	Mercury (ng/m^3)
05.10.2022	58.4	33.9	27.5	31.6	0.73	18.3	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.10.2022	59.1	32.7	26.3	30.8	0.69	20.4	29.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.10.2022	61.2	37.5	28.1	35.9	0.82	16.7	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.10.2022	60.7	36.4	29.3	33.4	0.76	17.5	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.10.2022	62.8	35.1	24.5	34.8	0.69	20.2	26.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.10.2022	63.4	35.9	26.8	30.8	0.70	18.8	25.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.10.2022	58.4	33.0	27.3	28.6	0.85	19.1	28.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.10.2022	57.6	37.4	26.9	34.6	0.79	16.2	29.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
02.11.2022	56.2	36.8	25.4	32.5	0.80	17.6	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
05.11.2022	59.1	38.4	30.5	30.0	0.69	20.5	30.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.11.2022	61.8	34.9	29.6	29.1	0.81	18.7	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.11.2022	62.4	33.7	24.2	28.6	0.77	19.6	27.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
16.11.2022	60.8	32.6	28.1	35.0	0.82	20.2	25.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.11.2022	63.0	35.7	26.9	33.7	0.69	18.0	26.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
23.11.2022	63.8	36.4	24.7	34.5	0.85	19.7	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.11.2022	57.2	37.2	25.3	30.9	0.79	16.5	29.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
30.11.2022	59.4	38.1	26.1	33.9	0.80	17.5	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
03.12.2022	61.5	32.9	27.2	28.7	0.79	18.4	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
07.12.2022	62.8	33.7	28.9	33.0	0.82	19.3	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.12.2022	60.8	34.6	30.7	31.9	0.75	20.0	29.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.12.2022	63.4	35.2	29.8	30.5	0.84	16.4	30.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.12.2022	56.8	37.4	24.7	34.6	0.69	17.5	28.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.12.2022	59.4	38.6	25.2	29.1	0.80	19.1	26.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.12.2022	61.5	34.9	26.8	32.6	0.77	20.0	27.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.12.2022	60.8	33.5	27.2	30.8	0.85	18.4	30.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
31.12.2022	62.5	32.1	28.1	35.7	0.76	16.7	28.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	–

Note- Arsenic (LOQ- 0.4ng/m³), Benzene (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³), *BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Checked By) Ashish Sharma

(Approved By) Pratap Singh

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VEL/E-03/1/TR/PN23710

® Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/183-208	**Report No:**	VEL/AA/183-208
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	**Reporting Date:**	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
		Protocol Used:	IS-5182& CPCB Guidelines
Sample Collected By:	Vardan Envirolab Representative	**Parameter Required:**	As per TOR Letter
Sample Description:	Ambient Air Quality Monitoring		
Location:	Malibrahmani (A8)		

RESULTS

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	SO_2 (µg/m³)	CO (mg/m³)	Ozone (µg/m³)	NH_3 (µg/m³)	Benzene (µg/m³)	B(α) P (ng/m³)	Arsenic (ng/m³)	Nickel (ng/m³)	Lead (µg/m³)	Mercury (ng/m³)
03.10.2022	68.4	45.9	35.9	42.3	0.89	26.7	34.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
06.10.2022	69.1	46.7	36.2	41.2	0.93	25.2	33.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.10.2022	67.2	47.2	34.7	46.8	1.03	27.3	32.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
13.10.2022	71.6	48.2	39.1	45.4	1.16	23.4	37.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.10.2022	70.8	44.6	40.5	44.9	0.97	24.6	38.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
20.10.2022	73.4	45.1	38.8	43.7	1.06	25.7	34.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.10.2022	74.1	46.9	37.6	42.6	0.98	27.4	35.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
27.10.2022	72.9	47.8	35.4	40.8	1.06	26.1	36.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
31.10.2022	73.4	48.2	32.6	41.7	0.89	24.0	34.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
03.11.2022	71.0	47.5	34.3	42.6	1.15	23.6	37.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
07.11.2022	68.4	46.2	33.8	43.8	0.93	25.7	38.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.11.2022	70.9	45.9	38.1	44.7	0.89	26.1	32.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.11.2022	69.3	44.2	39.6	45.1	0.92	27.2	34.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.11.2022	67.8	47.6	40.5	43.9	1.19	24.5	35.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.11.2022	72.5	48.0	38.4	45.5	1.02	23.3	36.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.11.2022	71.6	46.9	37.6	46.2	0.98	26.9	37.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.11.2022	70.8	47.5	32.1	44.0	1.05	27.4	38.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
01.12.2022	74.6	45.1	33.7	41.9	0.89	24.2	32.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
05.12.2022	73.6	44.3	34.5	40.6	0.96	23.1	33.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.12.2022	72.5	46.8	35.8	42.8	1.13	25.0	35.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.12.2022	71.6	47.2	36.4	43.7	1.07	26.7	37.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.12.2022	70.8	48.9	37.8	45.3	0.89	27.5	38.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.12.2022	68.4	45.0	39.4	45.0	0.94	23.9	34.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.12.2022	69.3	44.7	40.2	43.6	1.02	25.4	36.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.12.2022	67.2	46.8	38.7	42.9	1.17	24.6	32.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.12.2022	71.5	47.2	37.6	41.5	0.89	26.8	33.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	--

Note- Arsenic (LOQ- 1.1ng/m³), Benzene (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³) *BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Checked By)

(Approved By)

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VEL/E-03/1718/PM23709

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Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/209-234	**Report No:**	VEL/AA/209-234
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	**Reporting Date:**	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
		Protocol Used:	IS-5182& CPCB Guidelines
Sample Collected By:	Vardan Envirolab Representative	**Parameter Required:**	As per TOR Letter
Sample Description:	Ambient Air Quality Monitoring		
Location:	Brahmanbil (A9)		

RESULTS

Date	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	NO_2 (µg/m³)	SO_2 (µg/m³)	CO (mg/m³)	Ozone (µg/m³)	NH_3 (µg/m³)	Benzène (µg/m³)	B(α) P (ng/m³)	Arsenic (ng/m³)	Nickel (ng/m³)	Lead (µg/m³)	Mercury (ng/m³)
05.10.2022	56.9	33.9	26.1	29.6	0.77	17.1	28.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.10.2022	55.2	32.5	25.3	31.2	0.80	19.2	27.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.10.2022	57.8	34.6	29.4	30.8	0.68	18.8	26.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.10.2022	62.9	36.7	22.1	33.6	0.91	19.6	29.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.10.2022	60.7	31.2	24.6	32.4	0.63	15.4	30.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.10.2022	61.3	32.8	25.3	28.7	0.72	17.3	28.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.10.2022	58.6	37.2	27.2	29.1	0.80	18.1	26.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.10.2022	59.4	35.6	26.8	26.7	0.76	19.6	27.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
02.11.2022	57.3	34.9	24.1	27.5	0.67	17.2	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
05.11.2022	55.4	36.4	29.3	32.9	0.74	15.4	29.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.11.2022	62.0	32.8	22.7	33.5	0.69	16.7	28.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.11.2022	57.2	34.5	25.0	31.6	0.77	18.1	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
16.11.2022	58.9	36.2	29.6	30.8	0.90	19.2	28.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.11.2022	56.2	34.9	28.4	29.5	0.69	17.0	27.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
23.11.2022	58.8	37.6	27.3	27.4	0.74	16.3	26.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.11.2022	61.2	32.5	26.4	31.0	0.65	15.4	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
30.11.2022	60.9	31.6	22.8	33.7	0.72	18.0	30.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
03.12.2022	62.1	34.2	24.3	29.5	0.80	17.6	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
07.12.2022	55.8	33.6	23.8	28.4	0.69	19.4	26.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.12.2022	56.7	34.5	22.7	27.2	0.93	17.7	29.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.12.2022	54.3	37.0	25.1	31.5	0.66	18.3	28.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.12.2022	58.4	31.0	29.4	30.8	0.74	16.5	27.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.12.2022	62.6	32.8	27.2	32.6	0.65	18.4	29.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.12.2022	57.2	33.4	26.0	27.9	0.78	15.2	26.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.12.2022	59.1	35.4	25.8	26.4	0.92	19.7	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
31.12.2022	60.8	36.7	24.5	32.1	0.68	16.6	28.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	--

Note- Arsenic (LOQ- 1ng/m³), Benzène (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³), *BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Checked By)

(Approved By)

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VEL/E-05717RJPN237D8

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Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/235-260	**Report No:**	VEL/AA/235-260
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	**Reporting Date:**	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
		Protocol Used:	IS-5182& CPCB Guidelines
Sample Collected By:	Vardan Envirolab Representative	**Parameter Required:**	As per TOR Letter
Sample Description:	Ambient Air Quality Monitoring		
Location:	Kalamchhuin (A10)		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)	Ozone ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	Benzène ($\mu g/m^3$)	B(a) P (ng/m^3)	Arsenic (ng/m^3)	Nickel (ng/m^3)	Lead ($\mu g/m^3$)	Mercury (ng/m^3)
05.10.2022	67.3	42.3	34.6	38.4	0.82	23.6	34.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.10.2022	65.9	40.5	33.9	37.2	0.79	21.2	32.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.10.2022	70.4	39.8	30.8	41.6	0.93	22.9	30.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.10.2022	71.2	42.1	32.7	40.6	0.83	24.6	35.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.10.2022	66.9	43.7	36.1	39.5	0.93	23.1	33.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.10.2022	65.4	44.6	32.8	36.1	0.86	24.0	32.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.10.2022	64.3	41.2	33.4	38.9	0.91	21.2	34.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.10.2022	63.8	40.9	35.7	42.1	0.79	20.3	31.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
02.11.2022	67.1	43.6	34.9	41.6	0.90	23.6	30.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
05.11.2022	66.9	42.7	30.6	40.7	0.79	24.5	32.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.11.2022	69.1	41.2	32.8	38.4	0.83	20.7	33.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.11.2022	70.5	40.9	34.5	39.1	0.91	22.9	34.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
16.11.2022	71.2	43.6	33.7	37.6	0.88	21.2	35.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.11.2022	67.8	39.8	32.6	36.4	0.97	23.6	31.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
23.11.2022	65.4	43.5	36.1	35.7	0.85	24.8	32.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.11.2022	64.9	44.2	35.8	42.1	0.99	20.7	30.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
30.11.2022	63.2	41.6	34.9	40.8	0.79	21.6	32.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
03.12.2022	68.4	40.7	32.8	39.5	0.84	23.5	31.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
07.12.2022	67.9	39.5	33.4	38.4	0.96	22.5	34.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.12.2022	66.2	41.8	30.0	36.7	0.83	24.3	33.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.12.2022	71.8	42.7	36.8	37.5	0.98	21.0	35.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.12.2022	70.4	43.7	35.9	41.8	0.81	20.8	32.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.12.2022	69.4	44.6	34.5	40.5	0.79	24.3	31.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.12.2022	67.3	39.8	32.6	42.3	0.90	23.6	30.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.12.2022	65.0	41.2	33.8	39.8	0.89	22.1	31.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
31.12.2022	64.2	42.6	34.7	36.4	0.97	20.5	32.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	--

Note- Arsenic (LOQ- 1.0ng/m³), Benzène (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³)*BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Checked By) Kushal Singh

