Joint committee report

In compliance of Hon'ble NGT order dated 13.05.2024

in Original Application No. 115/2024

In the matter of

Rashid Noor Khan

Vs

MoEF&CC & Ors.

Committee members:

1. Dr. H.V.C. Chary Guntupalli, Scientist-E, MoEF&CC IRO, Bhopal
2. Sh Sunil Kumar Meena, Scientist-E, CPCB, RD, Bhopal
3. Sh. Kailash Narayan Katare, Regional Officer, MPPCB, Chhindwara

Dates of committee visit: **10th July 2024**

BEFORE THE NATIONAL GREEN TRIBUNAL, CENTRAL ZONAL BENCH
ORIGINAL APPLICATION No. 115/2024
CENTRAL ZONE BENCH, BHOPAL

IN THE MATTER OF:

RASHID NOOR KHAN .....APPLICANT

VERSUS

MoEF&CC & Ors. .....RESPONDENT

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Date: 09.08.2024

Submitted by MPPCB:-

Place: Bhopal

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Joint committee report

Hon'ble NGT vide its order dated 13.05.2024 in O.A. 115 of 2024 (CZ) "Rashid Noor Khan Vs MoEF&CC & Ors." has stated under Para 5 & 6 as:

Para 5. We deem it just and proper to call a report on the matter in issue, in present application, from a Joint Committee consisting of:-

(i) One representative from the MoEF&CC, Integrated Office at Bhopal

(ii) One representative from the CPCB, Bhopal

(iii) One Representative from the Madhya Pradesh Pollution Control Board, Bhopal

Para 6. The Committee is directed to visit the place and submit the factual and action taken report within six weeks. The State PCB will be the nodal agency for coordination and logistic support.

Copy of the order dated 13.5.2024 is enclosed as **Annexure-I.**

In compliance of the order, a committee of following officers was constituted and the committee visited the site i.e. M/s Satpura Thermal Power Plant, Sarani on 10th July 2024 to account the factual status on the issue raised in the petition of Sh Rashid Noor Khan. The details of the committee members are as tabulated below:

S. No.	Name & Designation Of the officer	Department
1.	Dr. H.V.C. Chary Guntupalli, Sci-E	MoEF&CC (IRO) Bhopal
2.	Sh. Sunil Kumar Meena, Sci-E	CPCB, RD, Bhopal
3.	Sh. Kailash Narayan Katare, Regional Officer	MPPCB (RO), Chhindwara

1.0 Major issue raised by the petitioner:

The major issue raised by the petitioner is about the following:

i. Violation of the provisions made under the fly ash disposal notification dated 31.12.2021 & 30.12.2022 specific reference to the utilization in construction of roads and flyovers embankments by the M/s Satpura Thermal Power Plant, Sarani.

ii. Environmental quality deterioration due to emission & effluent discharge quality.

iii. Stability of the fly ash dykes.

2.0 Observations of the committee

The committee visited M/s Satpura Thermal Power Plant, Sarani on 10th July 2024. The committee visited the fly ash dykes, Ash Water Recirculation System, ESP area, fly ash silos etc. to account the status of pollution inside the premise & at ash dykes. Secondly, committee had detailed discussion on the various means of fly ash utilization adopted by the project proponent and the status of fly as disposal in construction of the road & embankment. The committee also had discussion with National Highway Authority of India (NHAI), Obedullaganj Itarsi Section Sh Satyendra, Authority Engineer for the status of utilization of the fly ash in the construction of the Natioanl Highways specifically from Betul to Bhopal, Betul to Harda, Betul to Harda Highway at Godhna, Betul to Nagpur Highway at Pankha and Itarsi to Budni bypass.
The committee also collected information related to operational status of the plant, total nos. of ash dykes, their operational status, status of fly ash audit and stability study of the dykes.

Based on the discussion held with Sh V K Kaithwar, Chief Engineer & other representative of power plant and Sh Satyendra, Authority Engineer and the observation made during the field visit following is recorded as factual status:

- On the day of visit i.e. 10.7.2024, only Unit No. 10 & 11 were operational. Both the unit has 250MW power generating capacity. The generation from Unit#10 & Unit#11 was 5.958 Million KW & 5.874 Million KW respectively. The average generation was 248 MW & 245 MW respectively. Unit#1 to Unit#5 each of 62.5MW were non-operational since 2012-13 and later got dismantled. Further the Unit#6 to Unit#9 are also under shutdown and proposed for de-commissioning. Unit#12 of 660MW is proposed. Tender for EPC contract for installation has been hoisted on 7th Feb 2024 with due date of bid submission i.e. 7th September 2024. The Flue gas desulfurization (FGD) is under tendering stage with due date of bid

submission (extended) is 20th August 2024. Currently, FGD is not installed in any unit. The details are as tabulated below:

S. No.	Units	Capacity (MW)	Commissioning Date	Remarks
1	Unit #6	200	27.06.1979	Under Shutdown since 05.03.2021. Proposed for de-commissioning.
2	Unit #7	210	20.09.1980	Under Shutdown since 05.03.2021. Proposed for de-commissioning.
3	Unit #8	210	25.01.1983	Under Shutdown since 29.02.2020. Proposed for de-commissioning.
4	Unit #9	210	27.02.1984	Under Shutdown since 18.02.2020. Proposed for de-commissioning.
5	Unit #10	250	18.08.2013	Operational
6	Unit #11	250	16.03.2014	Operational
7	Unit #12	660	Proposed	Proposed

- The Consent to Operate issued by MPPCB under Water (P&CP) Act 1974 and Air (P&CP) Act, 1981 is valid upto **31/07/2025** for Unit#10 & Unit#11 for 500MW power generation. Copy of the CTO is enclosed as **Annexure-II.**

- The coal is sources from various areas viz. Pathakheda, Kanhan, Pench, Nagpur, Chandrapur, Wani area of Western Coal filed Limited (WCL) and Southern Eastern Coal Filed limited (SECL).

- There is total 03 ash dykes established to cater the ash disposal from the various power generating units. The details are as tabulated below:

S.No.	**1**	**2**	**3**
Dyke Name	373 Ha.	111 Ha.	130 Ha.
Connected units	Unit #1 to #9	Unit #6 to #9	Unit #10 & #11
Dyke inner/outer layer	Cement concrete lining	Cement Concrete lining	HDPE lining
Dyke GPS location	22.10694444N, 78.17194444 E	22.10940833 N, 78.15750000 E	22.10853611 N, 78.11055556 E
Ash filling started in year	Jan, 1968	26.10.2015	16.03.2014
Ash filling closed in year	**Nov. 2015**	Operational	Operational
Capacity of AWRS	610 Cum/hr	610 cum/hr	200 cum/hr

- It is pertinent to mention here that the old ash dyke i.e. 373 Ha has been handed over to M.P. Forest Department vide letter #2674 dated 29.11.2022 for reclamation. A copy of the letters, along with other related communications regarding the filling of ash in this dyke, which has been ongoing to date, with an extension up to 30th September 2024 for leveling the dyke surface, is enclosed as **Annexure-III.** The present status of ash filling in the dyke for the filling of the voids and leveling was communicated to Regional Officer, MPPCB vide letter #1578 on 01 August 2024 for allowing the same till 30.09.2024. Copy of the letter is enclosed as **Annexure-IV.** Committee during the visit also observed the ongoing ash filling in 373 Ha. Ash dyke.
- Other than the 373Ha area of ash dyke, the power plant shall reclaim/stabilize the excess temporary ash storage area of 44.5Ha, in compliance of the MoEFCC notification dated 30.12.2022. Copy of the letter to Member Secretary, MPPCB dated 12.4.2023 in this regard is also enclosed as **Annexure-V.**
- The Indian Institute of Technology, Indore has carried out the stability analysis of the ash dyke (111 Ha) on 29th April 2023 & submitted its report on 17.5.2023. Following was inferred & recommended:

  Inferences:

  - *No new gully formations or seepage was observed during the filed visit. Prima facie dykes are properly maintained and area 111 Ha. Was inspected for stability analysis.*
  - *Samples from dyke no. 111 were used to calculate geotechnical properties to be used in the analysis.*

- *From the stability analysis of the ash dyke it is observed that it is stable and can be used for future possibilities.*
- *Seepage analysis for both steady and sudden drawdown conditions indicates water will drain out in 12 hours' time considering the level to be 2/3rd of F.R.L.*
- *The phreatic line goes well below the surface indicating surface and toe drains are well connected.*

Recommendation:

- *Though the **ash dyke is stable in all the conditions**, however regular inspection of dykes is recommended. The surface and toe drains need to be maintained regularly. The focus should be given to the deaccumulation of water near the slopes.*
- *In case of heavy seepage (presumably), water can be drawn by pumping out and through checking should be carried out to verify any blockage in the PCC drain provided from the toe of the soil embankment to the ash storage.*

Copy of the stability report of 111 Ha dyke is enclosed as **Annexure-VI.**

It is pertinent to mention here that joint committee is in the opinion that the Overflow Channel provided in 111 Ha. ash dyke needs to be designed properly to avoid any flow of ash in the near by drain that is meeting the Tawa reservoir. The satellite images of previous years revealed that there was flow of ash containing water in the drain.

- The Indian Institute of Technology, Indore has carried out the stability analysis of the ash dyke (130 Ha) on 01st February 2024 & submitted its report on 28.02.2024. Following was inferred & recommended:

Inferences:

- *No new gully formations or seepage was observed during the filed visit. Prima facie dykes are properly maintained and area 130 Ha. Was inspected for stability analysis.*
- *All the obtained Factor of Safety (FOS) were below the permissible limit of minimum FOS as per IS 7894:1975 for both embankments.*
- *Since there is no provision for a clayed/rocky core in the bottom ash dyke which substantially reduced the FOS and hence increased instability.*
- *From the stability analysis of the ash dyke, it is observed that it is in transition between stability and instability.*

- *The material property (geotechnical) provided by the client didn't fit the general range of the soil matrix and thus embankment appears weak against shearing.*
- *Seepage analysis for steady and sudden drawdown conditions indicates water will* ***not drain out*** *in 12 hours' time considering the level to be 2/3rd of F.R.L.*
- *The phreatic line goes well below the surface indicating surface and toe drains are well connected.*

Recommendation:

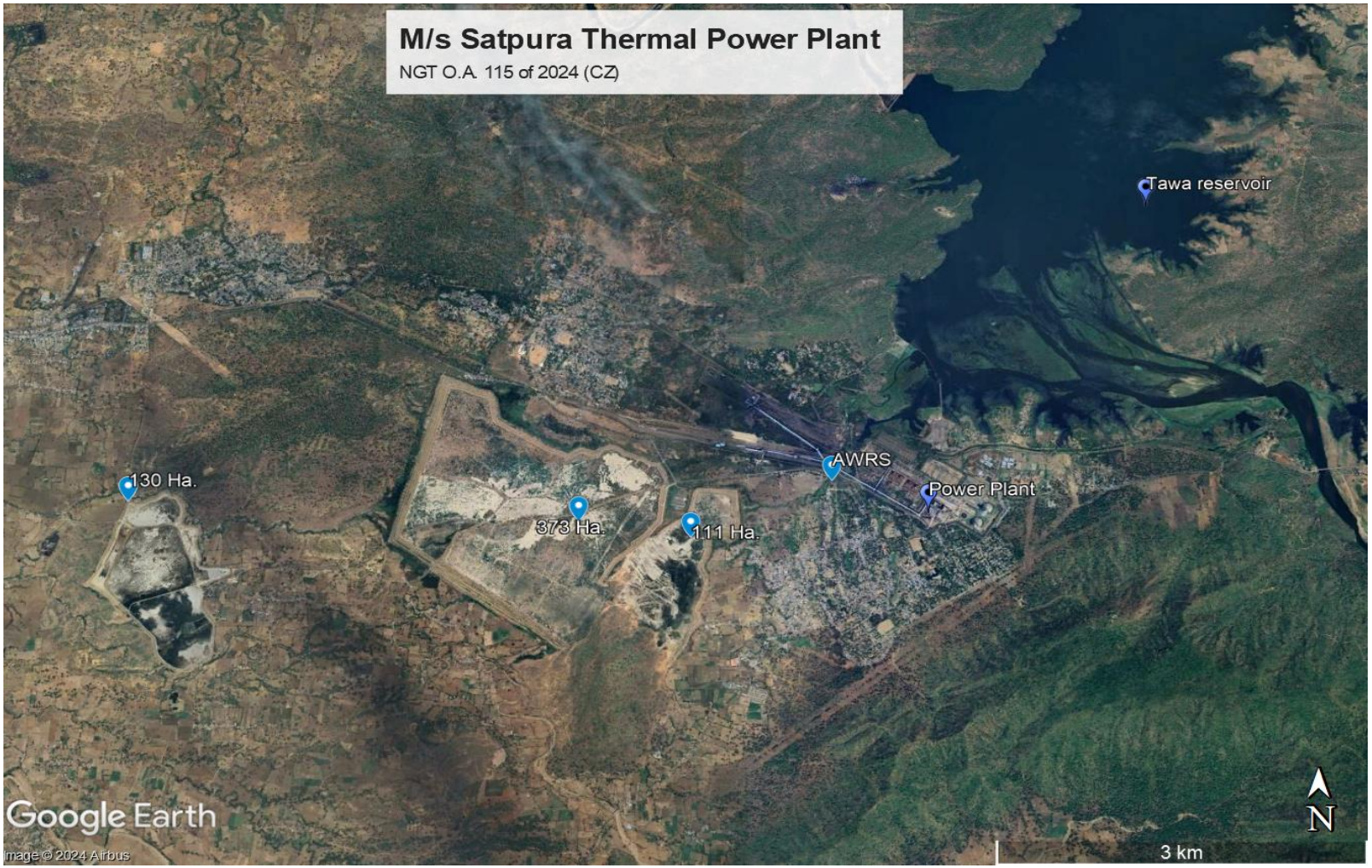
- *Prima facie it looked like the geotechnical data provided by the client is inaccurate and hence a fresh investigation of soil profile with testing of shear and index properties is the need of the hour. Separate geotechnical properties for embankment soil, clayed core, sand drain, rock toe and foundation should be determined.*
- *In case FOS is still below the permissible limit, the redesigning of the ash dyke is recommended at the 130-hectare site for both embankments followings IS 12169:1987 and IS 9423:1999.*

Copy of the stability report of 130 Ha dyke is enclosed as **Annexure-VII.**

The Joint Committee also opined for the same as recommended by IIT Indore in its stability analysis report, as on one corner of the dyke water was found accumulated in down gradient but there was no pumping system available to pump this accumulated water. Such kind of accumulation results in damage to the civil structure of the embankment.

Committee also observed that 10,000 Plants were planted on about 10 Ha. Land of the 111 ha. Ash dyke. Also, other two dykes were having good number of plants majorly of Babool.

The satellite view of the ash dykes, power plant & Tawa reservoir is as given below:



Satellite view of the Ash dykes, Power Plant & Tawa reservoir

3.0 Fly ash utilization

As per the submission made by Project Proponent (PP), since FY 2012-13 only 02 units viz. Unit no. 10 & Unit No. 11 of 250MW each are operational. The fly ash & bottom ash generated during the power generation is collected in silos. The dry fly ash is being utilized in available avenues, and rest of the ash is being discharge in ash dykes by adopting High Concentration Ash Disposal system.

The fly ash utilization of last 05 years (2019-2024) is as tabulated below:

S No	Ash utilization year	Ash utilization in percent %	Ash utilization in MT
1.	**2019-2020**	63.72 %	935798 MT
2.	**2020-2021**	94.20 %	1214197 MT
3.	**2021-2022**	99.82 %	895729 MT
4.	**2022-2023**	136 % (current + Legacy Ash)	1261575 MT (current + Legacy Ash in MT)
5.	**2023-2024**	121.07 % (current + Stored Ash)	1149162 MT (current + Stored Ash in MT)

The avenue-wise ash utilization is as tabulated below:

Particulars		Financial Year		
		2022-23	2023-24	2024-25 (upto 27.6.2024)
Total Fly ash generation (MT)		927613	949172	254669
Fly ash utilization (MT)		1261575	1149162	309662
Avenues of fly ash utilization	Roads & other construction work	141050	0	0
	Bricks	272855	263489	69071
	Filling of voids in ash bunds (373 Ha.)	753981	741231	190899
	Cement industry	15034	3949	0
	RMC plant (Concrete)	67052	86380	23682
	Others (Trading)	11603	54113	26010
Total utilization		1261575	1149162	309662
% utilization		136%	121.07%	121.59%

The ash utilization of last 03 Financial Year (2022 to 2025) reveals that PP is achieving the minimum 80% utilization required in each year of the 3-year

cycle as stipulated in notification dated 31.12.2021. However, it is pertinent to mention that major utilization is in void fillings of 373 Ha. Ash dyke.

Ash-disposal Compliance Audit report

- The project proponent (PP) has also engaged Authorized Auditor of National Institute of Technology, Uttarakhand for carrying out Ash-disposal Compliance Audit report for FY 2022-23. The observations from the Ash Disposal Compliance Audit Report for Satpura Thermal Power Station (STPS), Sarni, are as follows:

1. **Coal Consumption Records**: The coal consumption was recorded at 24,18,607 MT, with an average ash content of 35-41%. This data aligns with the fly ash generation reported for the financial year 2022-23.

2. **Fly Ash Disposal Compliance**: The fly ash generated was disposed of in accordance with the MoEF&CC Notification dated 31.12.2021 and its amendment on 30.12.2022. The disposal methods included:

    - Bricks manufacturing industry : 21.6%
    - Cement industry : 1.2%
    - Concrete manufacturing industry : 5.3%
    - Road construction work : 11.2%
    - Trading : 0.6%
    - Rail mode : 0.3%
    - Filling of voids in land reclamation : 59.8%

    The total ash disposed was 12,61,575 MT, resulting in a total ash utilization of 136%.

3. **Ash Disposal into Ash Ponds**: A total of 3,33,962 MT of ash was verified as used from ash ponds.

4. **Ash Pond Details**: There are three ash ponds with the following areas:

    - Ash Pond-1: 373 Hectares
    - Ash Pond-2: 130 Hectares
    - Ash Pond-3: 111 Hectares

    Ash Pond-1 has been surrendered to the forest department in compliance with regulations.

5. **Inspection of Ash Ponds**: The ash ponds were inspected and found to be in accordance with the design drawings. The active ash ponds have a capacity of 43,00,000 M3 and 80,00,000 M3, with a significant amount of unutilized ash.

These observations as stated in compliance Audit report indicate that the power station is adhering to regulatory requirements for ash disposal and management while also exploring various avenues for ash utilization.

However, the suggestions provided in the report are required to be adopted by the PP. The suggestions reported are as follows:

1. **Explore Alternative Disposal Avenues**: Since approximately 60% of the generated ash is currently utilized for filling voids in land reclamation of Ash bunds, it is recommended to explore other disposal methods after the expiration of the permission from the Forest Department on 31.03.2024.
2. **Utilization of Nearby Mines**: There are several mines within a 300 km radius of the power plant that could be utilized for backfilling mine voids or mixing ash with external overburden dumps under extended producer responsibility. However, despite efforts from the plant administration, this has not yet been materialized.
3. **Railway Network for Ash Disposal**: The administration has initiated the disposal of ash through the railway network, which could enhance the utilization of the generated ash.
4. **Filling of Coal Underground Mines**: STPS Sarni is exploring possibilities for filling coal underground mines at Western Coalfields Limited (WCL) with ash water, which could provide an additional avenue for ash disposal.

Copy of the Ash-disposal Compliance Audit report for FY 2022-23 is enclosed as **Annexure-VIII.**

4.0 Utilization of the ash in road construction:

The Project Proponent has submitted an update on fly ash utilization in road construction. The information provided indicates the following:

1. Between 2022 and 2024, the project proponent supplied 134,384 metric tons (MT) of fly ash to NHAI, Bhopal. This supply was specifically for the balance work related to the four-laning of the Itarsi to Betul Section of NH-69, spanning from 63 KMs to 137 KMs.

2. In the year 2023-24, a work order was issued to a sub-contractor for lifting fly ash at the contractor's cost. This action was taken based on NHAI, Nagpur's request for the laning of the Nagpur-Saoner-Betul section of NH-69. The project covers the stretch from Kms 3.00 to 59,300 in the state of Maharashtra and from Kms 137.000 to Kms 257.400 in the State of Madhya Pradesh. However, as of now, the sub-contractor has not commenced this work.

3. Other than these, PP has made communication with NHAI PIU Bhopal & Harda for sharing the transportation cost for the fly ash, but no response was received from NHAI.

The details on the communication made by the PP to NHAI for fly ash utilization are as tabulated below:

Sl. No.	Request received from Organization	Particulars	Proposed Qty. (Lakh CuM)	Lead (km)	Estimated Cost including GST (In Rs.)	Status as on date	Remarks
1	NHAI, Bhopal Request received on March 2022	Balance work for **four laning of Itarsi to Betul Section of NH-69** from km. 63.000 to km. 137.000 (Design length 73.955 km) in the State of Madhya Pradesh (Package -Il / NH- On EPC mode	2.45	40-90	4.39 Cr.	Order Executed	134384 MT fly ash has been transported NHAI, Bhopal for four laning Project during Nov.-2022 to Mar.-2023. Certificate received from NHAI.
2	NHAI, Harda Request received on July- 2022	Transportation of ash from 111 / 130-hectare ash ponds (and also from silo of PH-IV, if required) of STPS, Sarni to ash delivery locations of four lane road project of NHAI from **Temagaon - Chicholi package-II from chainage 36+500 to 60+850 of Temagaon to Betul section of NH- 47** (Old NH-59A) including excavation, loading / lifting and unloading works for utilization of ash.	1.54	100 - 130	13.28 Cr.	Request letter sent to NHAI for sharing of transportation cost vide no. 08-004 / Gen-374 / Sarni dtd. 17-02-2023.	No reply received from NHAI, Harda.
3	NHAI, Harda Request received on July- 2022	Transportation of Ash from 111 / 130-hectare ash pond (and also from silo of PH-IV, if required) of STPS, Sarni to ash delivery locations of four laning road project of NHAI **from Chicholi - Betul Pkg-III from chainage 83+075 to 120+600 of Temagaon to Betul section of NH-47** (Old NH-59A) including excavation, loading / lifting and un- loading works for utilization of ash.	3.11	60-80	17.91 Cr.	Request letter sent to NHAI for sharing of transportation cost vide no. 08-004/Gen-374/850 Sarni dtd 25-11-2022 & 505/0800/Fly Ash/632 Sarni dtd. 12/07/2023.	No reply received from NHAI, Harda.
4	NHAI, Bhopal Request received on Nov.-2022	Loading, Transportation and Unloading of ash from Ash Dam of STPS, Sarni to NHAI, **four laning of Ratapani stretch from Km. 8.300 to Km. 20.680 (Length 12.380 Km.) of Obedullaganj Itarsi section of NH-46** (Old NH- 69) in the state of	2.10	150 - 160	22.79 Cr.	Request letter sent to NHAI for sharing of transportation cost vide no 08-004 / Gen 374 / 83, 101 & 3626 Sarni dtd. 17/02/2023, 27-02-2023 & 04-01-2024.	No reply received from NHAI, Harda.

		Madhya Pradesh on EPC mode.					
5	NHAI, Bhopal Request received on March 23	**Balance work for four laning of Itarsi to Betul Section of NH-69** from km. 63.000 to km. 137.000 (Design length 73,955 km) in the state of Madhya Pradesh (Package -Il / NH-69) On EPC mode	0.37	63-137	--	Correspondence with NHAI for providing actual lead for preparation of Estimate vide letter dtd. 12/07/2023, 01/08/2023 & 06/09/2023.	No reply received from NHAI, Bhopal.
6	PWD Bhopal Request received on Aug.-2023	**Rehabilitation & Upgradation of Nasrullaganj-Rehti-Budhni Section of NH-146-B**, total design length-47.300 km from km 0+150 to km 50+500 to 2-lane with paved shoulder configuration in the state of Madhya Pradesh on EPC mode. (Demand of ash from PWD, National Highway Divison, Bhopal)	5.00	120-160	53.33 Cr.	Request letter sent to PWD. Bhopal for sharing of transportation cost vide no. 08-004/Gen-374/3663 Sarni dtd. 05-01 2024.	No reply received from PWD, National Highway Divison, Bhopal
7	NHAI, Nagpur Request received on Nov. 23	For laning of **Nagpur-Saoner-Betul section of NH-69** from Kms. 3.00 kms. 59,300 in the state of Maharashtra and from kms. 137.000 to kms. 257.400 in the State of Madhya Pradesh on Design, Build, Finance, Operate and Transfer (Annuity) basis:- Construction of VUP at ch. 27+230 (Pankha Junction) under COS as long term measures for rectification of Black Spot (MP-02-054) Supply of Fly Ash Reg.	1.00	70	Requisition received for lifting of fly ash on contractor's cost.	**Work order has been placed to** sub-contractor M/s Murli Manohar Developers vide. No. 08-004 / P&W Civil / Fly Ash / FAT-145 / 1607 Sarni dtd. 08-12-2023 on the behalf of NHAI, Nagpur concessionaire M/s Oriental Nagpur Betul Highway Limited Letter for execution of work sent to M/s Manohar Developers vide 505/0800/1948 Sarni dtd. 16/01/2024.	Work not started by the sub-contractor till date.

NHAI, Project Director, PIU, Bhopal vide its letter dated 8.7.2024 has submitted the fly ash utilization in following 03 road construction works executing under different-different Project Implementation Unit (PIU)

1. Betul to Bhopal under PIU Bhopal & Harda
2. Betul to Harda under PIU Harda
3. Betul to Nagpur under PIU Nagapur-2

The details are as tabulated below:

Name of the road stretch	**Road Construction Started on**	**Work completion date**	**Length of Road**	**No. of lanes**	**Qty of Fly ash supplied in Metric Tonn**	**Period of Fly ash Utilization**	**Name of Power Plant**
Obedullaganj Itarsi Exclusing Ratapani Section (NH- 46)	14.11.2017	07.12.2021	46.300	4	10912	14.11.2017 to 07.12.2021	**STPSS, Sarni**
Ratapani Section (NH- 46)	28.09.2022	25.10.2024	12.380	4	1668.9	28.09.2022 to 25.10.2024	NTPC, Gadarwara
Itarsi Betul Section (NH- 46)	22.02.2018	30.09.2024	73.955	4	109120	22.02.2018 to 30.09.2024	**STPSS, Sarni**
Harda Betul P1	10.09.2021	07.09.2023	30.000	4	660000 57200	10.09.2021 to 07.09.2023	NTPC, Gadarwara SSTPP, Dongalia
Harda Betul P3	15.09.2021	13.12.2023	40.248	4	266200	15.09.2021 to 13.12.2023	NTPC, Gadarwara
Betul Nagpur	20.01.2012	Feb-2015	174.512	4	8,55,304 (MP Section) 25,68,583 (MH Section)	20.01.2012 to Feb-2015	**STPSS, Sarni (MP Section)** Khaparkheda Power Plant, Koradi Power Plant (MH Section)

Copy of the letter is enclosed as **Annexure-IX.**

The information provided by NHAI, PIU, Bhopal reveals the following regarding fly ash utilization in road construction:

1. **Obedullaganj Itarsi Excluding Ratapani Section (NH-46) and Itarsi-Betul Section (NH-46):** The Project Proponent (M/s Satpura Thermal Power Plant, Sarni) supplied fly ash during the period from 2017 to 2024.
2. **Other Road Works:** For road works such as the Ratapani Section (NH-46), Harda Betul P1, Harda Betul P3, and Betul-Nagpur, fly ash was received from other power plants at no cost.

- The Paragraph (B) *"For the purpose of utilisation of ash, the subsequent sub-paras shall apply."* of the notification no. S.O. 5481(E) dated 31.12.2021, following is stated:

    1. *"All agencies (Government, Semi-government and Private) engaged in construction activities such as road laying, road and flyover embankments, shoreline protection structures in coastal districts and dams within a radius of 300 kms from the lignite or coal based thermal power plants shall mandatorily utilise ash in these activities (activities specified under Paragraph 'A (2)' of the said notification are as given below)*

        i. *Fly ash-based products viz. bricks, blocks, tiles, fibre cement sheets, pipes, boards, panels;*
        ii. *Cement manufacturing, ready mix concrete;*
        iii. *Construction of road and fly over embankment, Ash and Geo-polymer-based construction material;*
        iv. *Construction of dam;*
        v. *Filling up of low-lying area;*
        vi. *Filling of mine voids;*
        vii. *Manufacturing of sintered or cold bonded ash aggregate;*
        viii. *Agriculture in a controlled manner based on soil testing;*
        ix. *Construction of shoreline protection structures in coastal districts;*
        x. *Export of ash to other countries;*
        xi. *Any other eco-friendly purpose as notified from time to time.*

Provided that it is delivered at the project site free of cost and transportation cost is borne by such coal or lignite based thermal power plants.

Provided further that ***thermal power plant may charge for ash cost and transportation as per mutually agreed terms, in case thermal power plant is able to dispose the ash through other means and those agencies makes a request for it*** *and the provisions of ash free of cost and free transportation shall be applicable, if thermal power plant serves a notice on the construction agency for the same.*

- As, the Project Proponent is complying the minimum 80% utilization of the fly ash in 3-year cycle as per the notification dated 31.12.2021 and also utilizing more than 100% from last 03 financial years, by utilizing it in various avenues prescribed in the notification. So, based on the condition prescribed in the notification, PP is charging the ash cost or transportation with the user i.e. NHAI. However, no response is received by the PP from the NHAI for such terms.

5.0 Environmental Quality

5.1 Source emission:

Currently, only 02 units of the thermal power plant i.e. Unit #10 & Unit #11 is in operation since 2013. The Source emission monitored continuously through Online Continuous Emission Monitoring System (OCEMS) for Particulate matters, SO2 & NOx for the duration of April 2023 to June 2024 are as tabulated below:

Month	Unit #10 (Monthly Avg.)			Unit #11 (Monthly Avg.)		
	PM (mg/Nm3)	SO2 (mg/Nm3)	NOx (mg/Nm3)	PM (mg/Nm3)	SO2 (mg/Nm3)	NOx (mg/Nm3)
Apr-23	38.63	1451	464	41.29	1282	409
May-23	45.43	1425	467	39.82	1239	378
Jun-23	48.07	1456	494	49.91	1237	360
Jul-23	36.61	1323	491	41.51	1051	379
Aug-23	28.35	1288	487	Shut down due to Annual Overhaul	Shut down due to Annual Overhaul	Shut down due to Annual Overhaul
Sep-23	33.66	1261	538	32.72	1074	525
Oct-23	26.86	1507	454	35.58	1356	529
Nov-23	23.53	1595	471	35.13	1469	563
Dec-23	33.79	1496	485	35.77	1409	568
Jan-24	39.11	1432	514	37.29	1412	614
Feb-24	29.21	1530	484	28.91	1556	550
Mar-24	30.04	1476	472	26.94	1533	523
Apr-24	42.91	1291	453	35.21	1377	477
May-24	30.76	1494	421	23.67	1610	428
Jun-24	42.59	1379	435	27.51	1463	437

The result indicates that emission of particulate matters is under the prescribed standard i.e. 50 mg/NM3. However, the higher values of SO2 will only reduce after the FGD installation. The PP has to optimize the Air-to-Fuel ratio and Low NOx burners performance to further reduce the emission values of the NOx.

5.2 Ambient Air Quality

The project proponent has established 02 Continuous Ambient Air Quality Monitoring Station (CAAQMS) at following locations:

1. ETP (Inside the plant premises) GPS location (Latitude 22.111022, Longitude 78.18046)

2. MPPGCL Hospital (Outside the plant boundary) GPS location (Latitude 22.105998, Longitude 78.174813)

The Monthly average Ambient Air Quality w.r.t. PM10 & PM2.5 at CAAQMS located at ETP indicates that the values are under the prescribed norms of 24-Hourly standards. However, PP need to ensure that monitoring of the other parameters viz. SO2 & NOx be continuous as from Sept 2023 the SO2 & from April 2024 the NOx is not being monitored.

Month	**PM10 (µg/m3)**	**PM2.5 (µg/m3)**
Apr-23	70.17	27.74
May-23	74.95	22.90
Jun-23	85.58	21.29
Jul-23	28.75	8.23
Aug-23	45.45	12.46
Sep-23	46.28	14.92
Oct-23	82.05	35.44
Nov-23	96.29	66.10
Dec-23	83.19	51.80
Jan-24	99.57	61.57
Feb-24	83.55	40.14
Mar-24	71.64	24.58
Apr-24	73.80	28.37
May-24	91.97	29.14
Jun-24	70.98	23.14

The Monthly average Ambient Air Quality w.r.t. PM10 & PM2.5 at CAAQMS located at MPPGCL Hospital indicates that the values are above the prescribed 24-hourly standard i.e. 100µg/m3. However, SO2 & NOx values are under the limit. PP need to take efforts to control the Ambient air pollution by carrying regular road cleaning, water sprinkling, stopping biomass burning and controlling other polluting events.