(Approved By) Hitesh Singh

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VEL/E-037/TR/PN23707

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Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/261-286	**Report No:**	VEL/AA/261-286
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	**Reporting Date:**	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
Sample Collected By:	Vardan Envirolab Representative	**Protocol Used:**	IS-5182& CPCB Guidelines
Sample Description:	Ambient Air Quality Monitoring	**Parameter Required:**	As per TOR Letter
Location:	ChhotaGolagadia (A11)		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)	Ozone ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	Benzène ($\mu g/m^3$)	B(α) P (ng/m^3)	Arsenic (ng/m^3)	Nickel (ng/m^3)	Lead ($\mu g/m^3$)	Mercury (ng/m^3)
07.10.2022	50.3	27.6	19.3	23.6	0.59	16.5	27.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.10.2022	51.2	28.4	18.4	21.2	0.63	17.1	26.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
11.10.2022	49.6	26.9	21.3	22.7	0.71	15.3	25.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.10.2022	48.5	28.4	20.7	24.9	0.69	17.7	28.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
18.10.2022	51.6	26.3	22.5	25.7	0.72	16.2	27.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.10.2022	50.7	27.1	18.6	26.3	0.58	15.9	26.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
25.10.2022	48.3	25.0	21.6	24.2	0.60	16.6	25.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.10.2022	49.1	26.9	19.5	25.3	0.70	15.4	28.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
01.11.2022	51.6	25.8	20.7	24.6	0.59	17.0	27.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
04.11.2022	52.7	27.2	22.3	23.1	0.62	16.7	26.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.11.2022	50.0	27.3	21.5	22.8	0.71	15.8	25.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
11.11.2022	49.5	28.1	19.5	25.9	0.66	16.9	27.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.11.2022	48.6	26.9	18.7	20.0	0.72	17.4	26.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
18.11.2022	51.2	28.4	21.6	24.9	0.63	16.6	28.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.11.2022	50.6	26.0	20.5	26.7	0.59	15.4	25.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
25.11.2022	51.6	27.5	22.6	22.8	0.71	17.9	27.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.11.2022	52.0	25.6	19.4	23.5	0.68	16.8	26.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
02.12.2022	48.6	27.2	18.6	21.2	0.57	15.7	25.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
06.12.2022	49.5	28.1	20.0	20.9	0.66	16.3	27.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.12.2022	51.2	27.3	19.5	25.7	0.72	17.7	26.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
13.12.2022	48.6	25.8	21.3	25.8	0.63	16.0	28.3	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
16.12.2022	49.0	26.9	20.6	26.1	0.59	15.2	26.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
20.12.2022	51.6	28.4	18.4	24.2	0.68	16.9	25.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
23.12.2022	50.8	27.5	22.9	23.8	0.72	17.4	27.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
27.12.2022	52.6	26.8	21.5	22.1	0.57	16.5	26.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
30.12.2022	50.9	28.4	20.0	21.6	0.69	15.9	28.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	--

Note- Arsenic (LOQ- 0.1ng/m³), Benzène (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 1ng/m³), BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Checked By)
Kushal Sharma

(Approved By)
Group Leader
Pratap Singh

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VEL/E-03/1/1R/PH23706

® Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Hr)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/SOCM/AA/287-312	**Report No:**	VEL/AA/287-312
Name & Address of the Project:	M/s Subhadra Open Cast Mine. At Village Gopal Prasad, Kumuda, Nisha, Kankarei, Raijharan, Nisha P.S Angul, Tehsil TachlerSadar and Chhenipada, District- Angul, State- Odisha	**Reporting Date:**	09/01/2023
		Ref. No:	NIL
		Monitoring Period:	October 2022 to December 2022
		Equipment Used:	RDS & FPS with all accessories
Sample Collected By:	Vardan Envirolab Representative	**Protocol Used:**	IS-5182& CPCB Guidelines
Sample Description:	Ambient Air Quality Monitoring	**Parameter Required:**	As per TOR Letter
Location:	Dera (A12)		

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)	Ozone ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	Benzène ($\mu g/m^3$)	B(α) P (ng/m^3)	Arsenic (ng/m^3)	Nickel (ng/m^3)	Lead ($\mu g/m^3$)	Mercury (ng/m^3)
05.10.2022	76.3	50.6	38.4	43.6	0.98	28.4	38.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
08.10.2022	77.1	49.3	39.1	42.8	1.03	29.1	39.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.10.2022	73.9	52.7	37.6	44.9	1.17	27.2	40.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
15.10.2022	74.5	51.6	40.5	47.6	1.24	26.3	37.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.10.2022	72.8	47.8	35.6	48.4	1.09	30.5	36.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
22.10.2022	76.3	48.3	37.5	46.5	0.99	28.4	35.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.10.2022	77.4	52.4	38.4	45.2	1.07	27.6	38.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
29.10.2022	78.9	50.6	36.2	44.1	1.17	29.4	39.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
02.11.2022	75.4	51.9	39.1	43.9	1.23	26.7	37.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
05.11.2022	76.0	52.4	40.8	42.7	0.97	30.8	40.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
09.11.2022	78.9	49.3	37.6	41.6	1.09	27.2	38.9	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
12.11.2022	77.2	48.5	38.4	44.8	1.27	28.4	39.7	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
16.11.2022	76.3	51.0	39.9	46.7	1.10	26.1	36.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
19.11.2022	75.4	49.6	40.5	45.9	0.96	28.4	37.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
23.11.2022	73.9	52.7	37.6	47.2	1.08	29.5	35.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
26.11.2022	72.5	48.3	36.5	48.6	1.19	30.8	40.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
30.11.2022	74.0	50.7	39.1	46.5	1.25	28.4	38.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
03.12.2022	78.6	49.6	38.7	45.0	0.98	29.6	39.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
07.12.2022	77.5	48.5	35.4	44.2	1.06	30.0	37.6	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
10.12.2022	76.9	51.2	38.9	42.9	1.18	28.7	36.5	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
14.12.2022	74.2	52.7	39.4	43.7	1.22	29.1	38.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
17.12.2022	73.8	50.8	37.5	41.6	1.04	28.6	39.1	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
21.12.2022	72.8	49.6	40.0	44.5	0.97	30.2	40.0	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
24.12.2022	75.8	48.5	38.6	46.8	1.16	27.6	37.2	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
28.12.2022	78.1	51.3	35.7	48.1	1.24	26.8	36.4	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
31.12.2022	73.9	52.4	36.2	47.2	1.15	28.1	35.8	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ	*BLQ
Limit as per NAAQS	100	60	80	80	4	180	400	5	1	6	20	1	–

Note- Arsenic (LOQ- 1.1ng/m³), Benzène (LOQ- 0.5µg/m³), Benzo pyrene (LOQ- 0.5ng/m³), Lead (LOQ- 0.1µg/m³), Nickel (LOQ- 5.0ng/m³), Mercury (LOQ- 10ng/m³), *BLQ- Below Limit of Quantification, *LOQ- Limit of Quantification

(Checked By)

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VEL/E-03/1/TR/PN23706

ANNEXURE -A/5

IS 5182 (Part 11) : 2006

Indian Standard

METHODS FOR MEASUREMENT OF AIR POLLUTION

PART 11 BENZENE, TOLUENE AND XYLENE (BTX)

(Second Revision)

1 SCOPE

This standard (Part 11) prescribes active and passive sampling techniques with three gas chromatography based analytical methods for measurement of benzene, toluene and xylene in air.

2 REFERENCES

The following standard contains provisions, which through reference in this text constitute provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

IS No.	*Title*
4167 : 1980	Glossary of terms relating to air pollution (*first revision*)

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 4167 shall apply.

4 METHOD 1 (ACTIVE SAMPLING USING ACTIVATED CHARCOAL TUBES, DESORBED BY CARBON DISULPHIDE)

4.1 Principle

The charcoal tubes are available in different sizes and contain varying amount of activated charcoal. The ambient air is sucked through the tube using a low flow sampler used for collection of BTX sample in a way that results in an enrichment of the relevant substances in the activated charcoal. Desorption of the adsorbed benzene is done using carbon disulphide (CS_2). The substances desorbed in the CS_2 are analyzed by capillary gas chromatography. A flame ionization detector (FID) is used for analysis while quantification is performed using the internal/external standard.

4.2 Apparatus

4.2.1 *Low Volume Pump* — Portable, battery powered pump with a low flow controller with operating range between 5 to 500 ml/min (±0.2 ml/min) to suck the air sample.

NOTE — Wherever necessary intrinsically safe pumps may be used.

4.2.2 *Sampling Sorbent (Sample) Tubes* — Glass lined (or fused silica lined) stainless steel tube or stainless steel sorbent tubes of 6 mm O.D., 8.9 cm long tubes with a 6 cm of sorbent bed of 200 mg of activated charcoal (coconut shell) or other suitable adsorbent. A typical sorbent/sample tube is shown in Fig. 1 and Fig. 2.

Modular glass or stainless tube (OD 6-8 mm length 10-15 cm) packed with chromatography grade coconut shell activated charcoal, chromatography grade. Tube must have provision for fitting of backup section with provision to measure pressure drop across the tube during sampling. The minimum quantity of charcoal required in front section is 200 mg and in backup section 50 mg. Glass beads or any other porous inert material must be packed in inlet part of front section for uniform distribution of sucked air through tube at the time of sampling.

4.2.3 *Gas Chromatograph* — Any suitable gas chromatograph with flame ionization detector (FID) with fused silica capillary columns having a length of 25 m or more, an internal diameter of 320 µm or below and with a stationary phase film thickness less than 1.5 µm as follows or equivalent may be recommended:

Capillary 624 Column : Coating: cyanopropyl phenyl polysiloxane, Length × ID : 30 m × 0.25 mm, Film thickness (d_f) : 1.4 µm

Capillary Column : Coating : 5 percent phenyl, 95 percent dimethyl polysiloxane Length × ID : 25 m × 0.20 mm, Film thickness (d_f) = 0.33 µm

Wall Coated Column : Coating: Fused Silica PONA CB, Length × ID : 50 m × 0.21 mm, Film thickness (d_f) : 0.5 µm

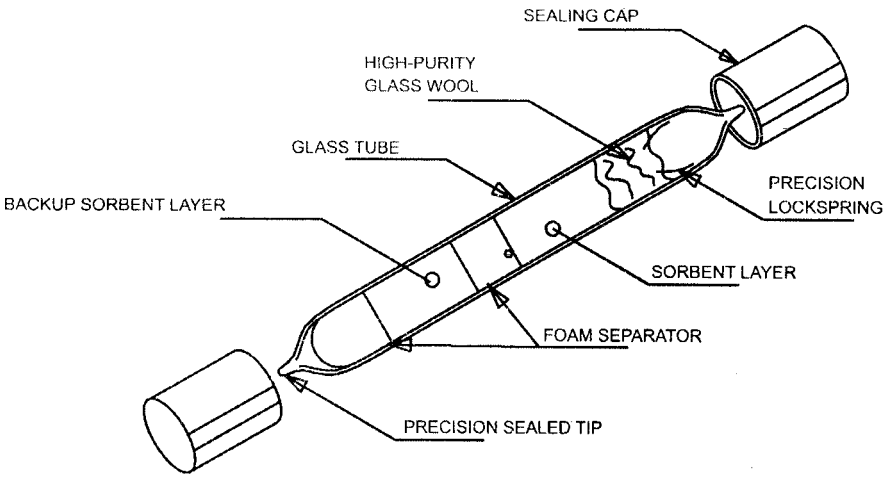


FIG. 1 SORBENT/SAMPLE TUBE FOR ACTIVE SAMPLING FILLED WITH ACTIVATED COCONUT SHELL CHARCOAL (CSC)

Capillary Column : Coating : Fused silica 100 percent dimethyl polysiloxane, Length × ID : 30 m × 0.32 ID, Film thickness (d_f) : 1.0 µm

4.3 Reagents

4.3.1 *Suitable Adsorbent* — Chromatographic grade activated charcoal (coconut shell) or other suitable adsorbent, that is, Chromosorb 106 or other suitable adsorbent having particle size in the range 60 to 80 mesh.