Month	**PM10 (µg/m3)**	**PM2.5 (µg/m3)**	**SO2 (µg/m3)**	**NOx (µg/m3)**
Apr-23	97.23	32.73	42.37	34.28
May-23	80.90	22.89	37.09	28.30
Jun-23	95.34	24.57	42.41	28.78
Jul-23	30.35	11.97	40.13	31.16
Aug-23	60.78	19.58	21.28	30.64
Sep-23	37.84	15.91	17.12	26.53

Oct-23	122.95	43.99	21.07	29.54
Nov-23	160.80	81.77	21.37	29.52
Dec-23	121.27	71.46	21.82	29.76
Jan-24	149.94	65.84	20.99	38.84
Feb-24	124.44	54.13	22.39	33.71
Mar-24	98.97	41.20	21.28	35.26
Apr-24	91.28	35.31	22.34	29.95
May-24	99.24	34.45	24.99	28.30
Jun-24	71.36	27.82	27.45	27.49

5.3 Water Quality:

The joint committee collected 02 water samples from following locations:
1. Toe drain of a 130-hectare ash pond,
2. Ash water recirculation system (AWRS) of a 111-hectare ash pond

S.No.	Parameters	Sampling Location		Prescribed standards w.r.t. Ash pond effluent
		Toe drain of a 130-hectare ash pond	Ash water recirculation system (AWRS) of a 111-hectare ash	
1.	pH	7.45	7.30	6.5-8.5
2.	Chloride	69.98	79.98	-
3.	Total Solids	760	850	-
4.	TDS	670	755	-
5.	TSS	90	95	100
6.	BOD	22	24	-
7.	COD	160	184	-
8.	Copper	0.018	0.02	-
9.	Lead	0.001	0.001	-

Note: Except pH & Color all units are in mg/l.

The analysis results reveals that both the samples are meeting the standard w.r.t. ash pond effluent. However, the higher values of COD reveals that some kind of pollution related to ash discharge is there. In this regard, PP shall carry out the detailed sampling and submit the report to CPCB & MPPCB. Copy of the analysis report is enclosed as **Annexure-X.**

Copy of the photographs taken during visit dated 10.7.2024 are enclosed as **Annexure-XI.**

6.0 Summary

The joint committee visited M/s Satpura Thermal Power Plant, Sarani on 10.7.2024, the committee observed that since 2013 only two power generating units (Unit no. 10 & 11) each of 250MW were in operation. A new unit of 660MW is proposed. The CTO for the above 02 units was valid. There are 03 ash dykes viz. 373 Ha, 130 Ha & 111 Ha to cater the need to dispose the ash generates during power generation. On the day of visit, 373 Ha ash dyke was in operation to fill the voids. This dyke was handed over to M.P. Forest Department on 29.11.2022 for reclamation. However, the PP was using this dyke for filling the voids decided mutually between PP & forest department. This will level the ash dyke surface. The period of void filling was extended by forest department till 30.9.2024 on the request of the PP. The committee directed PP to communicate the same to MPPCB for there instruction. PP vide letter dated 1.8.2024 communicated the status to Regional Office, MPPCB, Chindwara.

The PP has engaged IIT, Indore for the stability analysis of the 130 Ha & 111 Ha ash dykes. The study report submitted by IIT; Indore suggest that the 111 Ha. Dyke is stable in all the conditions; however regular inspection of dykes is recommended. Whereas 130 Ha dyke study suggested to conduct a fresh investigation of soil profile as the dyke was in transition between stability and instability. The committee also opined that the Overflow Channel provided in 111 Ha. ash dyke needs to be designed properly to avoid any flow of ash in the nearby drain that is meeting the Tawa reservoir. The satellite images of previous years revealed that there was flow of ash containing water in the drain. Also, opined about 130 ha. Ash dyke that recommendation of the IIT Indore needs to be implemented on priority as committee also pointed out the issue in the dyke during the visit that in one of the corners of the dyke water was found accumulated in down gradient but there was no pumping system available to pump this accumulated water. Such kind of accumulation results in damage to the civil structure of the embankment.

The ash disposal compliance audit report for the FY 2022-23 also recommended that PP need to explore alternative disposal avenues as approximately 60% of the generated ash is currently utilized for filling voids in land reclamation of Ash bunds.

The Project Proponent is complying the minimum 80% utilization of the fly ash in 3-year cycle as per the notification dated 31.12.2021 and also utilizing more than 100% from last 03 financial years, by utilizing it in various avenues prescribed in the notification. So, based on the condition prescribed in the notification, PP is charging the ash cost or transportation with the user i.e.

NHAI. However, no response is received by the PP from the NHAI for such terms.

The environmental quality indicates that the NOx value in source emission is on slightly higher side that can be improved on optimizing the Low NOx burner & air-to-fuel ratio. Further, the AAQ showed higher PM10 values near the hospital area. The higher values of COD in water samples needs to be re-assess by the PP.

7.0 Recommendations:

i. Project Proponent shall engage technical institute for the stability analysis of the 373 Ha ash dyke and also award a fresh study to IIT Indore for the fresh investigation of the 130 Ha ash dyke w.r.t. its stability issue.
ii. Project Proponent shall intimate periodically to MPPCB w.r.t. void filling at 373 Ha dyke and take necessary guidance.
iii. Project proponent shall also initiate action for the stabilization of the 44.5 Ha. Extra land in compliance of the notification.
iv. Project proponent shall re-design the overflow channel constructed at 111 Ha. Ash dyke to avoid spill over of the ash.
v. Project proponent shall make effective arrangement of pumping to pump the accumulated water in the 130 Ha. Ash dyke.
vi. As about 60% of the ash utilization is in filling the voids of the 373 Ha. Ash dyke, it is essential that project proponent shall explore other avenues of ash utilization to meet the prescribed target of notification 31.12.2021 for the second cycle.
vii. Project Proponent shall take up the NOx reduction measures in the source emission and also ensure continuous assessment of the Ambient air monitoring w.r.t. SO2 & NOx at CAAQMS installed near ETP.
viii. Project Proponent shall take action to improve the ambient air quality near the hospital area.
ix. Project Proponent shall engage 3rd party NABL/EPA recognized laboratory to analyses the water quality of tor drain & AWRS channel water w.r.t COD. And take necessary action as per the outcome of the analysis.

(Dr. H.V.C. Chary Guntupalli)	**(Sunil Kumar Meena)**	**(K N Katare)**
Scientist-E	Scientist-E	Regional Officer
MoEFCC, IRO, Bhopal	CPCB, RD, Bhopal	MPPCB, Chindwara

Annexure-I

Item No. 01

BEFORE THE NATIONAL GREEN TRIBUNAL
CENTRAL ZONE BENCH, BHOPAL
(Through Video Conferencing)

Original Application No.115/2024(CZ)

Rashid Noor Khan Applicant (s)

Vs

MoEF & CC & Ors. Respondent(s)

Date of Hearing: **13.05.2024**

CORAM: HON'BLE MR. JUSTICE SHEO KUMAR SINGH, JUDICIAL MEMBER
HON'BLE DR. A SENTHIL VEL, EXPERT MEMBER

For Applicant (s): Mr. Harshwardhan Tiwari, Adv.

For Respondent(s) :

ORDER

1. Issue raised in this application is violations of the provisions of the Environment (Protection) Act, 1986 and the guidelines issued vide a notification dated 31.12.2021 as amended vide S.O.6169(E) dated 30.12.2022 providing the disposal of fly ash and bottom fly ash in construction of roads and flyovers embankments which is required to be mandatorily used in the road constructions falling within 300 kilometres of the power house. This application has highlighted the noncompliance by the Satpura Thermal Power Station Sarni for noncompliance of notification on disposal of fly ash. Fly ash resulting from coal based thermal power plants is one of the alarming and continuously increasing sources of pollution leading to degradation of soil, water and air. Fly ash generated from thermal power plant and industrial waste discharged into the streams or dumped into surrounding land causes serious water and soil pollution problems. The fly ash dissolved solids, turbidity, chemical oxygen demand, alkalinity, hardness, and chlorides including concentration of copper, cadmium, zinc, lead, mercury and arsenic metals pose threats of pollution of heavy metals. Storage of fly ash beyond capacity of flyash dykes/ponds leading threat to devastating accidents due to their

breach. Sarni Power Plant is one of the oldest Power Plant in Madhya Pradesh. Its Fly Ash pond is full of capacity and from the past three years there was no use of fly ash in road construction or supply of fly ash by the Satpura Power Station Sarni to the contractor for road construction whereas in order to conserve the top the use of flay is mandatory for road constructions. The radius for ash utilization is fixed upto 300km.

2. A substantial issue of environment has been raised. Issue notice to the respondents. Returnable within four weeks.

3. Applicant is directed to take necessary steps for service to the respondents by both ways and also on available email.

4. Respondents are directed to submit their reply within six weeks through e-filing portal, preferably in the form of searchable PDF/ OCR Support PDF and not in the form of Image PDF.

5. We deem it just and proper to call a report on the matter in issue, in present application, from a Joint Committee consisting of:-

(i) One representative from the MoEF&CC, Integrated Office at Bhopal
(ii) One representative from the CPCB, Bhopal
(iii) One Representative from the Madhya Pradesh Pollution Control Board, Bhopal

6. The Committee is directed to visit the place and submit the factual and action taken report within six weeks. The State PCB will be the nodal agency for coordination and logistic support.

7. Applicant is directed to supply the required documents and copy of the application to the committee and respondents within a week and after compliance of service, the applicant has to submit an affidavit that the notice and copy of the application have been served on the committee and respondents.

8. The report in the matter be filed by the Committee through email at ngtczbbho-mp@gov.in preferably in the form of searchable PDF/OCR Support PDF and not in the form of Image PDF.

List it on **12th August, 2024.**

Sheo Kumar Singh, JM

Dr. A Senthil Vel, EM

13th May, 2024
O.A. No. 115/2024(CZ)
K

Consent Order

M.P. Pollution Control Board, E-5, Arera Colony, Paryavaran Parisar, Bhopal - 16 MP , Tele : 0755-2466191, Fax-0755-2463742

RED-LARGE	CCA-Renewal	CONSENT NO: ***	PCB ID: 18903

Outward No:120095,28/03/2024 **Consent No:AW-60010**

ANNEXURE_II

To,

The Occupier,
M/s. Satpura Thermal Power Station (MPPGCL- 2 X 250 MW), Betul,
City : Brahmanwada Ryt (Viran), Sarni,
Tal : Ghoradongari, Dist : Betul (M.P.)- 460447

Subject: Grant of Renewal of Consent to Operate under section 25 of the Water (Prevention & Control of Pollution) Act,1974 & under section 21 of the Air (Prevention & Control of Pollution) Act,1981

Ref: Your Receipt No. 1347562 Dt. 27/02/2024 and last communication received on Dt.23/02/2024

With reference to your above application for Renewal of consent to operate has been considered under the aforesaid Acts and existing rules therein. The M. P. Pollution Control Board has agreed to grant consent up to **31/07/2025**, subject to the fulfillment of the terms & conditions, enclosed with this letter and-

SUBJECT TO THE FOLLOWING CONDITIONS :-

a. Location: City : Brahmanwada Ryt (Viran), Sarni, Tal : Ghoradongari, Dist : Betul (M.P.)- 460447
Latitude : 22.1062 Longitude : 78.1808

b. The capital investment : Rs 3322.28 Crs

c. Product & Production Capacity:

Product	Applied Qty / year
GENERATION OF ELECTRICITY (Coal Based Thermal Power Plant Unit 10 & 11)	**500.0 MWH (2X 250 MWh)**

Note:-

1. For any change in above industry shall obtain fresh consent from the board.
2. This renewal of consent to operate is being considered with condition that the TPP shall have to abide the timelines for the achievement of new emission norms as per the MoEF&CC notification G.S.R. 243(E) dated 31-03-21.
3. The TPP Management shall comply with the direction issued by MPPCB in the matter of NGT OA No. 164/2018 & order dated 18/01/2022.
4. Industry shall have to use the Tarpaulin cover with minimum 400 GSM thickness. The automatic mechanical covering system shall be used in coal transporting vehicles.
5. Industry shall install PTZ Cameras at various strategic points to monitor above covering system in transporting vehicles.
6. TPP management shall utilize the remaining area like colony and others for rain water harvesting and maintain the flora and fauna, ZLD policy strictly.

The Validity of the consent is up to **31/07/2025** and has to be renewed before expiry of consent validity. Online application through XGN with annual license fees in this regard shall be submitted to this office 6 months before expiry of the consent/Authorization. Board reserves the right to amend/cancel / revoke the above condition in part or whole as and when required.

Enclosures:-

* *Conditions under Water Act*
* *Conditions under Air Act*
* *General conditions*

By the order of Chairman, MPPCB

Signature Not Verified
Digitally Signed by : A. A Mishra, Member Secretary
Date: 28/03/2024 09:50:37 AM

ACHYUT ANAND MISHRA
Member Secretary

(Organic Authentication on AADHAR from UIDAI Server)
TPAV # MF75SD89NU

M.P. Pollution Control Board, E-5, Arera Colony, Paryavaran Parisar, Bhopal - 16 MP , Tele : 0755-2466191, Fax-0755-2463742

CONDITIONS PERTAINING TO WATER (PREVENTION & CONTROL OF POLLUTION) ACT 1974 :-

1. The daily quantity of trade effluent of the unit shall not exceed **9496.0 KL/day**, and the daily quantity of sewage of the unit shall not exceed **90.0 KL/day.**

2. Trade Effluent Treatment:-

The applicant shall operate comprehensive effluent treatment system and maintain the same properly to achieve following standards-

pH	Between	5.5 – 9.0
Suspended Solids	Not exceed	100 mg/l.
BOD_3 Days 27 °C	Not exceed	30 mg/l.
COD	Not exceed	250 mg/l.
Oil and grease	Not exceed	10 mg/l.

TDS	Not exceed	2100 mg/l.
Chlorides	Not exceed	1000 mg/l.

For other parameters general standards of discharge as notified under EP Act 1986 notified by MPPCB from time to time shall be applicable

3. Sewage Treatment :-

The applicant shall operate and maintain sewage treatment facility to achieve following standards-

pH	Between	6.5 – 9.0
Suspended Solids	Not exceed	100 mg/l.
BOD 3 Days 27 °C	Not exceed	30 mg/l.
COD	Not exceed	250 mg/l.
Oil and grease	Not exceed	10 mg/l.
fecal coliform	Not exceed	1000 MPN/100 ml

4. The effluent shall be treated up to prescribed Standards and reuse in the process, for cooling and for green belt devolvement/gardening within premises. Hence zero discharge condition shall be practiced. In no case treated effluent shall be discharged outside of industry/unit premises.

5. Water meter preferably electromagnetic/ultrasonic type with digital flow recording facilities shall be installed separately for category wise consumption of water for Industrial cooling/boiler feed, mine spray, process & domestic purposes and data shall be submitted online through XGN monthly patrak/statements.

Sr	Water Code (Qty in KLD)	WC : 44664.0	WWG: 9586.0	Water Source	Remark
1	Boiler Feed	1200.0	768.0	Satpura dam lake	AS PER MOEF&CC NOTIFICATION NO. 3305 (E) DATED 7/12/15, THE INDUSTRY SHALL HAVE TO SWITCH ITS ONCE THROUGH COOLING (OTC) AND INSTALL COOLING TOWER(S) ANDACHIEVE SPECIFIC WATER CONSUMPTION UP TO A MAXIMUM OF 3.5M^3/MWH
2	Cooling Water	34440.0	7152.0	Satpura dam lake	
3	Cooling Water	2040.0	0.0	Recycled, treated effluent from ETP	
4	D.M Water Plant (DM Plant regeneration water)	360.0	360.0	Satpura dam lake	
5	Domestic Purpose	120.0	90.0	Satpura dam lake	
6	Mfg. Process (Hydrogen Plant / Chemical Feed Preparation consumption)	144.0	0.0	Satpura dam lake	
7	Others(Seal water/ Ashhandlingwater)	1200.0	576.0	Satpura dam lake	To be recycled after propertreatment
8	Others (Misc. service water).	2400.0	480.0	Satpura dam lake	To be recycled after propertreatment
9	Others(Losses & design marginwater)	2760.0	160.0	Satpura dam lake	

6. Any change in production capacity, process, raw material used etc. and for any enhancement of the above prior permission of the Board shall be obtained. All authorized discharges shall be consistent with terms and conditions of this consent. Facility expansions, production increases or process modifications which result new or increased discharges of

pollutants must be reported by submission of a fresh consent application for prior permission of the Board

7. All treatment/control facilities/systems installed or used by the applicant shall be regularly maintained in good working order and operate effectively/efficiently to achieve compliance of the terms and conditions of this consent

8. The specific effluent limitations and pollution control systems applicable to the discharge permitted herein are set forth as above conditions.

9. Compilation of Monitoring data-
i. Samples and measurements taken to meet the monitoring requirements specified above shall be representative of the volume and nature of monitored discharge. ii. Following promulgation of guidelines establishing test procedures for the analysis of pollutants, all sampling and analytical methods used to meet the monitoring requirements specified above shall conform to such guidelines unless otherwise specified sampling and analytical methods shall conform to the latest edition of the Indian Standard specifications and where it is not specified the guidelines as per standard methods for the examination of Water and Waste latest edition of the American Public Health Association, New York U.S.A. shall be used.

10. Recording of Monitoring Activities & Results-
i. The applicant shall make and maintain online records of all information resulting from monitoring activities by this Consent.
ii. The applicant shall record for each measurement of samples taken pursuant to the requirements of this Consent as follows:

(i) The date, exact place and time of sampling
(ii) The dates on which analysis were performed
(iii)Who performed the analysis?
(iv)The analytical techniques or methods used and
(v)The result of all required analysis

iii. If the applicant monitors any Pollutant more frequently as is by this Consent he shell include the results of such monitoring in the calculation and reporting of values required in the discharge monitoring reports which may be prescribed by the Board. Such increased frequency shall be indicated on the Discharge Monitoring Report Form.
iv. The applicant shall retain for a minimum of 3 years all records of monitoring activities including all records of Calibration and maintenance of instrumentation and original strip chart regarding continuous monitoring instrumentation. The period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the applicant or when requested by Central or State Board or the court.

11. Reporting of Monitoring Results:-
Monitoring Information required by this Consent shall be summarized and reported by submitting a Discharge Monitoring report on line to the Board.

12. Limitation of discharge of oil Hazardous Substance in harmful quantities:-
The applicant shall not discharge oil or other hazardous substances in quantities defined as harmful in relevant regulations into natural water course. Nothing in this Consent shall be deemed to preclude the institution of any legal action nor relive the applicant from any responsibilities, liabilities, or penalties to which the applicant is or may be subject to clauses.

13. Limitation of visible floating solids and foam:-
During the period beginning date of issuance the applicant shall not discharge floating solids or visible foam.

14. Disposal of Collected Solid waste/sludge-
All hazardous waste/sludge shall be disposed of as per the Authorization issued under Hazardous & other waste (M&TM) Rules 2016. And/other Solids Sludges, dirt, silt or other pollutant separated from or resulting from treatment shall be disposed of in such a manner as to prevent any pollutant from such materials from entering any such water Any live fish, Shall fish or other animal collected or trapped as a result of intake water screening or treatment may be returned to eaters body habitat.

15. Provision for Electric Power Failure-
The applicant shall assure to the consent issuing authority that the applicant has installed or provided for an alternative electric power source sufficient to operate all facilities utilized by the applicant to maintain compliance with the terms and conditions of the Consent.

16. Prohibition of By pass system of treatment facilities-
The diversion or by-pass of any discharge from facilities utilized by the applicant to maintain compliance with the terms and conditions of this Consent in prohibited except:
i. where unavoidable to prevent loss of life or severe property damage, or
ii. Where excessive storm drainage or run off would damage any facilities necessary for compliance with the terms and

conditions of this Consent. The applicant shall immediately notify the consent issuing authorities in writing of each such diversion or by-pass in accordance with the procedure specified above for reporting non-compliance.

17. TPP management shall submit the information online through XGN in reference to compliance of consent conditions.

Additional Water condition:-

1. All the recommendations made in the Charter on Corporate Responsibilities for Environment Protection(CREP) for thermal power sector shall be strictly implemented.
2. TPP management shall comply with the parameters notified in the Environment (Protection) Rules, 1986 notified by G.S.R. 3305(E) 7/12/15 as amended up to date, for Thermal Power Plants.
3. The effluent will be treated in ETP and be used in ash slurry preparation, dust suppression and plantation. The domestic effluent of plant and colony will be treated through sewage treatment plant and will be used within factory premises for irrigation in gardening & plantation. Zero discharge condition shall be maintained.
4. TPP management shall provide adequate facility for the treatment of industrial (including the bleed from boiler house) and domestic waste water to ensure that the treated effluent quality meets the standards prescribed by M. P. Pollution Control Board published in notification of Govt. of M. P. Gazette dated: 25/03/88 as amended up to date.
5. TPP management shall maintain closed cycle system with cooling tower. Once through cooling if any shall not be used. All the cooling tower blow down shall be reused in fire fighting, service water, coal handling plant and ash handling after proper treatment.
6. The TPP management shall operate & maintain Ash Water Recirculation System (AWRS) to ensure 100% recirculation of overflow of the ash dyke. Industry shall make arrangement for transportation of fly ash to ash pond in the form of medium slurry mode system having 38% ash and 62% water as per MoEF directives.
7. Water table depletion study in and around the project area shall be carried out by the project. All possible efforts including rain water harvesting to recharge ground water shall be taken up for the ground water enrichment in consultation with the Central Ground Water Authority.
8. Fly ash shall be collected in dry form and shall explore the possibility that storage facility (silo) of fly ash should be at least for one day. Un-utilized fly ash shall be disposed off in the ash pond in the form of high concentration slurry disposal. Industry shall also monitor mercury and other heavy metals (As, Hg, Cr, Pb etc.) in the bottom ash as also in the effluents from the ash pond. For disposal of ash in low lying area/mine for void filling prior permission from the Board be obtained, and conditions stipulated therein shall be followed.
9. As per the MoEF & CC notification dated 2015, the unit shall have to convert the Once Through Cooling (OTC) if any, to Cooling Tower (CT) by 6th of December 2017, and shall have to achieve specific water consumption upto maximum of 3.5 m3/MWh or as updated notification by MoEF&CC.
10. Ash pond shall be lined with HDPE/LDPE lining or any other suitable impermeable media such that no leachate takes place at any point of time. Ash pond water shall be re-circulated and utilized in the process or other beneficial purposes in the plant.
11. Industry shall regenerate the village ponds/surface water bodies located within 5 km radius of the project site as a part of its social welfare activities.
12. Industry shall make arrangement for transportation of fly ash to ash pond in the form of medium slurry mode system having 38% ash and 62% water as per MoEF amendment.

M.P. Pollution Control Board, E-5, Arera Colony, Paryavaran Parisar, Bhopal - 16 MP , Tele : 0755-2466191, Fax-0755-2463742

CONDITIONS PERTAINING TO AIR (PREVENTION & CONTROL OF POLLUTION) ACT 1981 :-

1. The applicant shall operate and maintain air pollution control system to achieve the level of pollutants to the following standards:-

Name of section	Capacity	Stack height (meters)	Fuel	Quantity	Control equipment to beinstalled	P.M, SO_X, NO_X, Hg (mg/Nm^3)
Boiler	Unit 10- ESP 99.928% eff.	275	COAL	175 MT/Hr.	Dust Suppressor, E.S.P	50,600,450, 0.03 *(to be achieved as per the notification G.S.R. 243(E) dated31-03-2021)*
Boiler	Unit 11- 99.928% eff.	275	COAL	175 MT/Hr.	Dust Suppressor, E.S.P	50,600,450, 0.03*(to be achieved as per thenotification G.S.R. 243(E) dated31-03-2021)*
Material Handling	bc-top & side skirtings	-	-	-	Dust Suppressor, Hood Cover, Water Sprinkler	600 microgram/ m^3 at 10 m from source
Material Handling	coal storage	-	-	-	Bag Filter, Dust Suppressor, Water Sprinkler	600 microgram/m^3 at 10 m from source
Material Handling	coal yard wagon unloading	-	-	-	Water Sprinkler	600 microgram/ m^3 at 10 m from source
Material Handling	Pulse jet bagfilter- 2 no	-	-	-	Dust Collector, Dust Suppressor, Water Sprinkler	600 microgram/ m^3 at 10 m from source
Process	closed circuit system	-	-	-	Dust Collector, Dust Suppressor, Hood Cover, Water Sprinkler	600 microgram/ m^3 at 10 m from source
Process	hammer mill1000 TPH	20	-	-	Bag Filter, Cyclone	PM- 50 mg/Nm^3
Process	Rotary braker- 1000 TPH	35	-	-	Bag Filter, Cyclone	PM- 50 mg/Nm^3

2. The Ambient air quality norms are prescribed in MoEF gazette notification no. GSR/826(E), dated: 16/11/09. Some of the parameters are as follows:
a. Particulate Matter (less than 10 micron) - 100 µg/m³ (PM10 µg/m³ 24 hrs. basis)
b. Particulate Matter (less than 2.5 micron) - 60 µg/m³ (PM2.5 µg/m³ 24 hrs. basis)
c. Sulphur Dioxide [SO2] (24 hrs. Basis) - 80 µg/m³
d. Nitrogen Oxides [NOx] (24 hrs. Basis) - 80 µg/m³
e. Carbon Monoxide [CO] (8 hrs. Basis) - 2000 µg/m³

3. The industry shall take adequate measures for control of noise level generated from industrial activities within the premises less than 75 dB(A) during day time and 70 dB(A) during night time.

4. The industry/unit shall make the necessary arrangements for control of the fugitive emission from any source of emission/section/activities.

5. All other fugitive emission sources such as leakages, seepages, spillages etc shall be ensured to be plugged or sealed or made airtight to avoid the public nuisance.

6. The industry/ unit shall ensure all necessary arrangements for control of odour nuisance from the industrial activities or process within premises

7. All the internal roads shall be made pucca to control the fugitive emissions of particulate matter generated due to transportation and internal movements. Good housekeeping practices shall be adopted to avoid leakages, seepages, spillages etc.

8. Industry shall take effective steps for extensive tree plantation preferably of the local tree species within or around the industry/unit premises for general improvement of environmental conditions.

Additional Air condition:-

1. The TPP shall have to abide by the timelines for the achievement of new emission norms as per the MoEF&CC notification G.S.R. 243(E) dated 31-03-21 according to the categorization of the TPP to be done by the task force, as provided in the said notification.
2. Industry shall regularly operate CAAQMS stations at suitable locations to monitor ambient air quality and stack emission. The management shall provide and ensure uninterrupted connectivity of CAAQMS with Environment Surveillance Centre at the HQ of M.P. Pollution Control Board for monitoring and data transmission purpose. Similarly CEMS shall be provided to monitor the emissions at each stack and CEQMS shall be provided for the monitoring of treated effluent quality and uninterrupted connectivity with Environment Surveillance Centre at the HQ of M.P shall be provided.
3. Industry shall have to provide & operate adequate pollution control arrangement at all points and non point sources. Suitable air pollution control equipments shall be installed for the control of fugitive emission during the handling/transportation of raw material and fly ash etc. Industry should improve house keeping near fly ash loading system/silo.
4. In case of coal being imported, or as per the statutory applicable norms being in force, the industry shall install sulphur recovery system for control of sulphur dioxide emission.
5. Industry shall install adequate dust extraction and dust suppression system to control fugitive emissions from the crushing house, dumper, conveyor belt, moving vehicles, pneumatic compressors, raw material handling and other vulnerable dusty areas.
6. Coal transportation to the plant site shall be undertaken by rail and no road transportation shall be undertaken as far as possible.The entire internal roads should be made pucca and good housekeeping practices shall be adopted.
7. Dry fly ash collection system shall be installed for regular disposal of generated fly ash in dry form. Fly ash and bottom ash generated during the process shall be utilized as per the provisions of Fly Ash Notification for beneficial uses such as brick making, road construction, cement making etc.
8. The Industry shall regularly operate Outdoor HD Industrial grade IP(Internet Protocol) Cameras with pan-TiltZoom(PTZ) feature, minimum focal length 5X with night vision facility and temper proof mechanism at suitable location to display all emission sources / stacks, coal yards coal conveyors / crushers and effluent discharge point and connect the same with Environment Surveillance Centre, MP Pollution control board Bhopal, and ensure its uninterrupted connectivity for remote Surveillance.
9. Regular monitoring of ground level concentration of SO2, NOx, PM2.5 and PM10 and Hg shall be carried out in the impact zone and records shall be maintained. If at any stage these levels are found to exceed the prescribed limits, necessary control measures shall be taken immediately.
10. Industry should make appropriate arrangement for protection of the green belt. Massive plantation shall be under taken under the guidance of forest Department/Horticulture expert. Local Species shall be planted all around the periphery of the industry as well as the ash dyke.
11. The entire internal roads should be made pucca and good housekeeping practices shall be adopted.
12. Industry management shall regulate the generation of electricity according to its fly ash handling and availability of ash holding capacity of the ash dyke(s).
13. The industry shall take steps to incorporate following measures for improvement in pollution control arrangements:
    a. Installation of stationery water sprinkler in Ash Pond area.
    b. Installation of fogger system in Silo Area.
    c. Industry shall incorporate pressurized mist gun in coal track line and mist gun in fly ash silo area.

GENERAL CONDITIONS:

1. The non hazardous solid waste arresting in the industry/unit/unit premises sweeping, etc. be disposed off scientifically so as not to cause any nuisance/pollution. The applicant shall take necessary permission from civic authorities for disposal to dumping site. If required.

Non Hazardous Solid wastes:-

Type of waste	Quantity	Disposal
Scrap/ Plastic packing material wood, card board, gunny begs etc	Record should be maintained	Sale to authorized party/As Per CPCB. MoEF Guide lines / Others.
FLY ASH & BOTTOM ASH	85600 MT/m	

2. The applicant shall allow the staff of Madhya Pradesh Pollution Control Board and/or their authorized representative, upon the representation of credentials:

a. To inspect raw material stock, manufacturing processes, reactors, premises etc to perform the functions of the Board.

b. To enter upon the applicant's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this Consent.

c. To have access at reasonable times to any records required to be kept under the terms and conditions of this Consent.

d. To inspect at reasonable times any monitoring equipment or monitoring method required in this Consent: or,

e. To sample at reasonable times any discharge or pollutants.

3. This consent is transferable in nature, in case of any change in ownership / management, the new owner / partner / directors / proprietor shall immediately apply for the consent with new requisite information.

4. The issuance of this Consent does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any invasion of personal rights, nor any infringement of Central, State or local laws or regulations.

5. Industry shall install separate electric metering arrangement for running of pollution control devices and this arrangement shall be made in such fashion that any non functioning of pollution control devices shall immediately stop electric supply to the production and shall remain tripped till such time unless the pollution control device/devices are made functional.

6. This consent is granted in respect of Water pollution control Act 1974 or Air Pollution Control act, 1981 only and does not relate to any other Department/Agencies. License required from other Department/Agencies have to be obtained by the unit separately and have to comply separately as per there Act / Rules.

7. Balance consent fee, if any shall be recoverable by the Board even at a later date.

8. The applicant shall submit such information, forms and fees as required by the board not letter than 180 day prior to the date of expiration of this consent.

9. The industry/unit shall establish a separate environmental cell, headed by senior officer of the unit for reporting the environmental compliances. The industry/ Unit shall submit environmental statement for the previous year ending 31st March on or before 30th September every year to the Board.

10. Industry shall obtain membership of Emergency Response Center of the Board if needed.

11. Knowingly making any false statement for obtaining consent or compliance of consent conditions shall result in the imposition of criminal penalties as provided under the section 42(g) of the Water Act or section 38 (g) of the Air Act.

12. After notice and opportunity for the hearing, this consent may be modified, suspended or revoked by the Board in whole or in part during its term for cause including, but not limited to, the following:

(a) Violation of any terms and conditions of this Consent.
(b) Obtaining this Consent by misrepresentation of failure to disclose fully all relevant facts.
(c) A change in any condition that requires temporary or permanent reduction or elimination of the authorized discharge.

13. On violation of any of the above-mentioned conditions the consent granted will automatically be taken as canceled and necessary action will be initiated against the industry.

14. The industry/unit shall also monitor the treated wastewater flow and report the same online through monthly patrak/statements.

15. The applicant shall take samples and measurement to meet the monthly requirements specified above and report online through XGN the same to the Board.

16. Ambient air quality at the boundary of the industry/unit premises shall be monitored and reported to the Board regularly on quarterly basis

17. The record of electricity consumption for running of pollution control equipment shall be maintained and submitted to the Board every month.