4.3.2 *Carbon Disulphide* (CS_2) — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 5 percent, Benzene 0.001 percent, H_2O < 0.02 percent.

4.3.3 *Benzene* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 3 percent, H_2O < 0.02 percent.

4.3.4 *Toluene* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 3 percent, H_2O < 0.02 percent.

4.3.5 *Xylene* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 3 percent, H_2O < 0.02 percent.

4.3.6 *Carrier Gas* — Helium or Nitrogen of purity > 99.9 percent, H_2O < 0.02 percent, Residues < 0.000 3 percent.

4.4 Sampling

4.4.1 *Selection of Sorbent Tube* — Samples are collected in glass sampling tube filled with a activated charcoal (coconut shell), Chromosorb 106 or other suitable adsorbent.

4.4.2 *Sample Tubes Labelling*

Sample tubes are labelled with a unique identification number and the direction of sampling flow. If empty sample tubes are obtained without labels, it is important to label and condition them before and after they are packed with adsorbent prior to use them for sampling.

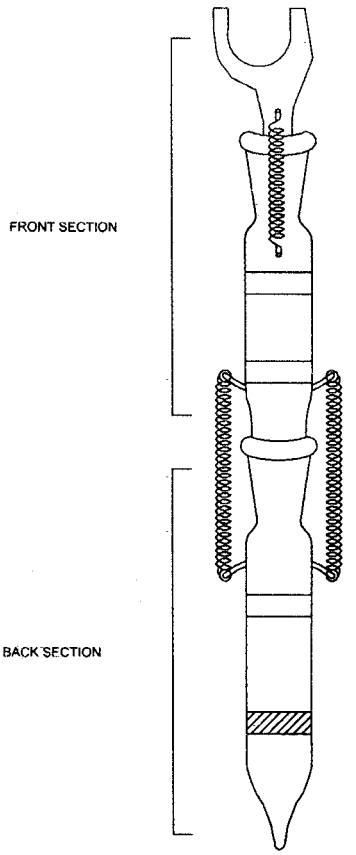


FIG. 2 INLET AND OUTLET OF THE SORBENT/SAMPLE TUBE

4.4.3 *Sampling Procedure and Sampling Rate*

A sample is collected by opening a tube at two ends, connecting it to a sample pump, and pulling air through the tube with the pump. Airborne chemicals are trapped onto the surface of the sorbent:

a) Two tubes are used in series to take care of breakthrough (if any) compatible to the thermal desorber. The sampling is carried out using low flow sampler. The schematic diagram of sampling train is given in Fig. 3.

b) Keep the tube in a vertical position during sampling to prevent the possibility of channelling that can lead to under sampling.

c) The arrow on the tube indicates air flow direction and should point to the tube holder and pump. If no arrow is present, the smallest section should be near the tube holder.

d) Sampling flow rate in the range of 20-100 ml/min is required (±2 percent) for ambient air.

e) A sample component may breakthrough from the back end of tube, if excessive flow rates are used. Sample is to be discarded, if the breakthrough is observed more than 10 percent. If analyzed concentration in backup section is more than 10 percent of front section, sample needs to be discarded.

The tube is then sealed with push-on caps, and sent to a laboratory for analysis.

4.4.4 *Storage of Blank and Sampled Tubes*

Seal clean, blank sorbent tubes and sampled tubes using inert fittings and PTFE ferrules. Wrap capped tubes individually in uncoated aluminum foil. Use clean, sealable metal cans containing a small packet of activated charcoal or activated charcoal/silica gel for storage and transportation of multiple tubes. Store the multi-tube storage container in a clean environment at 4 ± 1°C.

4.5 Procedure

4.5.1 *Calibration*

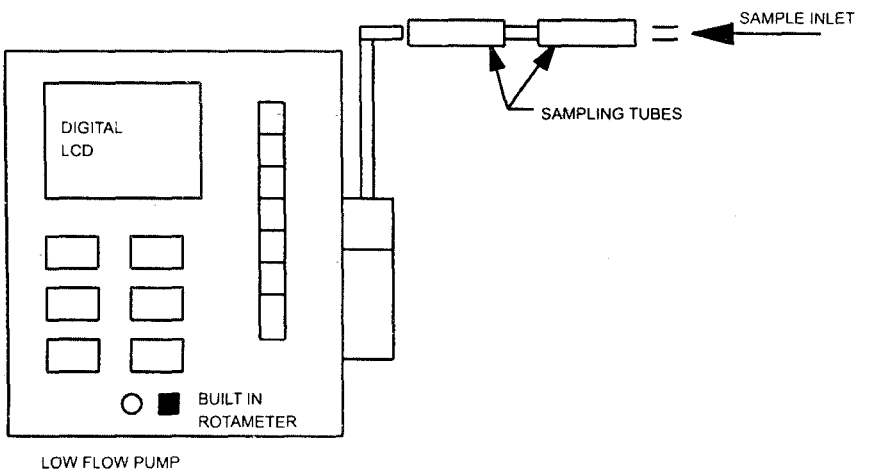


FIG. 3 LOW FLOW SAMPLING PUMP WITH SAMPLING TRAIN

Prepare a mix stock standard solution of 50 µg/µl of benzene, toluene and xylene each gravimetrically using a micro syringe in the eluting solvent that is CS_2. Prepare further diluted solutions of concentration range of 10, 1.0, 0.10 µg/µl with CS_2 from stock standard in a clean vial. Make up to 1 ml solution. Introduce immediately 1 µl standard solution into the injector of GC directly and plot the curve between the concentration and response (peak area). Prepare fresh standard solutions with each batch of samples. A typical chromatogram of standard mixture is given in Fig. 4.

4.5.2 *Analytical Procedure*

Samples collected through active sampling (sorbent tubes) are extracted or desorbed by conventional solvent (generally 1-5 ml of carbon disulphide) using ultrasonication for 15 min to remove analyte from the sorbent material. Desorbed samples are analyzed using gas chromatograph (GC) fitted with capillary column and flame ionization detector (FID). A single tube may provide enough samples to permit several analyses.

The following set of conditions is generally used:

a) *Gas flow*:

Nitrogen : 30 ml/min (FID make up + Column), (Column flow 1 ml/min approximately)

Hydrogen : 30 ml/min

Air : 300 ml/min

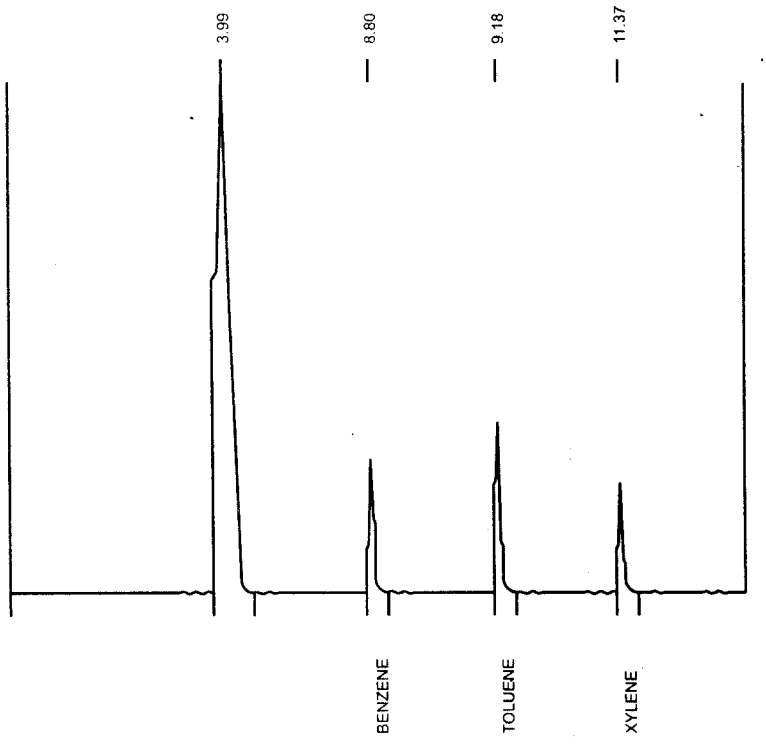


FIG. 4 TYPICAL CALIBRATION CHROMATOGRAM OF BENZENE, TOLUENE AND XYLENE
(Using column PE 624 at 0.017 4 µg/µl concentration of analytes)

NOTE — Instead of nitrogen, helium may also be used as carrier gas for flow setting and corresponding retention time of analytes may vary.

Capillary column 624, Coating: cyanopropyl phenyl polysiloxane, Length × ID : 30 m × 0.25 mm, Film thickness (d_f) : 1.4 µm

b) *Temperature programming*

Injection port : 250°C

FID : 300°C

Column/Oven : 50°C (hold for 3 min) , ramp1 @ 10°C/ min to 140°C (1 min) ramp 2 @ 20°C/min to 240 (1 min)

Injection volume: 5 µl, Total run time: 19.5 min, Split : 10

- Benzene RT 6.80 min, Search window : 1.00 s, 3.00 percent
- Toluene RT 9.18 min, Search window: 1.00 s, 3.00 percent
- Xylene RT 11.37 min, Search window: 1.00 s, 3.00 percent

NOTE — Temperature programming and retention time (RT) of analyte may vary column to column to get appropriate resolution of analyte peaks. Injection volume and split may also vary according to nature and probable concentration of analyte present in the extract.

4.6 Calculation

Amount of analyte compound found on tube can be converted into mg/m³, by using the formula:

$$\text{Volume of air (m}^3\text{) (sucked through the adsorption tube)} = \frac{S \times t}{10^6}$$

where

S = sampling rate, in ml/min; and

t = sampling time, in min.

$$\text{Concentration (µg/m}^3\text{) (at ambient condition)} = \frac{C \times V_1 \times 10^3}{V_2 \times V_3}$$

where

C = amount of compound found injection sample volume from standard curve, in µg/µl;

V_1 = total volume of the sample extracted in ml;

V_2 = volume of sample extract injected into GC, in µl; and

V_3 = volume of air sucked through the tube, in m³.

Blank value is to be subtracted from the amount of compound found in the sample.

$$\text{Concentration (µg/m}^3\text{) at (STP)} = \frac{C \times 101.3\,(273 + T)}{273 \times P}$$

where

C = concentration at ambient condition, in $\mu g/m^3$;

T = temperature of the ambient air, in °C; and

P = atmospheric pressure, in kPa.