Additional condition:-

1. The unit management shall ensure all the compliances regarding disposal and utilization of fly ash from its TPP as stipulated in MOEF&CC notifications no. dated 31.12.2021 and its amendments.

2. The unit management shall procure/make provision of the Bulkers/closed transport vehicles under its control to ensure fast and quick delivery of fly ash for ensuring free delivery of fly ash within the radius up to 300 km radius to the prospective users as per provision of Fly ash Notification.

3. The unit management shall keep / maintain and update the record of all the prospective users of fly ash within the radius of 100 km, keep constant liaison with them, provide fly ash to them in a timely manner and will submit 3 monthly compliance report to the Board.

4. A Industry shall ensure 100% utilization of fly ash in compliance of fly ash notification as amended up to date. Other alternatives like setting up of clinker grinding unit, encouragement of ancillary units for ensuring use of fly ash for other building products.

5. Dry fly ash collection system shall be installed for regular disposal of generated fly ash in dry form. The filling of

low lying area inside the premises shall be undertaken strictly in accordance with the prior permission granted by the MPPCB.

6. The TPP management shall adhere to the office memorandum (OM)of MoEF&CC dated 28-08-19 and the conditions stipulated therein pertaining to the use of fly ash as mentioned in the para 7 of the OM. TPP shall have to follow the same and the guidelines of the CPCB entitled "Guidelines for disposal/utilization of Fly ash for reclamation of Low Lying Areas and in stowing of abandoned mines /Quarries" for the disposal of fly ash.

7. The industry shall not raise any ash dyke without permission from Board.

8. Freeboard shall be maintained in all the ash dykes as stipulated/directed and shall keep additional freeboard for accommodating the peak rainfall of last 50 years. A bench mark level bearing report and marking in the dykes shall be submitted to the Board within one month from date of issue of this letter.

9. The TPP Management shall submit Ash Dyke Stability Report done by the institute of National Repute every year.

Renewal of Consent as required under the Water (Prevention & Control of Pollution) Act, 1974 & The Air (Prevention & Control of Pollution) Act, 1981 is granted to your industry subject to fulfillment of all the conditions mentioned above. For further renewal purpose you shall have to make an application to this Board through XGN at least Six months before the date of expiry of this consent. The applicant without valid consent (for operation) of the Board shall not bring in to use any outlet for the discharge of effluent and gaseous emission.

For and on behalf of
M.P. Pollution Control Board

By the order of Chairman, MPPCB

ACHYUT ANAND MISHRA
Member Secretary

(Organic Authentication on AADHAR from UIDAI Server)
TPAV # MF75SD89NU

Consent No:AW-60010

7161
22 MAR 2024

Annexure-III

कार्यालय प्रधान मुख्य वन संरक्षक (कक्ष भू–प्रबंध) वन भवन,

सी–ब्लॉक, द्वितीय तल, लिंक रोड़ नं.–2, तुलसी नगर, भोपाल, म0प्र0–462003

क्रमांक / एफ–4 / विद्युत / 2022 / 10–11 / 1737 भोपाल, दिनांक 21-3-24

प्रति,

वनमण्डलाधिकारी,
सामान्य वनमण्डल, उत्तर बैतूल,
मध्यप्रदेश।

मु. अ. (उ.) सारनी
आ./जा.क्र. 512
दिनांक 21/03/2024

विषय :सतपुड़ा ताप विद्युत गृह सारनी के 373 हेक्टेयर वनभूमि पर स्थित पुराने राखड़ बांध में राख के भराव की समयावधि बढ़ाने के संबंध में।

संदर्भ :आपका पत्र क्रमांक / मा.चि. / 2024 / 286 दि. 29.02.2024

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विषयांकित प्रकरण में आपके उक्त संदर्भित पत्र द्वारा दिये गये अभिमत पर इस कार्यालय द्वारा सहमति व्यक्त की जाती है। आपके अभिमत अनुसार आवेदक संस्थान से इस संबंध में वचन पत्र प्राप्त कर राख बांध के गड्ढों में राख भरने की समयावधि 30.09.2024 तक बढाई जावे।

21.03.24
(एच.एस.मोहन्ता)
अपर प्रधान मुख्य वनसंरक्षक (भू–प्रबंध)
मध्य प्रदेश, भोपाल

क्रमांक / एफ–4 / विद्युत / 2022 / 10–11 / 1738 भोपाल, दिनांक 21-3-24

प्रतिलिपि–

1. मुख्य वन संरक्षक, बैतूल वृत्त, बैतूल, मध्यप्रदेश की ओर सूचनार्थ प्रेषित।
2. मुख्य अभियंता (उत्पादन) म.प्र.पा.जा.कं.लि., सतपुड़ा ताप विद्युत गृह, सारणी, जिला बैतूल, म0प्र0–460447 की ओर आपके पत्र क्रमांक / 08–004 / मु.अ.(उत्पा) / 3783 दिनांक 15.01.2024 के संदभ्र में आवश्यक कार्यवाही हेतु अग्रेषित।

21.03.24
अपर प्रधान मुख्य वनसंरक्षक (भू–प्रबंध)
मध्य प्रदेश, भोपाल

Mail forwarded
Addl. CE (IV-2x250MW) / SE(O&M) IV.
S.E.(Civil)
for needful pl
& discuss
C.E. (Gen)
21.03

21.03.2024.

EE(AU)

I:\Power\F-4 2023-24.docx

मध्य प्रदेश पावर जनरेटिंग कंपनी लिमिटेड
कार्यालय मुख्य अभियंता (उत्पादन)
सतपुड़ा ताप विद्युत गृह सारनी जिला–बैतूल(म.प्र.) पिनकोड–460 447
Email ID :-stps1@rediffmail.com

क्रमांक 08–004/मु.अ.(उत्पा)/ 3783 सारनी,दिनांक 15/1/24

S763
17 JAN 2024

प्रति,

प्रधान मुख्य वन संरक्षक (भू–प्रबंध)
सतपुडा भवन मध्य प्रदेश भोपाल

विषयः– सतपुडा ताप विद्युत गृह सारनी के 373 हेक्टेयर भूमि पर स्थित पुराने राख बांध में राख के भराव की समयावधि बढाने के संबंध में आवेदन।

संदर्भः– 1/ इस कार्यालय का पत्र क्रमांक 08–004/मु.अ.उ./1511 दिनांक 12.07.2023
2/ आपका पत्र क्रमांक एक –4/ विद्युत /2022 /10–11/3594 भोपाल दिनांक 11.08.2023

महोदय,

इस कार्यालय के संदर्भित पत्र क्रमांक 01 द्वारा निवेदन के अनुसार 373 हेक्टेयर राख बांध में बने हुये गढ्ढों को पावर हाउस की राख से भराव कर वृक्षारोपण के लिये समतलीकरण दिनांक 31/03/2024 तक करने हेतु अनुमोदन आपके कार्यालयीन संदर्भित पत्र क्रमांक –02 द्वारा प्राप्त हुआ है।

यह संज्ञान में लाना आवश्यक है कि विगत समयावधि (01/10/2023 से 15/01/2024 तक) के दौरान सतपुडा ताप विद्युत गृह में कार्यरत् इकाईयों से उत्पन्न राख के अधिकांश भाग का उपयोग सीमेन्ट उत्पादन कारखानों, सडक निर्माण कार्यो तथा ब्रिक्स व ब्लॉक्स के निर्माण में सुनिश्चित किया गया। बकाया राख को विभाग द्वारा पाईप लाइनों के माध्यम से उक्त गढ्ढों में लगातार भरा जा रहा है। लेकिन वर्तमान में स्थल निरीक्षण के दौरान यह पाया गया कि उक्त गढ्ढों को निर्धारित दिनांक 31/03/2024 तक भर पाना संभव नहीं है।

अतः उक्त राख बांध के गढ्ढों को पावर हाउस से उत्पन्न राख द्वारा भरने व वृक्षारोपण हेतु उचित समतलीकरण करने के लिये राख भराव की समयावधि दिनांक 30/09/2024 तक प्रदान करने की कृपा करें।

धन्यवाद

भवदीय

(व्ही.के.कथवार)
मुख्य अभियंता(उत्पादन)
म.प्र.पा.ज.कं.लि.सारनी

प्रतिलिपिः–
1/ मुख्य अभियंता(संचा एवं संधा –उत्पादन) म.प्र.पा.ज.कं.लि.जबलपुर।

क्रमशः.....2

2/ मुख्य अभियंता (सिविल–अभियांत्रिकी) म.प्र.पा.ज.कं.लि.जबलपुर।
3/ मुख्य वन संरक्षक बैतूल वृत्त, बैतूल (म.प्र.)
4/ वनमंडलाधिकारी (सा.) उत्तर वन मंडल बैतूल (म.प्र.)
5/ अधीक्षण अभियंता (Opn)–IV एवं F.A.U. म.प्र.पा.ज.कं.लि.सारनी।
6/ अधीक्षण अभियंता(सिविल) म.प्र.पा.ज.कं.लि.सारनी।

(व्ही.के.कैथवार)
मुख्य अभियंता(उत्पादन)
म.प्र.पा.ज.कं.लि.सारनी

S.E (OPN)-IV
Receipt No. 2843
Date 11 AUG 2023

कार्यालय प्रधान मुख्य वन संरक्षक (कक्ष भू–प्रबंध) सतपुड़ा भवन, मध्यप्रदेश भोपाल

क्रमांक/एफ–4/विद्युत/2022/10–11/3594 भोपाल, दिनांक 11/08/23

प्रति,

वनमण्डलाधिकारी,
सामान्य वनमण्डल, उत्तर बैतूल,
मध्यप्रदेश।

मु. अ. (उत्पा.) सारनी
आ./डा.क्र. 1492
दिनांक 11/08/2023

विषय :सतपुड़ा ताप विद्युत गृह सारनी के 373 हेक्टेयर वनभूमि पर स्थित पुराने राखड़ बांध में राख के भराव की समयावधि बढ़ाने के संबंध में।

संदर्भ :मुख्य अभियंता (उत्पादन) म.प्र.पा.जा.कं.लि. का पत्र क्रमांक/08–004/1511 दिनांक 12.07.2023

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विषयांकित प्रकरण में इस कार्यालय द्वारा राखड़ बांध के गड्ढों को भरने हेतु दिनांक 30.09.2023 तक की समयावधि दी गई थी। आवेदक संस्था द्वारा उक्त संदर्भित पत्र से लेख किया है कि सतपुड़ा ताप विद्युत गृह में कार्यरत इकाईयों से राख का उत्सर्जन कम मात्रा में हो सका है। पावर हाऊस की राख को पाईप लाईनों के माध्यम से उक्त गड्ढों में लगातार भरा जा रहा है। वर्तमान में स्थल निरीक्षण के दौरान यह पाया गया कि उक्त गड्ढों को निर्धारित अवधि दिनांक 30.09.2023 तक गड्ढ़ों को भरा जाना सम्भव नहीं है। आवेदक संस्था द्वारा राख पोण्ड के गड्ढ़ों को भरने व समतलीकरण करने हेतु दिनांक 31.03.2024 तक समयावधि बढ़ाये जाने का अनुरोध किया गया है।

प्रकरण में दिनांक 31.03.2024 तक की समयावधि बढ़ाई जाती है, इस अवधि में आवश्यक रूप से गड्ढों को राख से भरकर एवं समतलीकरण किया जाकर आवश्यक रूप से वनभूमि विभाग को वापस करें। इसके पश्चात् इस प्रकरण में समयावधि नहीं बढ़ाई जावेगी।

11/8/2023
(सुनील अग्रवाल)
प्रधान मुख्य वनसंरक्षक (भू–प्रबंध)
मध्य प्रदेश, भोपाल

क्रमांक/एफ–4/विद्युत/2022/10–11/3595 भोपाल, दिनांक 11/08/23

प्रतिलिपि–

1. मुख्य वन संरक्षक, बैतूल वृत्त, बैतूल, मध्यप्रदेश
2. मुख्य अभियंता (उत्पादन) सतपुड़ा ताप विद्युत गृह, सारणी, जिला बैतूल, म0प्र0–460447

की ओर सूचनार्थ प्रेषित।

11/8/2023
प्रधान मुख्य वनसंरक्षक (भू–प्रबंध)
मध्य प्रदेश, भोपाल

SE(PAU) 16/6/23 E.OPN-IV

SE(Civil)/SE(OPN)IV/SE(MM)IV

CE(Gen.) 11/8/23

M.P. POWER GENERATING COMPANY LIMITED
OFFICE OF THE CHIEF ENGINEER (Gen.)
Satpura Thermal Power Station
Sarni Distt. – Betul – 460447
Phone : 07146-278422, Email - stps1@rediffmail.com

No. 08-004/Env/Gen/Sarni/ 50 **Sarni Dtd.** 12 APR 2023

To

The Member Secretary
Madhya Pradesh Pollution Control Board
Bhopal (M.P.)

Sub: STPS, Sarni, designation of ash ponds for STPS Sarni as per provisions of MOEF&CC Fly Ash Utilization Notification.

Ref: Government of India Ministry of Environment, Forest & Climate Change New Delhi Notification No. S.O. 5481 (E) dated 31.12.2021, amended by Notification No. S.O. 6169 (E) dated 30.12.2022.

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The Government of India Ministry of Environment, Forest & Climate Change New Delhi has issued the Notification No. S.O. 5481 (E) dated 31.12.2021, amended by Notification No. S.O. 6169 (E) dated 30.12.2022 for utilization & safe disposal of fly ash by thermal power plants, With reference to the Para No. A (6) this Notification it is to inform that. At present the STPS Sarni is having following two operational ash ponds:-

(i) Ash pond No. – 01 (Situated on 111 – hectares forest land acquired for use from Forest Department, near Sarni town having coordinates : 22* 06' 11.94" N 78* 09' 19.93" E):- Net area available for temporary storage of ash is 90 hectares.

(ii) Ash pond No. – 02 (Situated on 130 – hectare land acquired from private land owners, near village Dhased having coordinates: 22* 06' 08.21" N 78* 06' 47.56" E): Area available for temporary storage of ash is 94.50 hectares.

In view of above, at STPS Sarni the total area available for temporary storage of ash is 184.50 hectare.

However, the area permitted as per Para-A (6) of the said MOEF&CC Notification is as follows:

(i) For Power House No. II commissioned in the year 1980 having installed capacity of 410 MW (1x210 MW units) and Power House No. III commissioned in the year 1984 having installed capacity of 420 MW (2x210 MW units) having total installed capacity of 830 MW. However, specification of 0.1 hectare per Mega Watt (MW) of an operational ash pond or dyke is not applicable for the thermal power plants commissioned before 03rd November, 2009. (90 ha)

(ii) For Power House No. IV commissioned in the year 2014 having installed capacity of 500 MW (2x250 MW units): (50 ha)

Further, for proposed supercritical unit of 1x660 MW on land vacated by dismantling of old decommissioned 6x62.50 MW units of Power House No. I, for which MOEF & CC has already granted the TOR in December 2019 and as per the EAC meeting for Environmental Clearance is also convened on dated 28.12.2022 by MOEF & CC this project shall have to utilize 66 hectare out of net available 90 ha of available area of 111 ha.

Therefore, as of now, out of total area of 184.5 ha (90+94,5) available for temporary storage, the area permitted is 140 ha (90+50) i.e. 44.5 ha is in excess which shall be reclaimed / stabilized as per the stipulations of MoEF&CC Notification dated 30.12.2022.

Submitted for your information please.

Encl :- Location map.

(V.K. Kaithwar)
Chief Engineer (Gen.)
STPS: MPPGCL: Sarni

Copy to :-

01. The Member Secretary Central Pollution Control Board, New Delhi.
02. The Regional Officer, M.P. Pollution Control Board, Chhindwara (M.P.)
03. The Executive Director (PRG), M.P.P.G.C.L. Jabalpur.
04. The Chief Engineer (Civil-Engg.), M.P.P.G.C.L. Jabalpur.

(V.K. Kaithwar)
Chief Engineer (Gen.)
STPS : MPPGCL : Sarni

O/C RH SE(C)

CE(1)

कार्यालय प्रधान मुख्य वन संरक्षक (कक्ष भू–प्रबंध) सतपुड़ा भवन, मध्यप्रदेश भोपाल

क्रमांक/एफ–4/विद्युत/2022/10–11/1069 भोपाल, दिनांक 13/03/2023

प्रति,

7680

वनमण्डलाधिकारी,
सामान्य वनमण्डल, उत्तर बैतूल,
मध्यप्रदेश।

28 MAR 2023

विषय :मध्यप्रदेश विद्युत मण्डल को सारणी में राखड़ बांध के लिये दी गई वनभूमि।

संदर्भ :(1) मुख्य अभियंता (उत्पादन) सतपुड़ा ताप विद्युत गृह का पत्र क्रमांक/824 दिनांक 14.11.2022

(2) इस कार्यालय का पत्र क्रमांक/एफ–4/विद्युत/2022/10–11/3817 दिनांक 14.11.2022

(3) मुख्य अभियंता (उत्पादन) सतपुड़ा ताप विद्युत गृह का पत्र क्रमांक/08–004/मु.अ. (उत्पा)/4181 दिनांक 10.03.2022

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विषयांकित प्रकरण में इस कार्यालय के उक्त संदर्भित पत्र (2) द्वारा राखड़ बांध के गड्ढों को भरने हेतु दिनांक 31.03.2023 तक की अवधि दी गई थी। आवेदक संस्था द्वारा लेख किया है कि पावर हाऊस की राख को पाईप लाईनों के माध्यम से गड्ढों में लगातार भरा जा रहा है। वर्तमान में स्थिति में निर्धारित तिथि 31.03.2023 तक गड्ढ़ों को भरा जाना सम्भव नहीं है। आवेदक संस्था द्वारा राख पोण्ड के गड्ढ़ों को भरने हेतु दिनांक 30.09.2023 तक बढ़ाये जाने का अनुरोध किया गया है।

अतः इस कार्यालय के पत्र दिनांक 14.11.2022 द्वारा नियत की गई तिथि को 30.09.2023 तक बढ़ाया जाता है। शेष यथावत रहेगा।

O/C

13/3/2023
(सुनील अग्रवाल)
प्रधान मुख्य वनसंरक्षक (भू–प्रबंध)
मध्य प्रदेश, भोपाल

क्रमांक/एफ–4/विद्युत/2022/10–11/1070 भोपाल, दिनांक 13/03/2023

प्रतिलिपि–

1. मुख्य वन संरक्षक, बैतूल वृत्त, बैतूल, मध्यप्रदेश
2. मुख्य अभियंता (उत्पादन) सतपुड़ा ताप विद्युत गृह, सारणी, जिला बैतूल, म0प्र0–460447

की ओर सूचनार्थ प्रेषित।

13/3/2023
O/C प्रधान मुख्य वनसंरक्षक (भू–प्रबंध)
मध्य प्रदेश, भोपाल

EE(FAD)

F:\Power\New Section F-4 File.docx

कार्यालय वन परिक्षेत्र अधिकारी सारनी (सामान्य) म0प्र0

क्रमांक .....
सारनी, दिनांक .....

S.E. (OPN)-IV
Receipt No. 5070
Date 30 NOV 2022

मु. अ. (उत्पा.) सारनी
आ.पत्र क्र. 2579
दिनांक 29/11/2022

प्रति,

वनमंडलाधिकारी
उत्तर बैतूल (सा0) वनमंडल

द्वारा :- उपवनमंडलाधिकारी सारनी (सा0)

विषय :- सतपुड़ा ताप विद्युत गृह म0प्र0पा0ज0कं0लि0, सारनी स्थित 373 हेक्टेयर भूमि पर स्थित पुराने राख पौंड/बंड का अधिपत्य प्राप्त करने की सूचना बाबत्।

संदर्भ :- वनमंडल कार्यालय का कार्यालयीन पत्र क्रमांक/मा0चि0/2022/7738 बैतूल दिनांक 21.11.2022

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उपरोक्त विषयान्तर्गत संदर्भित पत्र के तारतम्य में निवेदन है, कि सतपुड़ा ताप विद्युत गृह म0प्र0पा0ज0कं0लि0, सारनी स्थित 373 हेक्टेयर भूमि पर स्थित पुराने राख पौंड/बंड का अधिपत्य म0प्र0पा0ज0कं0लि0 सारनी से वचन पत्र प्राप्त करते हुये पुराने राख बांध/पौंड पर की 18.13 हेक्टेयर भूमि म0प्र0पा0ज0कं0लि0 सारनी को पूर्व से निर्मित सड़क, राख पाईप लाईन तथा विद्युत लाईन के उपयोग हेतु छोडते हुए आज दिनांक 29.11.2022 को वन विभाग के द्वारा अपने आधिपत्य में लिया गया।

प्रतिवेदन सूचनार्थ सादर सम्प्रेषित।

संलग्न :- वचन - पत्र।

(अमित कुमार साहू, वनक्षेत्रपाल)
वन परिक्षेत्र अधिकारी
सारनी (सा0)

पृष्ठांकन क्रमांक/ 2674
सारनी, दिनांक 29/11/2022

प्रतिलिपि :- मुख्य अभियंता (उत्पा.) म0प्र0पा0ज0कं0लि0 सारनी की ओर सूचनार्थ।

(अमित कुमार साहू, वनक्षेत्रपाल)
वन परिक्षेत्र अधिकारी
सारनी (सा0)

Chief Chemist
SE(OPN)-IV/SE(Civil)
SE(MM)-IV
CE(Gen)
EE(AU) 29/11/2022
S.E. OPN-IV

आधिपत्य - पत्र

विषय :- सतपुड़ा ताप विद्युत गृह, म0प्र0पा0ज0कं0लि0, सारनी स्थित 373 हेक्टेयर भूमि पर स्थित पुराने राख पौंड / बंड का आधिपत्य म0प्र0 वन विभाग द्वारा प्राप्त करने बाबत्।

संदर्भ :- 1) वन एवं पर्यावरण मंत्रालय भारत सरकार नई दिल्ली का 111 हेक्टेयर वनभूमि व्यपवर्तन का कार्यालय ज्ञाप क्रमांक एफ क्र. 8-23 /2008/एफसी नई दिल्ली दिनांक 13.10.2009

2) मुख्य अभियंता (उत्पा) सारनी का पत्र क्र. 08-004 /वनभूमि हस्ता./824 सारनी दिनांक 14.11.2022

3) प्रधान मुख्य वनसंरक्षक (कैम्पा), भोपाल का पत्र क्र. - एफ-4 /विद्युत/2022/10-11/3817 भोपाल दिनांक 14.11.2022

4) वनमंडलाधिकारी उत्तर बैतूल (सा0) का पत्र क्र./मा0चि0/2022/7738 बैतूल दिनांक 21.11.2022

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विषयान्तर्गत संदर्भित पत्रों तथा म0प्र0पा0ज0कं0लि0 एवं म0प्र0 शासन वन विभाग के उच्चाधिकारियों द्वारा 373 हेक्टेयर भूमि पर स्थित पुराने राख पौंड/बंड के मौका -मुआयना पश्चात तथा म0प्र0पा0ज0कं0लि0 से वचन पत्र प्राप्त करते हुये पुराने राख बांध/पौंड पर की 18.13 हेक्टेयर भूमि म0प्र0पा0ज0कं0लि0 को पूर्व से निर्मित सड़क, राख पाईप लाईन तथा विद्युत लाईन के उपयोग हेतु छोड़ते हुए वन विभाग म0प्र0 शासन आज दिनांक 29.11.2022 को पुराना राख बॉध /पौंड को अपने आधिपत्य में प्राप्त करता है।

संलग्न :- वचन -पत्र

अधिकारी, म0प्र0पा0ज0कं0लि0, सारनी

1. श्री एम0एस0 धुर्वे, कार्य. यंत्री (सिविल) संभाग - दो
2. श्री सैयद रियाज मोहम्मद सहायक यंत्री (सिविल) संभाग - दो
3. श्री आर0के0 गुप्ता सहायक यंत्री (सिविल) संभाग- दो

अधिकारी, वन विभाग म0प्र0 शासन

1. श्री अमित साहू, वनक्षेत्रपाल परिक्षेत्र अधिकारी सारनी (सा0)
2. श्री हवसुलाल उइके, वनपाल परिक्षेत्र सहायक पाथाखेडा
3. श्री रोवा धुर्वे, वनपाल परिक्षेत्र सहायक बगडोना
4. श्री सुभाषचन्द्र शर्मा, वनरक्षक बीटगार्ड दक्षिण पाथाखेडा

मध्य प्रदेश पावर जनरेटिंग कंपनी लिमिटेड
सतपुड़ा ताप विद्युत गृह, सारनी जिला–बैतूल(म0प्र0)
E-Mail:stps1@rediffmail.com, Fax No.07146-278466
PHONE-278422 PIN-460447

क्रमांक / 08-004/वन हस्तां/ 854 सारनी, दिनांक 29 /11/2022

वचन पत्र

म.प्र.पा.जन.कं.लि., यह वचन देता है कि सतपुड़ा ताप विद्युत गृह, सारनी स्थित पुराने राख पौंड / बंड का हस्तांतरण म.प्र.वन विभाग द्वारा प्राप्त कर लेने के उपरांत इस भूमि पर रिक्लेमेशन / मिट्टी ढांकने / प्लांटेशन आदि कार्य हेतु पूर्व में जमा राशि रूपये 5.25 करोड़ के अतिरिक्त जो भी राशि म.प्र. वन विभाग द्वारा जब भी वांछित होगी उसका भुगतान करने हेतु म.प्र.पा.जन.कं.लि., सहमत है ।

म.प्र.पा.जन.कं.लि., यह वचन देता है कि पुराने राख पौंड / बंड के जिस भाग में राख भराव का कार्य शेष है उस कार्य को दिनांक 31/03/2023 तक सतपुड़ा ताप विद्युत गृह, सारनी के द्वारा पूर्ण किया जावेगा ।

म.प्र.पा.जन.कं.लि., से वन विभाग जो 18.13 हेक्टेयर भूमि आधिपत्य में नहीं ले रहा है उसका उपयोग केवल राख के परिवहन से संबंधित वाहनों के लिए ही किया जावेगा ।

(गुरूनाथ श्रीनिवास)
मुख्य अभियंता (उत्पा.)
मप्रपाजनकंलि., सारनी

(गुरूनाथ श्रीनिवास)
मुख्य अभियंता (उत्पा.)
म.प्र.पा.जन.कं.लि., सारनी

कार्यालय प्रधान मुख्य वनसंरक्षक, (भू-प्रबंध) मध्य प्रदेश, सतपुड़ा भवन, भोपाल

एफ–4/विद्युत/2022/10–11/3817 भोपाल, दिनांक 14/11/22

प्रति,

वनमण्डलाधिकारी,
सामान्य वनमण्डल, उत्तर बैतूल,
मध्यप्रदेश।

मु. अ. (उत्पा.) सारनी
आ. क्र. 2477
दिनांक 14/11/2022

विषय :**मध्यप्रदेश विद्युत मण्डल को सारणी में राखड़ बांध के लिये दी गई वनभूमि।**

संदर्भ :मुख्य अभियंता (उत्पादन) सतपुड़ा ताप विद्युत गृह का पत्र क्र./824 दिनांक 14.11.22

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उपरोक्त पत्र से मध्यप्रदेश पावर जनरेटिंग कम्पनी लिमिटेड, सारनी द्वारा सारनी में स्थित राखड़ बांध की वनभूमि वापस करने के संबंध में लेख किया है। पत्र की प्रति संलग्न है।

मेरे द्वारा दिनांक 13.11.2022 को सारनी में वन अमले तथा आवेदक संस्था के अधिकारियों के साथ स्थल का निरीक्षण किया गया।

प्रकरण में आवेदक विभाग को राखड़ बांध के लिये दी गई वनभूमि के साथ–साथ शासकीय भूमि (32.70 हेक्टेयर) तथा आवेदक द्वारा अर्जित निजी भूमि (51.43 हेक्टेयर) का आधिपत्य तत्काल प्राप्त करे। प्राप्त निजी भूमि तथा शासकीय भूमि को संरक्षित वन घोषित करने की कार्यवाही भी प्रारम्भ करे।

आवेदक संस्था द्वारा इस राखड़ बांध में पूर्व से निर्मित सड़क, पाईप लाईन तथा विद्युत लाईन में उपयोग हो रही वनभूमि को यथावत अपने पास रखने का अनुरोध किया है। यह भूमि लगभग 18.13 हेक्टेयर होती है। अतः इस भूमि का आधिपत्य अभी न प्राप्त किया जाये।

प्रकरण में आवेदक संस्था ने वृक्षारोपण कार्य के लिये रू. 5.25 करोड़ की राशि उपलब्ध कराई है। आवेदक संस्था से यह वचन पत्र ले लेवे कि वृक्षारोपण के लिये अतिरिक्त राशि की आवश्यकता जब भी होगी, वह भुगतान के लिये सहमत है।

साथ ही आवेदक संस्था से जो 18.13 हेक्टेयर वनभूमि नहीं ली जा रही है उसका उपयोग केवल राखड़ के परिवहन से संबंधित वाहनों के लिये किया जाये। अन्य कार्यो के लिये इसका उपयोग वर्जित रहेगा। यदि आवेदक इस वन भूमि का उपयोग अन्य कार्यों के लिये करना चाहता है तो इसकी अनुमति मुख्यालय से प्राप्त की जाना होगी।

इस भूमि पर कुछ भाग में राख का भराव पूर्ण रूप से नहीं हुआ है। अतः स्थल पर हुई चर्चा के अनुसार यह कार्य दिनांक 31.03.2023 तक आवेदक संस्था करेगा। इस संबंध में भी वचन पत्र आवेदक संस्था से प्राप्त कर लिया जाये।

उपरोक्तानुसार सभी वचन पत्र प्राप्त कर राखड़ बांध की भूमि का आधिपत्य तत्काल प्राप्त कर लिया जाये।

निरीक्षण स्थल पर हुई चर्चा के अनुसार राखड़ बांध का जो भाग स्थाईत्व को प्राप्त कर चुका है, उसमें रोपण का प्रस्ताव तैयार कर इसे वर्ष 2023–24 के ए.पी.ओ. में सम्मिलित करने हेतु इस कार्यालय को प्रस्तुत किया जाये।

संलग्नः–उपरोक्तानुसार।

14/11/2022
(सुनील अग्रवाल)
प्रधान मुख्य वनसंरक्षक (कैम्पा)
मध्य प्रदेश, भोपाल

-2-

एफ–4/विद्युत/2022/10–11/3818 भोपाल, दिनांक 14/11/22

प्रतिलिपि–

1. मुख्य वन संरक्षक, बैतूल वृत्त, बैतूल, मध्यप्रदेश।
2. मुख्य अभियंता (उत्पादन), सतपुड़ा ताप विद्युत गृह, मध्यप्रदेश पावर जनरेटिंग कम्पनी लिमिटेड, सारनी, मध्यप्रदेश।

14/11/2022
प्रधान मुख्य वनसंरक्षक (कैम्पा)
मध्य प्रदेश, भोपाल

SE(Civil)

CE(Gen)

14/11/2022

SPEED POST

MADHYA PRADESH POWER GENERATING CO. LIMITED
(Govt. of MP Undertaking)
SATPURA THERMAL POWER STATION
P.O. SARNI: DISTRICT-BETUL (M.P.) 460447
FAX: (07146) 278466 PHONE: 278422
E-mail : stps1@rediffmail.com Website :- mppgcl.mp.gov.in

No. 08-004/G-194-A/ 82 Sarni, Dtd. 01/02/2022

To,

The Member Secretary,
M.P. Pollution Control Board,
Paryawaran Parisar, E-5, Arera Colony,
Bhopal-462016 (MP)
E-mail: hq-mppcb@mp.gov.in, it_mppcb@rediffmail.com

Sub: - Reclamation of 373 hectare ash pond by handing over to M.P. Forest Department.

Ref.: 1. MoEF&CC Gazette notification no. S.O. 5481(E) dated 31.12.2021
2. Letter no. 08-004/STPS/P&W/2970, Sarni dated 13.01.2022

In context with above, it is to submit that Satpura Thermal Power Station (STPS), M.P. Power Generating Company Ltd. Sarni is utilizing 373 hectare ash pond since the year 1967. Now, in compliance to the recent MOEF&CC notification dated: 31/12/2021, wherein there is a provision at condition no. A-5, that if ash dyke has stabilized/filled and reclamation has taken place, in such case legacy (stored) ash utilization shall not be required for thermal power station.

Accordingly, action has been initiated by STPS, Sarni and vide letter under ref.-2 has sought guidelines from the Forest Department, GoMP as regards of reclamation for the subject ash pond. After completion of surrendering / reclamation by Forest department, the STPS, Sarni will approach M.P. Pollution Control Board for issuance of certificate as per condition no. A-5 of the notification.

This is for your kind information please.

Encl.: Copy of letter under ref.-2.