5 METHOD 2 (ACTIVE SAMPLING USING TENAX/CHROMOSORB 106 SORPTION TUBES, DESORBED THERMALLY)

5.1 Principle

Thermal desorption tubes filled with Tenax TA or other suitable adsorbent as Chromosorb-106, etc, are used for adsorption of benzene, toluene, and xylene in place of charcoal tube. The ambient air is sucked through the tube using a low flow personal sampler in a way that results in an enrichment of the relevant substances on the adsorbent. These tubes are directly connected to the automated thermal desorbers coupled with the gas chromatograph equipped with capillary column and flame ionization detector. The thermal desorption technique offer the advantage of a greatly improved analytical sensitivity, as solvent is not used in this process and the collected sample is not diluted. In most cases analytical recovery is close to 100 percent and desorption efficiency corrections are not required.

5.2 Apparatus

5.2.1 *Sampling Device : Low Volume Pump* — Intrinsically safe, portable, battery powered pump (SKC, PA, USA or equivalent make) (*see* Fig. 3) with a low flow capable of accurate and adjustable flow controller with operating range between 5 to 500 ml/min to suck the air sample with great accuracy in the range of 20-100 ml/min is required (±2 percent). The time programmable, built in flow indicator, rechargeable battery operated low flow pump with adjustable run time up to 8 h should be preferred for sampling of BTX.

5.2.2 *Sampling Sorbent (Sample) Tube* — Automated Thermal Desorption (ATD) tubes of stainless steel filled with absorbing material are required. Stainless steel or glass sorbent tubes (*see* Fig. 5) of 8.9 cm long, 6 mm O.D. with a 6 cm sorbent bed in the central portion packed with greater than 200 mg of solid adsorbent material (that is Tenax TA, Chromosorb106 or any other suitable adsorbent).

NOTE — To be suitable for thermal desorption, sorbent must meet exact specifications that include low contaminant background, high thermal stability and sufficient adsorptive strength to retain components of interest and should also release them quickly when heat is applied.

5.2.3 *Automated Thermal Desorption Apparatus (Two-Stage Thermal Desorption)*

Two-stage automated thermal desorption is recommended to use heat and a flow of inert (carrier) gas to extract volatiles from a solid adsorbent matrix directly into the carrier gas and transfer them to downstream system elements such as the analytical column of a GC.

Two-stage automated thermal desorption is used for the best high resolution capillary chromatography (that is, analytes desorbed from the sorbent tube must be refocused before being rapidly transferred to the GC analytical column).

Typical key components and operational stages of a two-stage desorption system are presented in Fig. 6 and Fig. 7.

5.2.4 *Focusing Tube*

The narrow (typically < 3 mm ID) tube containing a small bed of sorbent, which is maintained near or below ambient temperature and used to refocus analytes thermally desorbed from the sorbent tube. The focusing trap is typically packed with 20 mg of Carbopack™ B (60/80 mesh) and 50 mg of a Carboxen™ 1000-type sorbent (60/80 mesh).

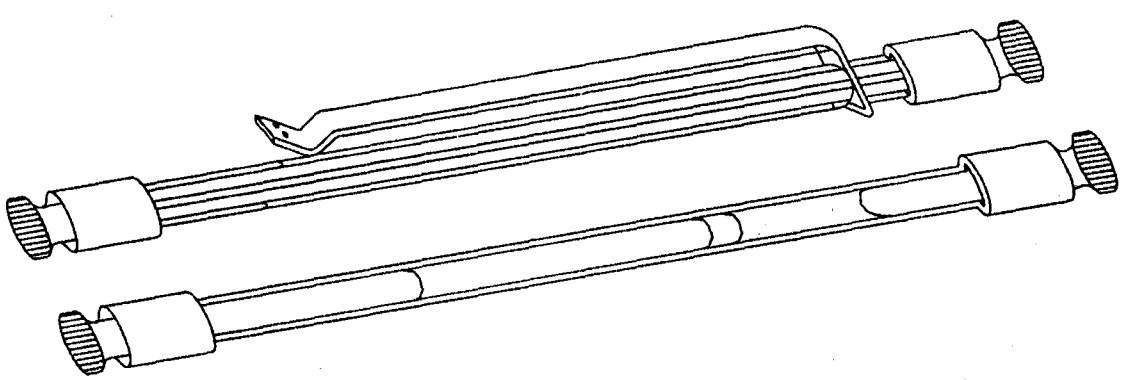


FIG. 5 SORBENT/SAMPLE TUBES OF STAINLESS STEEL OR GLASS FILLED WITH ADSORBING MATERIAL (TENAX OR SO) AND PROTECTING CAPS

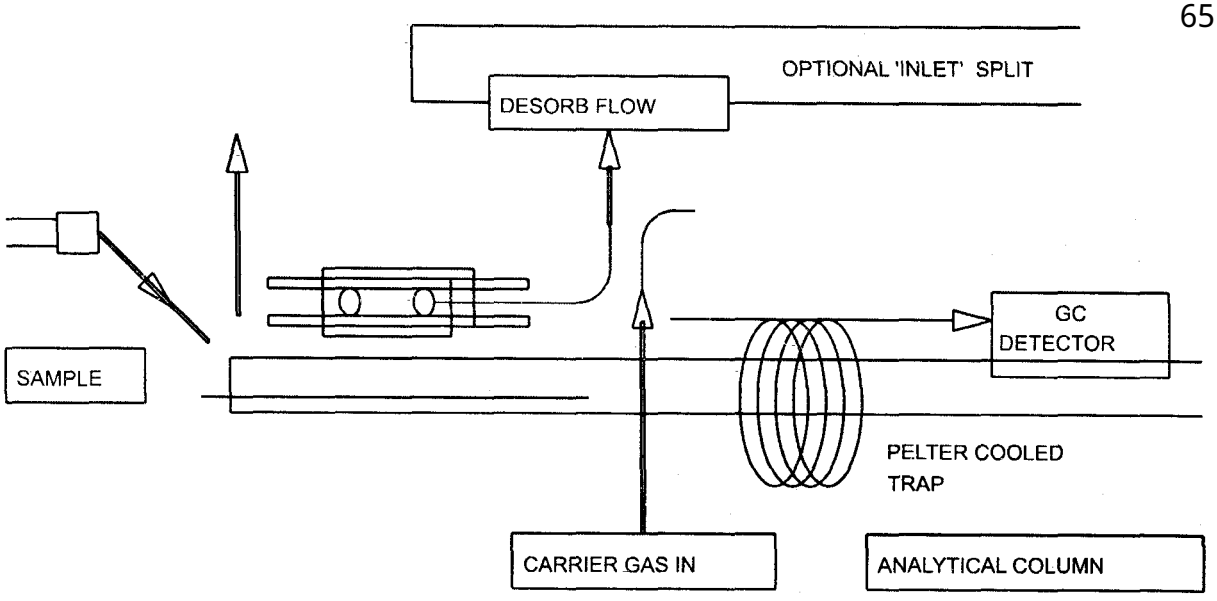


FIG. 6 STAGE 1 : SAMPLE TUBE DESORPTION OR AIR SAMPLE TRANSFER TO TRAP

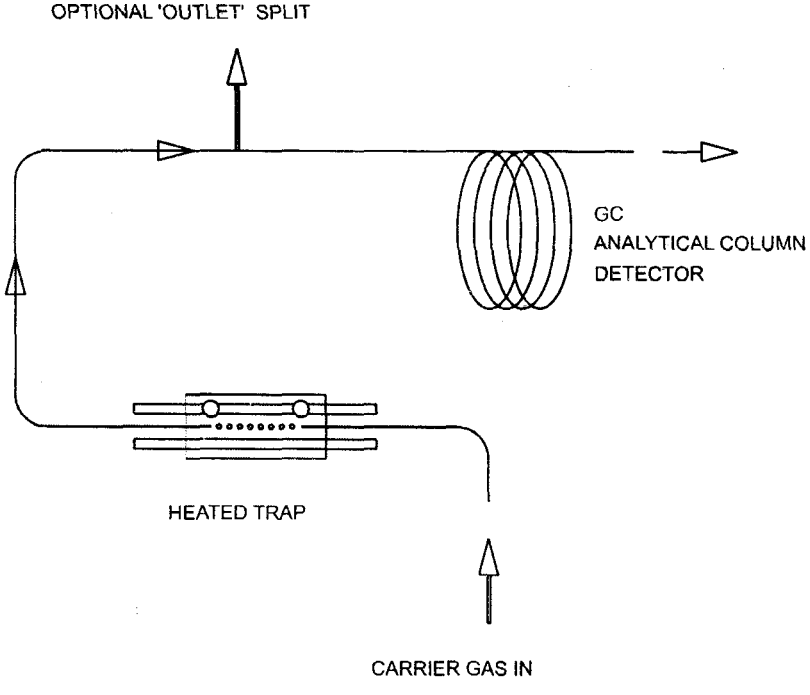


FIG. 7 STAGE 2 : TRAP DESORPTION
(Sample transfer to GC Column)

Once all the BTX have been transferred from the sorbent tube to the focusing tube, the focusing tube is heated rapidly to transfer the analytes into the capillary column of GC in the form of a band of vapor.

5.2.5 *Electronic Cryogen Systems*

Automated thermal desorber have electronic systems to cool the focusing tube or cold trap. Other non-automated desorber require typically cryogens, that is, liquid nitrogen, liquid argon, or liquid carbon dioxide to cool the focusing tube.

The cryogen-free trap cooling option with a multistage Peltier electrical closed cycle coolers is used. At its low temperature, the trap must provide quantitative analyte retention for target compounds as well as quantitative and rapid desorption of target analytes.

5.2.6 *Thermal Desorber — GC Interface*

The interface line is leak-tight and lined with an inert

material such as deactivated fused silica. Alternatively, thread the capillary column itself through the heated transfer line/interface and connected directly into the thermal desorber.

Place the sealed tubes on the thermal desorber (Perkin Elmer Model ATD 400 Automated System or equivalent). Heat the interface between the thermal desorber and the GC uniformly.

Other thermal desorbers may have different arrangements for automation. Alternatively, use equivalent manual desorption.

NOTE — Use of a metal syringe-type needle or unheated length of fused silica pushed through the septum of a conventional GC injector is not recommended as a means of interfacing the thermal desorber to the chromatograph. Such connections result in cold spots, cause band broadening and are prone to leaks.

5.2.7 *High Resolution Capillary Column Chromatography*

Any suitable gas chromatograph equipped with flame ionization detector (FID) with fused silica capillary columns having a length of 25 metres or more, an internal diameter of 320 µm or below and with a stationary phase film thickness less than 1.5 µm as follows or equivalent may be recommended:

Capillary 624 Column	: Coating: cyanopropyl phenyl polysiloxane, Length × ID : 30 m × 0.25 mm, Film thickness (d_f) : 1.4 µm
Capillary Column	: Coating: 5 percent phenyl 95 percent dimethyl polysiloxane, Length × ID : 25 m × 0.20 mm, Film thickness (d_f) : 0.33 µm
Wall Coated Column	: Coating: Fused Silica PONA CB, Length × ID : 50 m × 0.21 mm, Film thickness (d_f) : 0.5 µm
Capillary Column	: Coating: Fused silica 100 percent dimethyl polysiloxane, Length × ID : 30 m × 0.32 mm, 1.0 µm film thickness

5.3 Reagent

5.3.1 *Carbon Disulphide* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 5 percent, Benzene < 0.000 1 percent, H_2O < 0.02 percent.

5.3.2 *Benzene* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 3 percent, H_2O < 0.02 percent.

5.3.3 *Toluene* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 3 percent, H_2O < 0.02 percent.

5.3.4 *Xylene* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 3 percent, H_2O < 0.02 percent.

5.3.5 *Carrier Gas* — Helium or Nitrogen of purity > 99.9 percent, H_2O < 0.02 percent, Residues < 0.000 3 percent.

5.4 Sampling

5.4.1 *Sampling Location* — Site should be free from any obstacle to free flow of the air in the vicinity.

5.4.2 *Selection of Sorbent Tube and Sorbent Mesh Size* — Samples are collected in SS or glass sampling tube filled with Tenex TA, Chromosorb 106 or other suitable adsorbent (two in series to take care of breakthrough, if any) and compatible to the thermal desorber. The sorbents of particle size in the range 60 to 80 mesh should be used for tube packing.

5.4.3 *Conditioning the Tube*

Condition newly packed tubes for at least 2 h (30 min for preconditioned, purchased tubes) at 320°C while passing at least 30 ml/min of pure Nitrogen or Helium carrier gas through them.

Tube conditioning before reuse of sample tube is also must.

Once conditioned, seal the tube with brass, 1/4 inch fittings and PTFE ferrules. Wrap the sealed tubes in uncoated aluminium foil and place the tubes in a clean, air-tight, opaque container.

A package of clean sorbent material, for example, activated charcoal or activated charcoal/silica gel mixture, may be added to the container to ensure clean storage conditions.

Store in a refrigerator (organic solvent-free) at 4±1°C, if not to be used within a day. On second and subsequent uses, the tubes will generally not require further conditioning as above. However, tubes with an immediate prior use indicating high levels of pollutant trace gases should be reconditioned prior to continued usage.

NOTE — Other sorbents may require different conditioning temperatures.

5.4.4 *Sample Tubes Labelling*

Sample tubes are labelled with a unique identification number and the direction of sampling flow. Stainless steel tubes are most conveniently labelled by engraving. Glass tubes are best labelled using a temperature resistant paint. If empty sample tubes are obtained without labels, it is important to label them before packing and condition them after packing with adsorbent prior to use them for sampling.

5.4.5 *Sampling Procedure and Sampling Rate*

A sample is collected by opening a tube at two ends, connecting it to a sample pump, and pulling air through the tube with the pump. Airborne chemicals are trapped onto the surface of the sorbent:

a) Two tubes are used in series to take care of breakthrough (if any) compatible to the thermal desorber. The sampling is carried out using low flow sampler. The schematic diagram of sampling train is given in the Fig. 3.

b) Keep the tube in a vertical position during sampling to prevent the possibility of channelling that can lead to under-sampling.

c) The arrow on the tube indicates air flow direction and should point to the tube holder and pump. If no arrow is present, the smallest section should be near the tube holder.

d) Sampling flow rate in the range of 20 - 30ml/min is required (±0.2 ml/min) for ambient air.

e) A sample component may breakthrough from the back end of tube if excessive flow rates are used.

Sample is to be discarded if the breakthrough is observed more than 10 percent.

NOTE — A sample component may breakthrough from the back end of tube if excessive flow rates are used. The sample is to be discarded, if the breakthrough is observed more than 10 percent.

5.4.6 *Sampling Period*

The sorbent tubes are exposed in field for previously determined period (generally between 1 - 4 h or so). Before and after sampling the samples are stored and transported to field/laboratory in sealed containers.

NOTE — Exposure period may be shortened for highly polluted area that is near gasoline dispensing station, garage, refinery or other direct emission source.

5.4.7 *Blank and Sampled Tube Storage*

Seal clean, blank sorbent tubes and sampled tubes using inert, fittings and PTFE ferrules. Wrap capped tubes individually in uncoated aluminium foil. Use clean, sealable metal cans containing a small packet of activated charcoal or activated charcoal/silica gel for storage and transportation of multiple tubes. Store the multi-tube storage container in a clean environment at 4 ± 1°C.

5.5 Procedure

5.5.1 *Calibration*

A standard solution of the compounds of interest in the elution solvent is prepared gravimetrically, using a micro syringe, by adding pure compounds or pre-weighed blends to flasks partially filled with the elution solvent (CS_2). Prepare Benzene standard solution and a blank 0.043 5 µg/ml, 0.087 µg/µl, 0.174 µg/µl, 0.261 µg/µl and 0.348 µg/µl.

1 µl each of standard solution was injected into the sorption/sample tube, which is desorbed thermally, and analyte is transferred to capillary GC directly. Plot the curve between the concentration and response (peak area).

Multi-point external calibration is used on ATD-GC taking 5 levels of BTX standard solution using CS_2 as a diluting solvent or introduction of a fixed volume gas phase standard (optional).

Typical chromatogram for benzene, toluene and xylene is given in Fig. 8 and typical calibration graphs for benzene, toluene and xylene is given in Fig. 9.

5.5.2 *Analytical Procedure*

Remove the sorbent and extract the trapped chemical from sample tubes using heat. Samples collected through this technique (sorbent tubes) may be desorbed by Automated Thermal Desorber generally by 2-stage desorption technique on ATD-GC. The desorbed samples are transferred to gas chromatograph (GC) directly and analysed using capillary column and flame ionization detector (FID). No solvent is required in this process.

a) *Desorption of the sorbent tube onto a focusing trap* — Place the sealed tubes on the thermal desorber (Automated system or equivalent). Heat the interface between the thermal desorber and the GC uniformly.

Desorption of the sorbent tube (typically 200-300°C for 5-15 min with a carrier gas flow of 30-100 ml/min and refocusing of the target analytes on a focusing trap held at near-ambient or sub-ambient temperatures.

Reverse the flow direction of N_2 or He gas, set the flow rate to at least 30 ml/min, and heat the tube to 325°C (in this case) to achieve a transfer of BTX onto a focusing tube at a temperature of 27°C or so.

NOTE — Analytes should be desorbed from the tube in backflush mode, that is, with the gas flow in the reverse direction to that of the air flow during sampling.

b) *Rapid desorption of the focusing trap* — Rapid desorption of the focusing trap (typically 40°C/s to a top temperature of 250-350°C, with a hold time of 10-15 min at the top temperature and an inert/ carrier gas flow of 30-100 ml/min) take place to transfer the analytes into the analytical column.

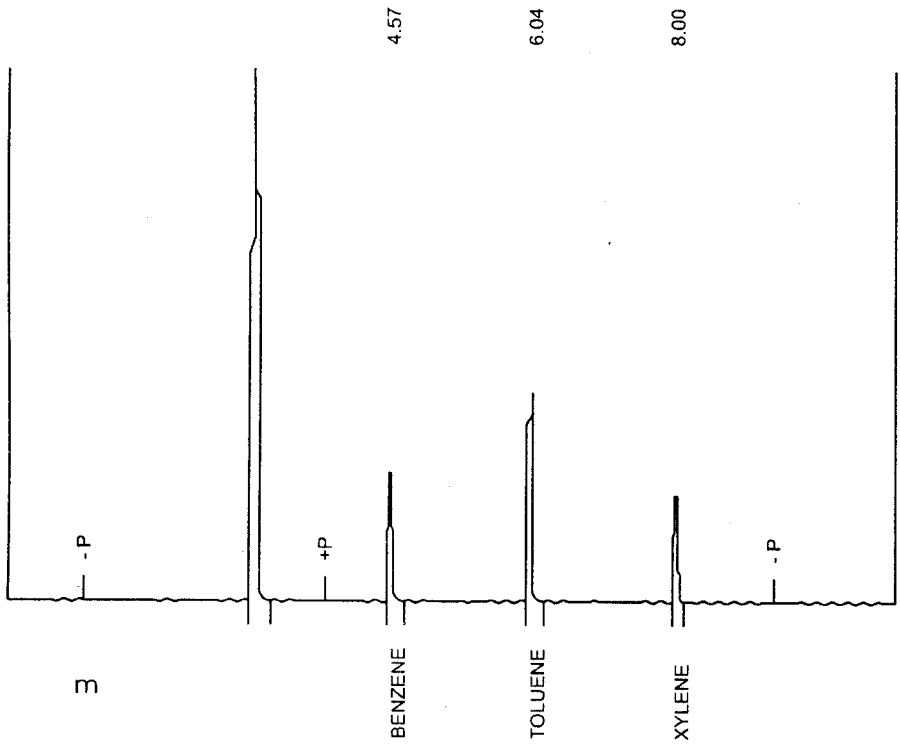
Analytes are transferred to the column in the form of narrow band of vapor. Desorption in the focusing

trap initiates the analytes to run through GC column. Different thermal desorbers may have different arrangements for automation. Alternatively, use equivalent manual desorption

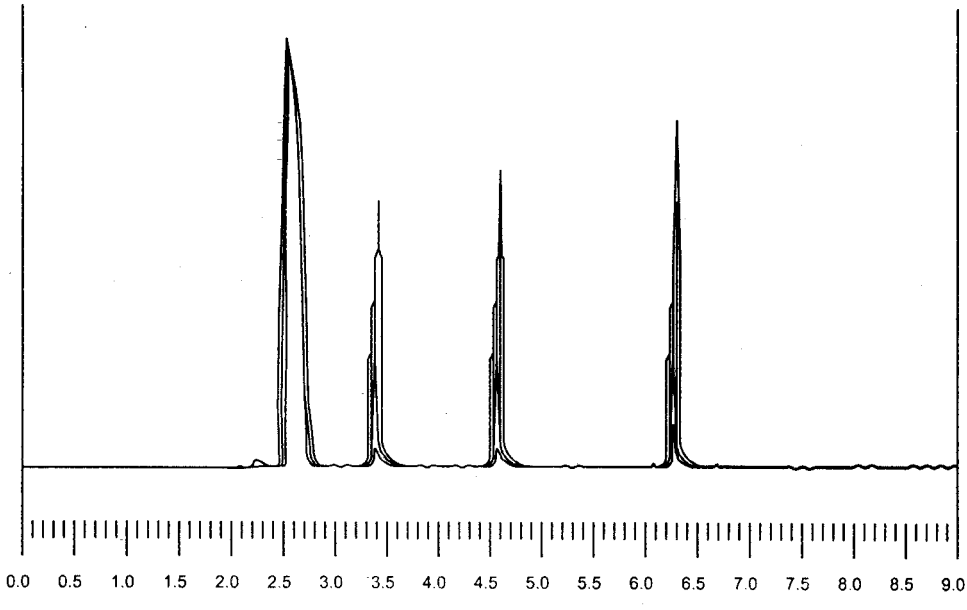
NOTE — Components should normally be desorbed from the focusing trap in backflush mode, that is, with the gas flow through the cold trap in the reverse direction to that used during analyte focusing.

c) *Sample splitting* — If the sample loading is high, it is usually possible to eliminate sufficient water to prevent analytical interference by using sample splitting.