(R.K. Gupta)
CHIEF ENGINEER (GEN.)
STPS: MPPGCL: SARNI

Copy to:-
1. The E.D. (O&M: Gen.), MPPGCL, Jabalpur
2. The Regional Officer, M.P. Pollution Control Board, In front of Mullaji petrol pump, Parasia Road, Chhindwara-480001 (E-mail: romppcbcwh@gmail.com)
3. The Senior Chief chemist, STPS, Sarni
4. The S.E. (Opn.)-IV & Nodal Officer (Fly ash utilization), STPS, Sarni
5. The S.E. (Civil), STPS, Sarni

MADHYA PRADESH POWER GENERATING COMPANY LIMITED,
(Govt. of M.P. Undertaking)

SATPURA THERMAL POWER STATION,
P.O. SARNI, DISTT-BETUL (M.P.) 460 447
FAX (07146) 278466, PHONE 278 422,
E-mail: stps1@rediffmail.com, Website-mppgenco.nic.in,
E-tendering Website: www.mpeproc.gov.in

No. 08.004/STPS/P&W/ 2970 Sarni dated 13 JAN 2022

To,
The DFO, North
MP Forest department,
Betul.

Sub:- Reclamation of forest land in 373 hectare ash pond for handing-over to MP Forest Department.

Ref:- 1) MoEF letter No-F. No.8-23 /2008-FC New-Delhi dated 13/10/2009
2) MoEF CC, GoI New-Delhi, Notification No-5075 dated 31.12.2021, on fly ash utilization.

Dear Sir,

Satpura Thermal Power Station (STPS), had established an ash pond on 373 hectare land comprising of 288.98 hectare (say 289 hectare) forest land, 51.43 hectare private land and 32.70 hectare Govt. land.

As the capacity of this ash pond was nearing to exhaustion, the MPPGCL approached to MP-Forest department for obtaining the diversion of 111 hectare forest land for utilization of the same to establish an extra Naveen ash pond on it. While obtaining the environmental clearance (EC) for this 111 hectare forest land the MoEF vide order No cited under reference -1 above, (CP- 1 & 2) have stipulated a condition that "Detailed proposal for reclamation of old ash pond / bund with good plantation and other measures shall be prepared and implemented in consultation with the State forest research Department at the user agency's cost. The cost of reclamation shall be deposited with the forest department and after reclamation the area will be transferred back to the forest Department ". In compliance, the MPPGCL in consultation with MP Forest, District authorities has complied at times the requisite steps including deposition of the desired demand-amount (Rs. 5.25 Cr.) for reclamation of forest land in the year 2015. (CP- 3 & 4).

The STPS is now willing to hand over the above mentioned forest land which has filled up and stabilized, back to MP Forest Department. In this context, we request for necessary guideline with consideration towards the following:-

Contd. 2

Only 288.98 hectare forest land was got diverted to MPPGCL from MP Forest.

i) The current status of 373 hectare land is as below:-

a) Active Pond area (On top surface) = 287.76 Hectares

b) Land under ash bund body and margin beyond bottom = 85.076 Hectares

Total = 372.836 Hectares

ii) Further to above, after surrendering the ash pond / bund land to Forest department MPPGCL shall be left with no extra land to accommodate the existing ash conveying pipe lines and its inspection corridor, presently passing through the surfaces of 373 hectare old ash bund. It would be inevitable to provide ash pipe lines with prime objective of minimum length design criterion and its inspection road corridor running for existing two live ash ponds on 111 and 130 hectare ash pond areas.

As-such, it may please be permitted to retain requisite land area of old ash bund(the active area will be calculate only after detailed on-site survey) to keep continue the ash pipe line run / inspection road for STPS utilization through ash pond / bund.

If required, a joint inspection for physical verification may be made by Forest & STPS, Sarni for the same.

iv) The soil cover laying as per the suggestion of State Forest Research Institute, Jabalpur may please be carried-out by the MP Forest Department, the complete cost for which shall be borne by the MPPGCL as per the requirement of MoEF guide-line dated 19.9.2006.

Thanking you.

Encl:- CP-1 to 4

Yours Faithfully,

(R.K. Gupta)
Chief Engineer(Gen)
STPS:MPPGCLSARNI

(Not on Original)

Copy to:- 1) The E.D.(O&M-Gen), MPPGCL, Jabalpur: The draft for this letter was prepared in consultation with the O/o the E.D.(O&M-Gen), JBP.
2) The Chief Engineer (Civil-Engineering), MPPGCL, Jabalpur:- The draft for this letter was prepared in consultation with the O/o the C.E.(Civil-Engineering), JBP
3) The Addl. C.E. (O&M)-II, MPPGCL, Sarni.
4) The S.E. (Civil), MPPGCL, Sarni.

...Dt. 17/9/2022

(R.K. Gupta)
Chief Engineer(Gen)
STPS:MPPGCLSARNI

Forwarded to - The EE(O), (Gen)-II
STPS Sarni -
For necessary action.

...(C)
...NI

ANNEXURE_IV

मध्य प्रदेश पावर जनरेटिंग कंपनी लिमिटेड
सतपुड़ा ताप विद्युत गृह, सारनी जिला–बैतूल(म0प्र0)
E-Mail:stps1@rediffmail.com, Fax No.07146-278466
PHONE-278422 PIN-460447

क्रमांक/08–004/Gen.194-A/1578 सारनी, दिनांक 01 AUG 2024

प्रति,

क्षेत्रीय अधिकारी,
क्षेत्रीय कार्यालय, मध्यप्रदेश प्रदूषण नियंत्रण बोर्ड,
छिन्दवाड़ा।
ई–मेलः–romppcbcwh@gmail.com

विषय :– सतपुड़ा ताप विद्युत गृह सारनी के विद्युत गृह क्रं–4 की राखड़ का निष्पादन 373 हेक्टे. राख बाँध (पुराना राख बाँध) में करने संबंधी।

संदर्भ :– (1) वन एवं पर्यावरण मंत्रालय, भारत सरकार, नई दिल्ली का 111 हेक्टे. वन भूमि व्यपवर्तन का कार्यालय ज्ञाप क्रमांक एफ. क्र. 8–23/2008–एफसी नई दिल्ली दिनांक 13.10.2009।
(2) वन परिक्षेत्र अधिकारी, सारनी का पत्र क्र. 2674 सारनी, दिनांक 29.11.2022।
(3) प्रधान मुख्य वनसंरक्षक (कैम्पा), म.प्र., भोपाल का पत्र क्र. एफ–4/विद्युत/2022/10–11/3817 भोपाल, दिनांक 14.11.2022।
(4) वनमण्डलाधिकारी उत्तर बैतूल (सा.) वनमंडल का पत्र क्र./मा. चि./2024/1764 बैतूल, दिनांक 28.03.2024।

महोदय,

सतपुड़ा ताप विद्युत गृह सारनी का 373 हेक्टे. राख बाँध (पुराना राख बाँध) कार्यबाह्य किया जा चुका है। कार्यबाह्य किये जाने के उपरान्त वन एवं पर्यावरण मंत्रालय, भारत सरकार, नई दिल्ली के संदर्भित पत्र क्र. (1) के परिपालन में उक्त 373 हेक्टे. राख बाँध, दिनांक 29/11/2022 को राज्य वन विभाग को सौपा गया है (संलग्न संदर्भित पत्र क्र. 2)। चूँकि हस्तांतरित किये गये स्थल का समतलीकरण करने के क्रम में यह पाया गया कि 373 हेक्टे. राख बांध के काफी हिस्से ऐसे हैं, जो असमतल एवं बड़े रिक्तावकाश युक्त हैं। जिन्हें ऊपरी मृदा से भरे जाने के बजाय राख से भरा जाना पर्यावरणीय दृष्टि से उचित माना गया। जिस बाबत् वनविभाग भोपाल द्वारा दिनांक 14/11/2022 को अनुमति प्रदान की गई (संलग्न संदर्भित पत्र क्र. 3), जिसकी अवधि क्रमानुसार तीन विस्तार उपरांत दिनांक 30/09/2024 कर दी गई है (संलग्न संदर्भित पत्र क्र. 4), इस दिशा में कार्य निरतंर प्रगति पर है।

दिनांक 10/07/2024 एवं 11/07/2024 को MoEF&CC, CPCB एवं MPPCB की संयुक्त समिति द्वारा 373 हेक्टे. राख बाँध (पुराना राख बाँध) के निरीक्षण के दौरान यह बिन्दु संज्ञान में लाया गया कि कार्यबाह्य हुये एवं वनविभाग को हस्तांतरित किये गये इस अक्रियाशील राख बाँध के समतलीकरण एवं गड्ढों के भराव के लिए गीली राख के प्रयोग विषयी अनुमति MPPCB से प्राप्त की जानी चाहिए थी। इस क्रम में यह लेख करना उचित होगा कि इस हस्तांतरित 373 हेक्टे. राख बाँध की Watch & Ward का कार्य किया जा रहा है एवं मानसून सीजन में बाँध की फिटनेस की सतत निगरानी की जाती है। समतलीकरण के कार्य में Ash Slurry का उपयोग हो रहा है तथा इस कार्य से किसी भी परिवेशीय वायु में प्रदूषण की कोई भी घटना

मध्य प्रदेश पावर जनरेटिंग कंपनी लिमिटेड
सतपुड़ा ताप विद्युत गृह, सारनी जिला–बैतूल(म0प्र0)
E-Mail:stps1@rediffmail.com, Fax No.07146-278466
PHONE-278422 PIN-460447

जानकारी में नही लाई गई है। अतः यह कथन किया जाता है कि इस तरह राख का निष्पादन पर्यावरण अनुकूल तरीके से हो रहा है।

उक्त वर्णित सयुंक्त समिति के द्वारा संज्ञान में लाये जाने के पश्चात् एवं उनके निर्देशों के परिपालन के क्रम में निवेदन किया जाता है कि 373 हेक्टे. के इस राख बाँध के समतलीकरण व गड्ढों का भराव गीली राख या ऐश स्लरी से किये जाने के कार्य को उसकी सततता के साथ दिनांक 30/09/2024 तक जारी रखने की अनुमति प्रदान करने की कृपा करें।

तदानुसार अनुमति प्राप्ति हेतु प्रेषित।

संलग्न :– उपरोक्तानुसार ।

(व्ही. के. कैथवार)
मुख्य अभियंता (उत्पा.)
म.प्र.पा.ज.क.लि., सारनी

प्रतिलिपि : –

1. सदस्य सचिव, केन्द्रीय प्रदूषण नियंत्रण बोर्ड, परिवेश भवन, ईस्ट अर्जुन नगर, शाहदरा, नई दिल्ली – 110032। ई–मेलः– mscb.cpcb@nic.in
2. कार्यपालक निदेशक (संचा.संधा./उत्पा.), म.प्र.पा.ज.क.लि., जबलपुर।
3. सदस्य सचिव, मध्यप्रदेश प्रदूषण नियंत्रण बोड, पर्यावरण परिसर, ई–5 सेक्टर, अरेरा कॉलोनी, भोपाल (म.प्र.)–462016 ई–मेलः– it_mppcb@rediffmail.com
4. क्षेत्रीय अधिकारी, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, क्षेत्रीय कार्यालय (WZ), केन्द्रीय पर्यावरण भवन, E-5 अरेरा कॉलोनी, लिंक रोड–3, रविशंकर नगर, भोपाल–462016। ई–मेलः–rowz.bpl-mef@nic.in
5. अधीक्षण अभियंता (प्रवर्तन)–चार एवं नोडल अधिकारी राख उपयोगिता, म.प्र.पा.ज.क.लि., सारनी।
6. अधीक्षण अभियंता (सिविल), म.प्र.पा.ज.क.लि., सारनी।
7. मुख्य रसायनज्ञ, म.प्र.पा.ज.क.लि., सारनी।

F. No. 8-23/2008-FC
Government of India
Ministry of Environment and Forests
(F.C. Division)

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi - 110003.
Dated: 13th October, 2009.

To

The Principal Secretary (Forests),
Government of Madhya Pradesh,
Bhopal.

Sub: Diversion of 111.00 ha of forest land for construction of Naveen Ash Bund in Dist Betul, Madhya Pradesh for Satpura Thap Vidyut Grih in favour of M. P. Power Generating Company Ltd. Madhya Pradesh.

Sir,

I am directed to refer to the Government of Madhya Pradesh's Letter No. F-2/2/26/2007/10-11/Vidhyut/546 dated 28.02.2008 on the subject mentioned above seeking prior approval of the Central Government under the Forest (Conservation) Act, 1980. After careful consideration of the proposal by the Forest Advisory Committee constituted under Section-3 of the said Act, in-principle approval for the said proposal was granted vide this Ministry's letter of even number dated 02nd March, 2009, subject to fulfilment of certain conditions. The State Government has furnished compliance report in respect of the conditions stipulated in the in-principle approval and has requested the Central Government to grant final approval.

2. In this connection, I am directed to say that on the basis of the compliance report furnished by the State Government vide letter No. F-4/2/26/2007/10-3/Vidhut/1988 dated 31.08.2009, approval of the Central Government is hereby granted under Section-2 of the Forest (Conservation) Act, 1980 for diversion of 111.00 ha of forest land for construction of Naveen Ash Bund in Dist Betul, Madhya Pradesh for Satpura Thap Vidyut Grih in favour of M. P. Power Generating Company Ltd. Madhya Pradesh subject to fulfilment of the following conditions:-

1. Legal status of forest land shall remain unchanged.
2. Detailed proposal for reclamation of old ash pond / bund with good plantation and other measures shall be prepared and implemented in consultation with the State Forest Department at the user agency's cost within two years. The cost of reclamation shall be deposited with the forest Department and after reclamation the area will be transferred back to the State Forest Department.

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(299) (304)

3. A comprehensive wildlife plan shall be made for the Division in consultation with Wildlife Institute of India at the User Agency's cost. The cost of implementation of the plan shall be borne by the User Agency.
4. The proper muck disposal plan if required, should be prepared and implemented in consultation with the State Forest Department at the user agency's cost so that these mucks do not get washed away to river. A detailed plan shall be made before final approval.
5. Trees shall be felled only when it becomes necessary and that too under strict supervision of State Forest Department, and at the cost of the project.
6. No labour camps shall be established on forest land.
7. The User Agency shall provide fuel-wood preferably alternate fuel to the labourers working at the site to avoid damage/felling of trees.
8. The forest land shall not be used for any purpose other than that specified in the proposal.
9. All other conditions proposed by the State Government of Madhya Pradesh at the time of submission of the proposal to the Central Government.
10. All other conditions under different rules, regulations and guidelines including environmental clearance and the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 shall be complied with before transfer of forest land before transfer of forest land.

Yours faithfully,

(B.K. Singh)
Sr. Assistant Inspector General of Forests

Copy to:-

1. The Principal Chief Conservator of Forests, Government of Madhya Pradesh, Bhopal.
2. The Nodal Officer, Forest Department, Government of Madhya Pradesh, Bhopal.
3. The CCF(Central), Regional Office, Bhopal.
4. User Agency.
5. Monitoring Cell, FC Division, MoEF, New Delhi.
6. Guard File.

(B.K. Singh)
Sr. Assistant Inspector General of Forests

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(2)

(54) (12)

E-mail: sanchita@nic.in
sansom_2859@yahoo.co.in
Telefax: 011-24695402

भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FORESTS AND CLIMATE CHANG
इंदिरा पर्यावरण भवन, जोर बाग रोड,
अलीगंज, नई दिल्ली-110 003
INDIRA PARYAVARAN BHAWAN, JOR BAGH ROAD,
ALIGANJ, NEW DELHI-110 003
Website : moef.nic.in

2nd Level, JAL Block
Date: 27th March, 2015

F. No. J-13012/5/2013-IA.II (T)

To

M/s M. P. Power Generating Co. Ltd.
Shakti Bhawan, Vidyut Nagar
Jabalpur - 482 008
Madhya Pradesh
Ph: 0761-266111; 2660500

Subject: **New Ash Pond of 111 ha for Satpura Thermal Power Station in Sarni, Dist. Betul, Madhya Pradesh by M/s. M.P. Power Generating Co. Ltd. – Permission reg.**

Sir,

This has reference to your letters dated 23.10.2013, 18.11.2013, 03.12.2013, 10.06.2014, 18.09.2014, 22.11.2014 and 31.01.2015, on the above mentioned subject. It is noted that Units 1 to 5 (5x62.5 MW) established in 1967-70 of your TPP have been de-commissioned. The Units 6 & 7 of 210 & 200 MW respectively were established in 1979-80 and Units 8 & 9 (2x210 MW) were established in 1983-84. Environmental Clearance for Units 10 & 11 (2x250 MW) was accorded by the Ministry on 27th February, 2009 and were commissioned in the year 2013-14. ToR for 1x660 MW (in place of 5x62.5 MW) was accorded by the Ministry on 9th May, 2013.