Sample may be split either: (a) between the focusing trap and the capillary column (single splitting) during trap (secondary) desorption, or (b) between both the



8A Typical View

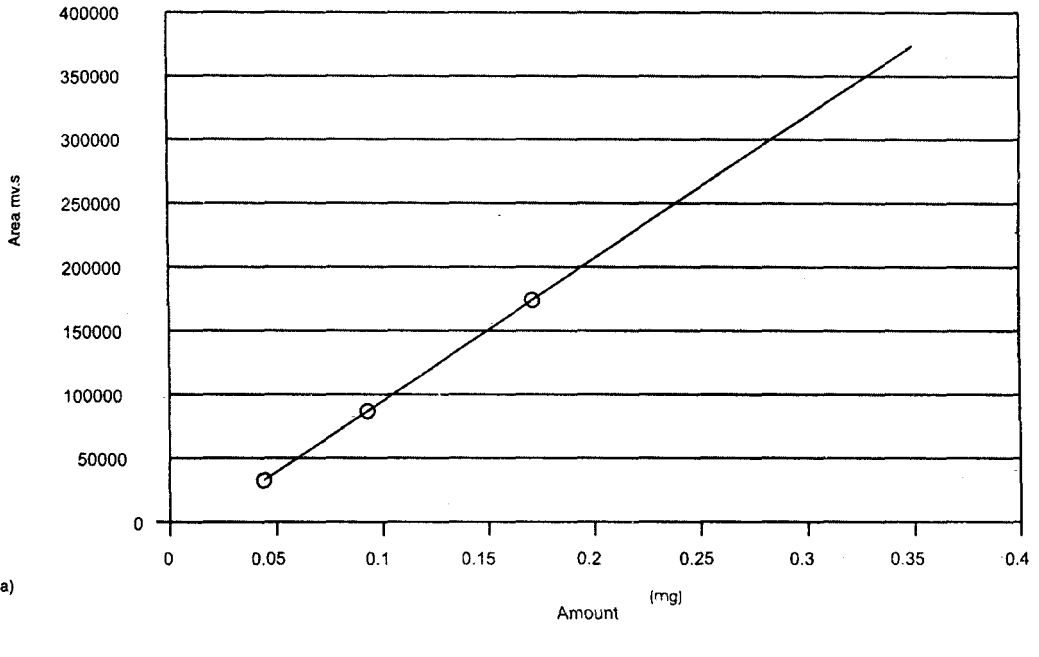


8B Overlay View on ATD-GC-FID System

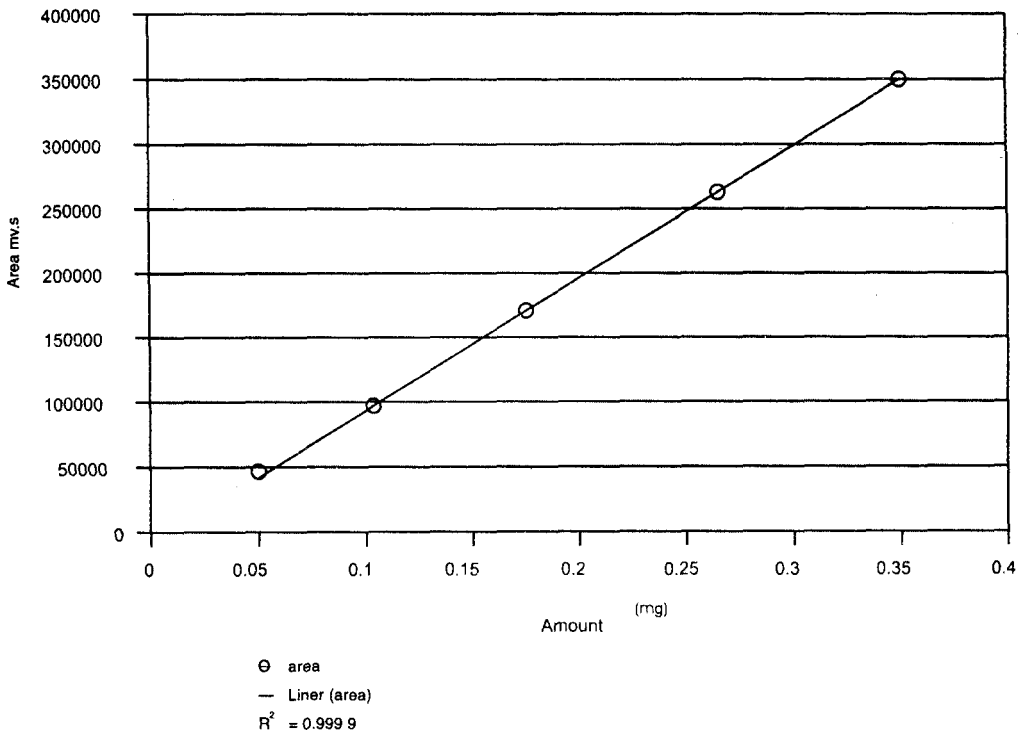
FIG. 8 CHROMATOGRAMS OF BENZENE, TOLUENE AND XYLENE
(Using Column PE5, 25 m × 0.20 mm, d_f = 0.33 µm 5 percent phenyl 95 percent dimethyl polysiloxane, at concentration of analytes, 0.017 4 µg/µl)

tube and the focusing trap during primary (tube) desorption, that is, double splitting. It may, in fact, be necessary to split the sample in some cases to prevent overloading the analytical column or detector due to excess water accumulation or during the analysis of high concentration/large volume air samples.

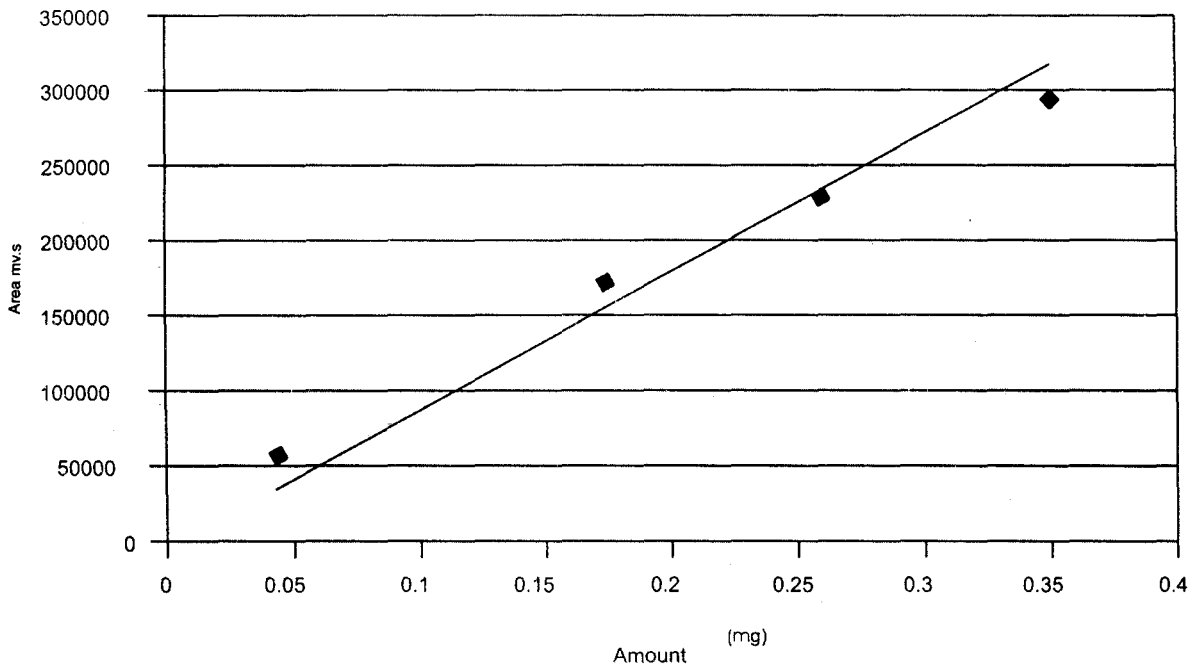
NOTE — Sample splitting is one of the key approaches to water management. Moisture management by sample splitting is applicable to relatively high concentrations (10 ppb) or large volume air samples.The mass of water retained by the sorbent tube during sample collection may be sufficiently reduced by the split alone to eliminate the need for further water management steps.



9A Benzene



9B Toluene



9C Xylene

FIG. 9 CALIBRATION GRAPH

d) *Trap desorption and GC/MS analysis* — After each tube is desorbed, rapidly heat the focusing trap and apply pure Nitrogen or helium carrier gas. Sample splitting is necessary to accommodate the capillary column. Analytes are transferred to the column in a narrow band of vapor.

The GC run is initiated based on a time delay after the start of thermal desorption. The analytical cycle and ATD and GC conditions are described as follows:

1) *ATD Conditions*

i) Purge time: 1 min (After leak test air is purged to reduce analyte oxidation).

ii) Tube oven temperature : 300°C, Desorb time is 12 min.

iii) Cold trap low temperature : –30°C.

iv) Heat rate of cold trap: 40°C/s up to 225°C for 20 min.

v) Heated valve temperature: 6 Port rotary valve: 200°C.

vi) Transfer line temperature: 225°C.

vii) Inlet and Outlet split: 50 and 20 ml/min before and after cold trap respectively.

(These vary depending on nature and probable concentration of analyte in the sample).

2) *GC Conditions*

i) The ambient laboratory temperature should be between 10°C and 35°C with a relative humidity 20 percent to 75 percent with no condensation. The GC-ATD will operate safely between 15°C and 32°C.

ii) Capillary Column, coating: 5 percent phenyl 95 percent dimethyl polysiloxane, Length × ID : 25 m × 0.20 mm, d_f = 0.33 µm.

iii) Detector: Flame ionization detector (FID) at 260°C.

iv) Air and H_2 Gas: 400 ml/min and 40 ml/min (10 : 1).

v) Carrier Gas: Nitrogen.

vi) Attenuation and Range: – 6 and 1.

vii) Injector: Off.

viii) Oven initial temperature: 50°C hold for 2 min.
Ramp 1 – 8.0°C/min to 140°C hold for 3 min.
Ramp 2 – 10.0°C/min to 250°C hold for 3 min.

ix) Run Time : 30.25 min.

x) Benzene RT 4.57 min, Search window : 1.00 s, 3.00 percent.

xi) Toluene RT 6.04 min, Search window : 1.00 s, 3.00 percent.

xii) Xylene RT 8.00 min, Search window : 1.00 s, 3.00 percent.

NOTE — Temperature programming and retention time (RT) of analyte may vary column to column to get appropriate resolution of analyte peaks. Injection volume and split may also vary according to nature and probable concentration of analyte present in the extract.

e) *Conditioning of sorbent tubes reuse* — All volatiles should be stripped from the sorbent tubes during the thermal desorption process leaving them clean and ready for reuse. The tubes should be resealed to ensure they are kept clean and ready for immediate reuse.

5.6 Calculation

Amount of analyte compound found on tube can be converted into mg/m^3 by using the formula:

$$\text{Volume of air, in m}^3\text{ (sucked through the adsorption tube)} = \frac{s \times t}{10^6}$$

where

s = sampling rate, in ml/min; and

t = sampling time, in min.

$$\text{Concentration, in } \mu\text{g/m}^3\text{ (at ambient condition)} = \frac{C_2}{V_3}$$

where

C_2 = amount of anlyte compound found on sample tube in µg; and

V_3 = volume of air sucked through the tube, in m^3.

Blank value is to be subtracted from the amount of compound found in the sample.

$$\text{Concentration, in mg/m}^3\text{ at (STP)} = \frac{C \times 101.3\ (273 + T)}{273 \times P}$$

where

C_3 = concentration at ambient condition, in mg/m^3;

T = temperature of the ambient air, in °C; and

P = atmospheric pressure, in kPa.

6 METHOD 3 (PASSIVE SAMPLING USING COCONUT SHELL ACTIVATED CHARCOAL PASSIVE DIFFUSION SAMPLER TUBES)

6.1 Principle

Controlled diffusion with an activated charcoal tube is used to enrich the substances targeted for analysis. A diffusion sampling system comprises a sampling layer and a diffusion path in front of this layer. The diffusion path is filled with porous cellulose acetate, to prevent convection currents. The sample is taken by exposing the tube to ambient air (protected from rain). During this exposure time, the analytes stream into the activated charcoal due to the concentration gradient between the air and the desorption layer hand are adsorbed by the charcoal. Once the sample has been collected, the tubes are taken to the laboratory where desorption is done and the substances dissolved in the CS_2 are analyzed using capillary gas chromatography (GC) equipped with flame ionization detector (FID).

6.2 Apparatus

6.2.1 *Sampling Device* — Passive diffusion sampler or Sorption diffusion tube (Fig. 10) of known dimensions (length, internal diameter etc), or standard make [*Orsa-5, Drager, Lubeck. Germany; Radiello diffusive sampler, Fondozione Salvatore Maugeri (FSM), Italy; SKC diffusive sampler series 5, PA, USA* or other equivalent make] filled with known amount (generally 400 mg or so but less than 600 mg) of coconut shell activated charcoal (crystalline form, mesh size between 30 and 80 mesh) and of known diffusion constant, uptake rate and desorption efficiency (for benzene toluene and xylene) provided with protecting hood and passive diffuser tube

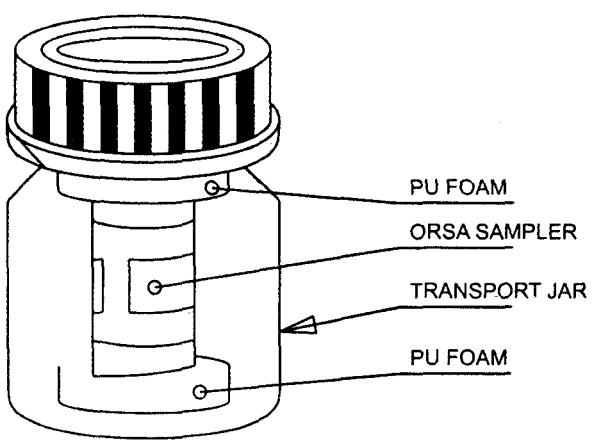


FIG. 10 PASSIVE DIFFUSION SAMPLER TUBE FOR BTX WITH TRANSPORTATION BOTTLE

holder to protect the tube from rain and direct sunlight. Suitable diffusion barrier like acetate cellulose is provided at ends of diffusive sampler tubes. All the supporting parts that is diffusive tube body, tube holder, clip etc should be made of stainless steel or polycarbonate or polyethylene. The glass bottles (*see* Fig. 10) are used for storing and transporting the sample tubes before and after sampling to/from field and laboratory.

6.2.2 *Gas Chromatograph* — Any suitable gas chromatograph equipped with flame ionization detector (FID) with fused silica capillary columns having a length of 25 m or more, an internal diameter of 320 µm or below and with a stationary phase film thickness less than 1.5 µm as follows or equivalent may be recommended.

Capillary 624 Column : Coating: cyanopropyl phenyl polysiloxane, Length × ID : 30 m × 0.25 mm, Film thickness (d_f) : 1.4 µm

Capillary Column : Coating: 5 percent phenyl, 95 percent dimethyl polysiloxane, Length × ID : 25 m × 0.20 mm, Film thickness (d_f) : 0.33 µm

Wall Coated Column : Coating: Fused Silica PONA CB, Length × ID : 50 m × 0.21 mm, Film thickness (d_f) : 0.5 µm

Capillary Column : Coating: Fused silica 100 percent dimethyl polysiloxane, Length × ID : 30 m × 0.32 ID, Film thickness (d_f) : 1.0 µm

6.3 Reagents

6.3.1 *Carbon Disulphide* (CS_2) — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 5 percent, Benzene 0.000 1 percent, H_2O < 0.02 percent.

6.3.2 *Benzene* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 3 percent, H_2O < 0.02 percent.

6.3.3 *Toluene* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 3 percent, H_2O < 0.02 percent.

6.3.4 *Xylene* — Chromatographic grade, Purity > 99.9 percent (GLC), Residue < 0.000 3 percent, H_2O < 0.02 percent.

6.3.5 *Carrier Gas* — Helium or Nitrogen of purity > 99.9 percent, H_2O < 0.02 percent, Residues < 0.000 3 percent.

6.4 Sampling

6.4.1 *Sampling Location*

The sorption diffusion tube with tube hood is placed with the pillar at the height of 1.8-2.1 m at desired location. Site should be free from any obstacle to free flow of the air in the vicinity.

6.4.2 *Sampling Rate*

The sampling is performed through natural diffusion (sampling rate generally range between 5 and 10 ml/min). The analyte is adsorbed on to activated charcoal.

6.4.3 *Sampling Period*

The diffusive samplers are exposed in field for previously determined period [generally for a fortnight (15 days) or so].

NOTE — Exposure period may be shortened to a week or few days only for highly polluted area that is near gasoline emissions or dispensing station, garage or so.

6.4.4 *Sample Diffuser Tubes Labelling* — Sample tubes are labelled with a unique identification number.

6.4.5 *Blank and Sampled Tube Storage*

Before and after sampling the samples are stored and transported to field/laboratory in sealed glass bottle. Store these tubes in storage container having clean environment maintained at 4 - 5°C.

6.5 Procedure

6.5.1 *Calibration*

Prepare a mix stock standard solution of 50 µg/µl of benzene, toluene and xylene each gravimetrically, using a micro syringe in the elution solvent that is CS_2. Prepare further diluted solutions of concentration range of 10, 1.0, 0.10 µg/µl with CS_2 from stock standard in a clean vial. Make up to one millilitre solution. Introduce immediately 1 ml standard solution into the injector of GC directly and plot the curve between the concentration and response (peak area). A typical chromatogram of standard mixture is given in Fig. 11.

6.5.2 *Analytical Procedure*

Samples collected through passive technique (sorbent diffusion tubes) may be desorbed by conventional solvent (generally carbon disulphide). The samples extracted in carbon disulphide are analysed on Capillary GC equipped with flame ionization detector (FID). 1 µl of each standard solution is injected into the column. GC conditions are given as follows:

GC-FID conditions

Capillary column : Wall coated fused silica, PONA, d_f - 0.5 µm

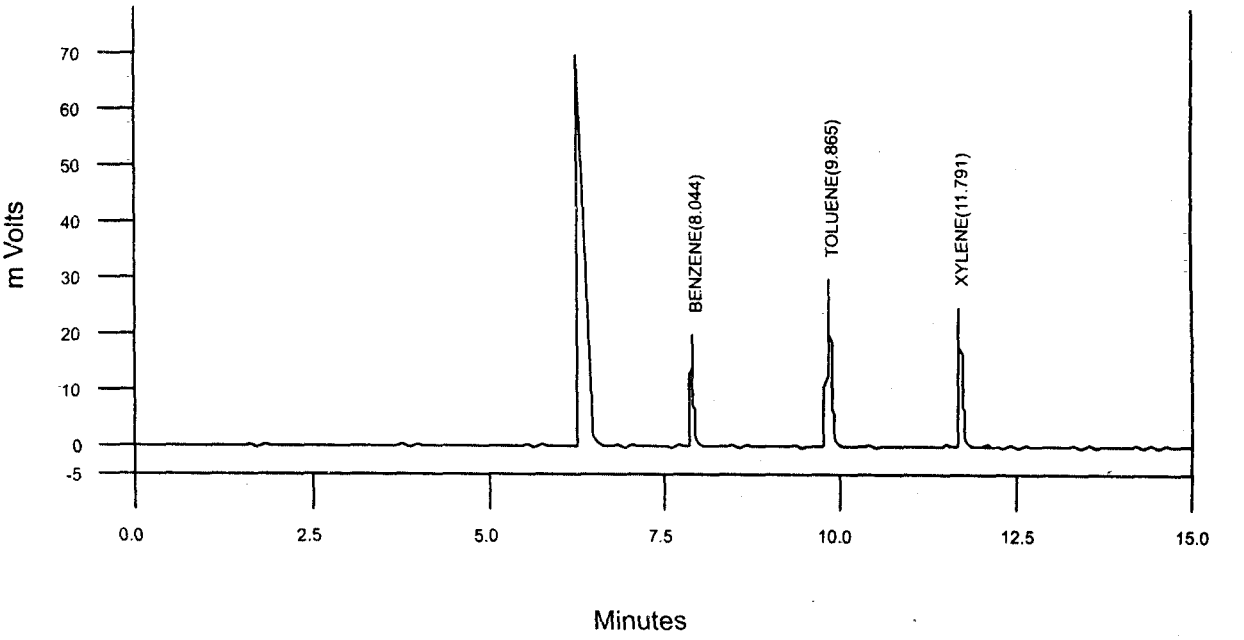


FIG. 11 STANDARD CHROMATOGRAM OF BENZENE, TOLUENE AND XYLENE
(Using CP_Silica PONA capillary column 50 m × 0.2 mm ID, film thickness d_f - 0.5 µm)

Length × ID : 50 m × 0.21 mm

Gas flow:

a) Nitrogen : 30 ml/min (Make up + column), (Column flow: 1 ml/min)

b) Hydrogen : 30 ml/min

c) Air : 300 ml/min

Temperature programming:

Injection port : 250°C FID : 300°C

Oven : 60° - 230°C @ 10°C/min

Typical Injection volume: 2 µl, total run time: 20 min.

- Benzene RT 8.06 min, Search window : 1.00 s, 3.00 percent
- Toluene RT 9.86 min, Search window : 1.00 s, 3.00 percent
- Xylene RT 11.78 min, Search window : 1.00 s, 3.00 percent

NOTE — Temperature programming and retention time (RT) of analyte may vary column to column to get appropriate resolution of analyte peaks. Injection Volume and split may also vary according to nature and probable concentration of analyte present in the extract.

6.6 Calculation

Calculations are given as follows:

$$C = (M - M_{blank}) \times K_{ORSA} \times 1\,000 / DE \times D \times t$$

where

C = concentration of the measured compound/ analyte, in mg/m³;

M = determined mass of the measured compound, in ng;

M_{blank} = weight of analyte organic vapour on blank tube, in ng;

K_{ORSA} = equipment constant of the diffusive sampler (that is 0.8 cm^{-1} for Drager's ORSA 5 diffusive sampler);

1000 = conversion factor to get µg/m³ from, in mg/m³;

DE = desorption efficiency (that is 0.98 for Drager's ORSA 5 diffusive sampler);

D = diffusion coefficient in cm^2/s at 25°C and 1 013 kPa (Benzene 0.085 9 cm^2/s, Toluene 0.076 4 cm^2/s, Xylene 0.072 7 cm^2/s for Drager's ORSA 5 diffusive sampler); and

t = sampling duration, in seconds.

Alternatively following formulae may be applied for calculations:

$$C = (M - M_{blank})/DE \times U \times t$$

where

C = concentration of the measured compound, in µg/m³;

M = determined mass of the measured compound, in ng;

M_{blank} = weight of analyte organic vapour on blank tube, in ng;

DE = desorption efficiency (0.98);

U = uptake rate in l/h at 25°C (benzene 0.387 l/h, toluene 0.343 l/h, xylene); and

t = sampling duration, in hours.

$$\text{Concentration (mg/m}^3\text{) at (STP)} = \frac{C_3 \times 101.3\ (273 + T)}{298 \times P}$$

where

C_3 = concentration at ambient condition, in µg/m³;

T = temperature of the ambient air; in kelvin; and

P = atmospheric pressure, in kPa.

7 CONVERSION OF CONCENTRATION IN PPB

$$C\ [\text{ppb}] = C\ [\mu\text{g/m}^3] \times 24.1/M$$

where

24.1 = molar volume at 20°C in litres; and

M = molar mass.

8 INTERFERENCES AND LIMITATIONS

8.1 Interference from Sorbent Artifact and Minimizing Artifact Interference

Stringent tube conditioning and careful tube capping and storage procedures are essential for minimizing artifacts. System and sorbent tube conditioning must be carried out using more stringent conditions of temperature, gas flow and time than those required for sample analysis.

NOTE — A reasonable objective is to reduce artifacts to 10 percent or less of individual analyte masses retained during sampling.

8.2 Artifacts from Long-Term Storage of Blank Tubes

Literature reports of the levels of artifacts on (a) Carbotrap/pack™ C, Carbotrap/pack™ B; and Carbosieve™ SIII multi-bed tubes; and (b) Tenax® GR tubes by workers when sealing the tubes using metal Swagelok®-type caps and PTFE ferrules with multi-tube, glass storage jars are reported to be between 0.01 ng after 1-2 months and 0.1 ng after six months respectively. Artifact levels reported for other porous polymers are higher, for example, 5 ng for Chromosorb 106 after one week.

Some varieties of charcoal contain metals which will catalyze the degradation of some organic analytes during thermal desorption at elevated temperatures thus producing artifacts and resulting in low analyte recoveries.

8.3 Artifacts Generated During Sampling and Sample Storage

8.3.1 *Active Sampling*

Benzaldehyde, phenol and acetophenone artifacts are reported to be formed via oxidation of the polymer Tenax when sampling high concentration (100 - 500 ppb) ozone atmospheres.

Tenax should thus be used with an ozone scrubber when sampling low levels (< 10 ppb) of these analytes in areas with appreciable ozone concentrations.

Carbotrap pack type sorbents have not been reported to produce this level of artifact formation. Once retained on a sorbent tube, chemically stable VOCs, loaded in laboratory conditions, have been shown to give good recoveries, even under high ozone concentrations for storage of a year or more.

8.3.2 *Passive Sampling*

The uptake rate of diffusive samplers is not significantly affected by air movement, provided the air velocity exceeds a threshold value which depends on design. Generally, air velocities greater than 0.1 ms^{-1} and below 10 ms^{-1} are sufficient for the passive sampling.

8.3.3 Temperature correction for sampled air volume is to be made, if sampling is performed below 20°C or above 30°C .

9 DETECTION LIMITS AND MAXIMUM QUANTIFIABLE CONCENTRATIONS OF AIR POLLUTANTS

The method of detection limit is defined for each system by making seven replicate measurements of a concentration of the compound of interest near the expected detection limit (within a factor of five), computing the standard deviation for the seven replicate concentrations, and multiplying this value by 3.5 (the Student's t value for 99 percent confidence for seven values).

Detection limits for atmospheric monitoring vary depending on several key factors. They are:

a) Sample storage condition,

b) Injection volume,

c) Minimum artifact levels,

d) GC detector selection, and

e) Volume of air sampled. The volume of air sampled is in turn dependent upon a series of variables including SSVs, pump flow rate limitations and time-weighted-average monitoring time constraints.

Generally detection limits range about sub-ppb for BTX in one litre air samples using the GC-FID. Detection limits are greatly dependent upon the proper management of water for GC capillary analysis of volatile organics in air using sorbent technology.

9.1 Safe Sampling Volume (SSV)

Usually calculated by halving the retention volume (indirect method) or taking two-thirds of the breakthrough volume (direct method), although these two approaches do not necessarily give identical results. The latter definition is generally used.

9.2 Breakthrough Volume (BV)

The volume sampled when the amount of analyte collected in a backup sorbent tube reaches a certain percentage (typically 5 percent) of the total amount collected by both sorbent tubes.

10 QUALITY ASSURANCE (VALIDATING THE SAMPLE COLLECTION PROCEDURE)

10.1 Blanks

Artifact levels on laboratory and field blanks should be at the low or sub-nanogram level for carbonaceous sorbents and Tenax® and at the double digit ng level for Porapaks®, Chromosorb®. If artifact levels are considerably above this, careful attention must be paid to the tube conditioning and storage procedures.

Artifact peaks, which are 10 percent or more of the area of average component peaks, should be marked as artifacts in the final data reports.

10.2 Performance Criteria for the Monitoring Pump

Records of the pump flow rate delivered against the pump flow rate or pressure selected on a pump should be reviewed at least once per three months. If the performance of any pump has been found to have changed significantly over that time; for example if completely different pump settings are required to deliver the same pump flow rate, the pump should be serviced by the manufacturer or their approved agent.

10.3 Performance Criteria for the Solid Adsorbent Sampling of Ambient Air

There are four performance criteria, which must be met for a system. These criteria are:

a) A method detection limit of 0.5 ppb,

b) Duplicate (analytical) precision within 20 percent on synthetic samples of a given target analyte or vapor in a typical vapor mix in humidified zero air,

c) Agreement within 25 percent for distributed volume pairs of tubes taken in each sampling set, and

d) Audit accuracy within 30 percent for concentrations normally expected in contaminated ambient air (0.5 to 25 ppb).

10.4 Calibration of Response

The multi-level calibration procedures and calibration frequencies should be followed for this. It is also advisable to analyze a single level calibrant (i.e. tubes loaded with analyte masses in the mid-range of those expected to be collected during sampling) approximately every tenth sample during an analytical sequence, as a check on system performance.

10.5 Analytical Precision of Duplicate Pairs

The measure of analytical precision used for this method is the absolute value of the relative difference between two identical samples (same flow rate over the same time period from with a common inlet to the sample volume). The analytical precision is expressed as a percentage as follows:

$$\text{Analytical precision} = [(X_1 - X_2)/X \times 100]$$

where

X_1 = a measurement value taken from one of the two tubes used in sampling,

X_2 = a measurement value taken from the second of two tubes used in sampling, and

X = average of X_1 and X_2.

The analytical precision is a measure of the precision achievable for the entire sampling and analysis procedure including the sampling and thermal desorption process mentioned above and the analytical procedure.

10.6 Accuracy

A measure of accuracy is the degree of agreement with audit standards. Audit accuracy is defined as the relative difference between the measurement result and the nominal concentration of the compound:

$$\text{Audit accuracy, percent} = \frac{(\text{Spiked value} - \text{Observed value}) \times 100}{(\text{Spiked value})}$$

Annexure-A/6

The Orissa State Bar Council
CUTTACK - 753 002
Phone No.- 0671-2607885

Enrolment No. & Date O-1047/17.12.11

Name SANJAYA KUMAR MISHRA, ADV.

Place of Practice : Cuttack

Date of Birth : 04.03.1969

Sign. of the Chairman

Sign. of the Secretary

TO WHOM IT MAY CONCERN

The holder of this card is an advocate under **Orissa State Bar Council.** If found, please return or post in the following address.

Father's/ Husband's Name : Sri Nilamani Mishra

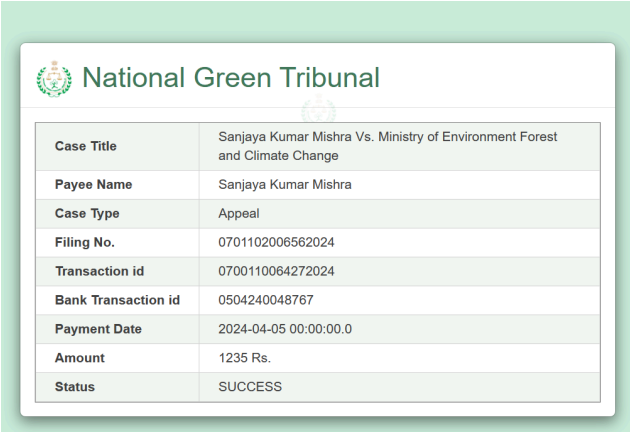
Address At:-Maszid Chowk, P.o/Dist:-Bolangir,

Phone No. : 06652:-232723

Sanjaya Kumar

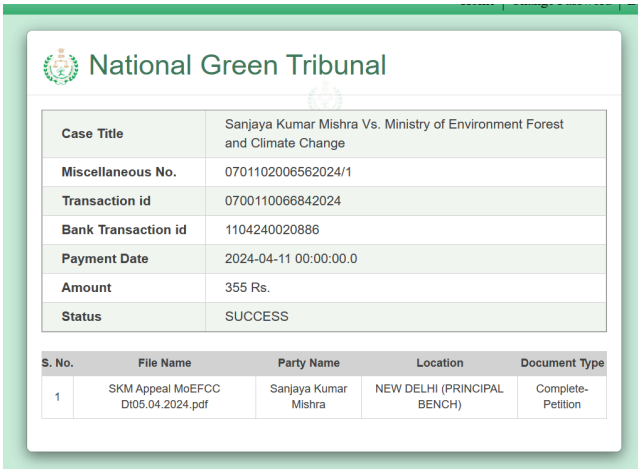
Sign. of the Card Holder

Annexure-A/7



National Green Tribunal

Case Title	Sanjaya Kumar Mishra Vs. Ministry of Environment Forest and Climate Change
Payee Name	Sanjaya Kumar Mishra
Case Type	Appeal
Filing No.	0701102006562024
Transaction id	0700110064272024
Bank Transaction id	0504240048767
Payment Date	2024-04-05 00:00:00.0
Amount	1235 Rs.
Status	SUCCESS



National Green Tribunal

Case Title	Sanjaya Kumar Mishra Vs. Ministry of Environment Forest and Climate Change
Miscellaneous No.	0701102006562024/1
Transaction id	0700110066842024
Bank Transaction id	1104240020886
Payment Date	2024-04-11 00:00:00.0
Amount	355 Rs.
Status	SUCCESS

S. No.	File Name	Party Name	Location	Document Type
1	SKM Appeal MoEFCC Dt05.04.2024.pdf	Sanjaya Kumar Mishra	NEW DELHI (PRINCIPAL BENCH)	Complete-Petition