2. It is further noted that the capacity of existing ash pond (373 ha) for disposal of ash generated from Units 6 to 9 will exhaust in next two months and it is not feasible to utilize the 130 ha ash pond meant for Unit 10 and 11 (2X250 MW). As such, the only alternative left is to construct a new ash pond of 111 ha in order to continue power generation from existing units; otherwise, old units will be under forced outages after two months. Further, this ash pond will also be utilised for storing the ash generated from proposed 1x660 MW Units at Sarni for which TOR has already been approved by the Ministry.

3. The matter was placed before the EAC (Thermal Power) in its 8th, 20th and 30th meetings held during January 9-10, 2014, August 28-29, 2014 and January 29-30, 2015 respectively. In acceptance of the

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recommendation of the EAC and in view of the information/clarification submitted by you with respect to the above mentioned power project, permission is hereby accorded for establishing a new ash pond on 111 ha for Satpura TPS in Sarni subject to the following conditions:

(i) The compliance to the Action Plan for 100% fly ash utilization in the year 2015-16 shall be submitted to the Ministry and its Regional Office on a quarterly basis.

(ii) A detailed feasibility study by competent experts shall be conducted regarding measures to accommodate additional ash in exigency like by increasing the height of existing ash dyke (373 ha), by changing the method of disposal etc.

(iii) Thick green belt of 30 m shall be developed all around the ash pond.

(iv) Harnessing solar power within the premises of the plant particularly at available rooftops shall be carried out and status of implementation including actual generation of solar power shall be submitted in the half-yearly monitoring report.

(v) A long term study of radio activity and heavy metals contents on coal to be used shall be carried out through a reputed institute and results thereof analyzed shall be reported every two year in the monitoring reports. Thereafter mechanism for an in-built continuous monitoring for radio activity and heavy metals in coal and fly ash (including bottom ash) shall be put in place.

(vi) Fugitive emissions shall be controlled to prevent impact on agricultural or non-agricultural land.

(vii) An Environmental Cell comprising of at least one expert in environmental science/ engineering, ecology, occupational health and social science, shall be created preferably at the project site itself and shall be headed by an officer of appropriate seniority and qualification. It shall be ensured that the Head of the Cell shall directly report to the Head of the Plant who would be accountable for implementation of environmental regulations and social impact improvement/mitigation measures.

(viii) CSR schemes identified based on Public Hearing issues and need based assessment shall be implemented in consultation with the village Panchayat and the District Administration right from the start of the development of project. As part of CSR,

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...qualification of local employable youth and eventual ... in the project after imparting relevant training, ... be also undertaken. Company shall provide separate ... for community development activities and income ... programmes.

(ix) ... monitoring of CSR activities, a CSR Committee or ... Audit Committee or a suitable credible external agency ... appointed. CSR activities shall also be evaluated by an ... independent external agency. This evaluation shall be both ... and final.

(x) ... project proponent shall formulate a well laid Corporate ... Policy and identify and designate responsible ... at all levels of its hierarchy for ensuring adherence to ... policy and compliance with the conditions stipulated in ... clearance letter and other applicable environmental laws ... regulations.

This issues with the approval of the Competent Authority.

(Sanchita Jindal)
Scientist 'F' & Director (I)

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110 001.
2. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110 066.
3. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110 032.
4. The Secretary, Department of Environment, Government of Madhya Pradesh, Bhopal.
5. The Chairman, Madhya Pradesh Pollution Control Board, E-5, Arera Colony, Paryavaran Parisar, Bhopal-462 016, Madhya Pradesh.
6. The Chief Conservator of Forests, Regional Office (WZ), E-5, Kendriya Paryavaran Bhawan, Arera Colony, Ravishankar Nagar, Bhopal -462 016.
7. The Collector, District Betul, M.P.
8. Guard file/Monitoring file.

(Sanchita Jindal)
Scientist 'F' & Director (I)

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कार्यालय प्रधान मुख्य वनसंरक्षक, (भू-प्रबंध) मध्य प्रदेश, सतपुड़ा भवन, भोपाल

एफ–4/विद्युत/2022/10–11/3817 भोपाल, दिनांक 14/11/22

प्रति,

वनमण्डलाधिकारी,
सामान्य वनमण्डल, उत्तर बैतूल,
मध्यप्रदेश।

मु. अ. (उत्पा.) सारनी
आ.क्र. 2477
दिनांक 14/11/2022

विषय :मध्यप्रदेश विद्युत मण्डल को सारणी में राखड़ बांध के लिये दी गई वनभूमि।

संदर्भ :मुख्य अभियंता (उत्पादन) सतपुड़ा ताप विद्युत गृह का पत्र क्र./824 दिनांक 14.11.22

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उपरोक्त पत्र से मध्यप्रदेश पावर जनरेटिंग कम्पनी लिमिटेड, सारनी द्वारा सारनी में स्थित राखड़ बांध की वनभूमि वापस करने के संबंध में लेख किया है। पत्र की प्रति संलग्न है।

मेरे द्वारा दिनांक 13.11.2022 को सारनी में वन अमले तथा आवेदक संस्था के अधिकारियों के साथ स्थल का निरीक्षण किया गया।

प्रकरण में आवेदक विभाग को राखड़ बांध के लिये दी गई वनभूमि के साथ–साथ शासकीय भूमि (32.70 हेक्टेयर) तथा आवेदक द्वारा अर्जित निजी भूमि (51.43 हेक्टेयर) का आधिपत्य तत्काल प्राप्त करे। प्राप्त निजी भूमि तथा शासकीय भूमि को संरक्षित वन घोषित करने की कार्यवाही भी प्रारम्भ करे।

आवेदक संस्था द्वारा इस राखड़ बांध में पूर्व से निर्मित सड़क, पाईप लाईन तथा विद्युत लाईन में उपयोग हो रही वनभूमि को यथावत अपने पास रखने का अनुरोध किया है। यह भूमि लगभग 18.13 हेक्टेयर होती है। अतः इस भूमि का आधिपत्य अभी न प्राप्त किया जाये।

प्रकरण में आवेदक संस्था ने वृक्षारोपण कार्य के लिये रू. 5.25 करोड़ की राशि उपलब्ध कराई है। आवेदक संस्था से यह वचन पत्र ले लेवे कि वृक्षारोपण के लिये अतिरिक्त राशि की आवश्यकता जब भी होगी, वह भुगतान के लिये सहमत है।

साथ ही आवेदक संस्था से जो 18.13 हेक्टेयर वनभूमि नहीं ली जा रही है उसका उपयोग केवल राखड़ के परिवहन से संबंधित वाहनों के लिये किया जाये। अन्य कार्यों के लिये इसका उपयोग वर्जित रहेगा। यदि आवेदक इस वन भूमि का उपयोग अन्य कार्यों के लिये करना चाहता है तो इसकी अनुमति मुख्यालय से प्राप्त की जाना होगी।

इस भूमि पर कुछ भाग में राख का भराव पूर्ण रूप से नहीं हुआ है। अतः स्थल पर हुई चर्चा के अनुसार यह कार्य दिनांक 31.03.2023 तक आवेदक संस्था करेगा। इस संबंध में भी वचन पत्र आवेदक संस्था से प्राप्त कर लिया जाये।

उपरोक्तानुसार सभी वचन पत्र प्राप्त कर राखड़ बांध की भूमि का आधिपत्य तत्काल प्राप्त कर लिया जाये।

निरीक्षण स्थल पर हुई चर्चा के अनुसार राखड़ बांध का जो भाग स्थाईत्व को प्राप्त कर चुका है, उसमें रोपण का प्रस्ताव तैयार कर इसे वर्ष 2023–24 के ए.पी.ओ. में सम्मिलित करने हेतु इस कार्यालय को प्रस्तुत किया जाये।

संलग्नः–उपरोक्तानुसार।

14/11/2022
(सुनील अग्रवाल)
प्रधान मुख्य वनसंरक्षक (कैम्पा)
मध्य प्रदेश, भोपाल

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भोपाल, दिनांक 14/11/22

एफ–4/विद्युत/2022/10–11/3818

प्रतिलिपि–

1. मुख्य वन संरक्षक, बैतूल वृत्त, बैतूल, मध्यप्रदेश।
2. मुख्य अभियंता (उत्पादन), सतपुड़ा ताप विद्युत गृह, मध्यप्रदेश पावर जनरेटिंग कम्पनी लिमिटेड, सारनी, मध्यप्रदेश।

14/11/2022
प्रधान मुख्य वनसंरक्षक (कैम्पा)
मध्य प्रदेश, भोपाल

SE(Civil)

CE(Gen)

14/11/2022

कार्यालय वन परिक्षेत्र अधिकारी सारनी (सामान्य) म0प्र0

क्रमांक ..... सारनी, दिनांक .....

प्रति,

वनमंडलाधिकारी
उत्तर बैतूल (सा0) वनमंडल

Receipt No. 5070
Date 30 NOV 2022

मु. अ. (उत्पा.) सारनी
आ.पत्र क्र. 2579
दिनांक 29/11/2022

द्वारा :- उपवनमंडलाधिकारी सारनी (सा0)

विषय :- सतपुड़ा ताप विद्युत गृह म0प्र0पा0ज0कं0लि0, सारनी स्थित 373 हेक्टेयर भूमि पर स्थित पुराने राख पौंड/बंड का अधिपत्य प्राप्त करने की सूचना बाबत्।

संदर्भ :- वनमंडल कार्यालय का कार्यालयीन पत्र क्रमांक/मा0चि0/2022/7738 बैतूल दिनांक 21.11.2022

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उपरोक्त विषयान्तर्गत संदर्भित पत्र के तारतम्य में निवेदन है, कि सतपुड़ा ताप विद्युत गृह म0प्र0पा0ज0कं0लि0, सारनी स्थित 373 हेक्टेयर भूमि पर स्थित पुराने राख पौंड/बंड का अधिपत्य म0प्र0पा0ज0कं0लि0 सारनी से वचन पत्र प्राप्त करते हुये पुराने राख बांध/पौंड पर की 18.13 हेक्टेयर भूमि म0प्र0पा0ज0कं0लि0 सारनी को पूर्व से निर्मित सड़क, राख पाईप लाईन तथा विद्युत लाईन के उपयोग हेतु छोडते हुए आज दिनांक 29.11.2022 को वन विभाग के द्वारा अपने आधिपत्य में लिया गया।

प्रतिवेदन सूचनार्थ सादर सम्प्रेषित।

संलग्न :- वचन - पत्र।

(अमित कुमार साहू, वनक्षेत्रपाल)
वन परिक्षेत्र अधिकारी
सारनी (सा0)

पृष्ठांकन क्रमांक/ 2674 सारनी, दिनांक 29/11/2022

प्रतिलिपि :- मुख्य अभियंता (उत्पा.) म0प्र0पा0ज0कं0लि0 सारनी की ओर सूचनार्थ।

(अमित कुमार साहू, वनक्षेत्रपाल)
वन परिक्षेत्र अधिकारी
सारनी (सा0)

Chief Chemist
SE(OPN)-IV/SE(Civil)
SE(MM)-IV
CE (Gen)
EE (AU) 29/11/2022
SE OPN-IV

मध्यप्रदेश पावर जनरेटिंग कंपनी लिमिटेड
(म.प्र.शासन का उपक्रम)
सतपुड़ा ताप विद्युत गृह
पो.आ.सारनी: जिला बैतूल (म.प्र.) 460447
फैक्स (07146)278466 /फोन: 278422
E-mail: stps1@rediffmail.com Website: mppgcl.mp.gov.in

क्रमांक 08-004/ W-408/ 889 सारनी, दिनांक 13 /12/2022

प्रति,

सदस्य सचिव,
म.प्र. प्रदूषण नियंत्रण बोर्ड, पर्यावरण परिसर,
ई-5, अरेरा कॉलोनी, भोपाल (म.प्र.)-462 016 |
ई-मेल: it_mppcb@rediffmail.com, hq-mppcb@mp.gov.in

विषय: सतपुड़ा ताप विद्युत गृह, मध्यप्रदेश पॉवर जनरेटिंग कंपनी लिमिटेड, सारनी के 373 हेक्टेयर एश पौंड में एकत्रित लीगेसी राख के संबंध में |

संदर्भ: 1. वन विभाग मध्य प्रदेश शासन का पत्र दिनांक 03.11.1976
2. पर्यावरण एवं वन मंत्रालय का कार्यालय ज्ञाप क्रमांक 8-23/2008-FC दिनांक 13.10.2009
3. वन परिक्षेत्र अधिकारी सारनी (सामान्य) म.प्र. का पत्र क्र. 2674 सारनी दिनांक 29.11.2022

उपरोक्त विषयांतर्गत लेख है कि सतपुड़ा ताप विद्युत गृह, मध्यप्रदेश पॉवर जनरेटिंग कंपनी लिमिटेड, सारनी को संदर्भित पत्र क्र. 1 के माध्यम से वर्ष 1976 में वन भूमि पर राख संग्रहण हेतु निर्माण कार्य की अनुमति प्राप्त हुई थी जिसके पश्चात 373 हेक्टेयर भूमि पर बनाये गये राख पौंड का उपयोग कंपनी द्वारा राख संग्रहण हेतु किया गया।

पर्यावरण एवं वन मंत्रालय के संदर्भित कार्यालय ज्ञाप क्र. 2 (छायाप्रति संलग्न) की शर्त क्रमांक 2 के अनुपालनार्थ पुराने 373 हेक्टेयर राख पौंड के पुनरूद्धार हेतु मृदा आवरण एवं पौध रोपण किये जाने की कार्यवाही के तहत म.प्र. वन विभाग को वर्ष 2015 में 5.25 करोड रूपये की राशि जमा करायी गयी थी। म.प्र.पॉ.जन.कं.लि., सारनी द्वारा 373 हेक्टेयर भूमि पर स्थित उक्त पुराने राख पौंड/बंड को वन विभाग मध्यप्रदेश को वापिस कर दिया गया है। जिसका आधिपत्य वन विभाग द्वारा दिनांक 29.11.2022 को संदर्भित पत्र क्र. 3 के माध्यम से लिया जा चुका है। राख पौंड के पुनरुद्धार हेतु मृदा आवरण एवं पौध रोपण की आगामी कार्यवाही वन विभाग द्वारा संपादित की जानी है|

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय की अधिसूचना सं. का.आ. 5481 (अ) दिनांक 31 दिसम्बर 2021 में अंकित प्रावधान क (5) (अधिसूचना पृष्ठ क्र. 4) में निम्नानुसार उल्लेख है-

> "लीगेसी राख का उपयोग वहां अपेक्षित नहीं है, जहाँ राख के तालाब या डाइक स्थिर हो गए है और हरित पट्टी के निर्माण या पौध रोपण से पुनरुद्धार किया गया हैं और संबंधित राज्य प्रदूषण नियंत्रण बोर्ड इस संबंध में प्रमाणित करेगा | किसी राख तालाब या डाइक के स्थिरीकरण और भूमि-उद्धार का कार्य, जिसमें केन्द्रीय प्रदूषण नियंत्रण बोर्ड या राज्य प्रदूषण बोर्ड द्वारा प्रमाणन शामिल है, इस अधिसूचना के प्रकाशन की तारीख से एक वर्ष के भीतर किया जाएगा |"

वन विभाग को उक्त राख पौंड के हस्तांतरण के समय इसमें 792.97 लाख टन लीगेसी राख उपलब्ध थी | 373 हेक्टेयर राख पौंड को वन विभाग को लौटा दिये जाने के कारण उक्त अधिसूचना दिनांक 31.12.2021 के अनुसार म.प्र.पॉ.जन.कं.लि. पर 373 हेक्टेयर राख बांध में संचित लीगेसी राख का उपयोग करने का उत्तरदायित्व नहीं है। तत्संबंध में म.प्र. प्रदूषण नियंत्रण बोर्ड द्वारा प्रमाणन प्रदान किये जाने का निवेदन किया जाता है|

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संलग्न: संदर्भित पत्रों एवं अधिसूचना दिनांक 31.12.2021 की छायाप्रति।

(व्ही.के. कैथवार)
मुख्य अभियंता (उत्पा.)
म.प्र.पा.ज.कं.लि., सारनी

प्रतिलिपि :-

1. क्षेत्रीय अधिकारी, म.प्र. प्रदूषण नियंत्रण बोर्ड, मुल्लाजी पैट्रोल पम्प के सामने, परासिया रोड, छिंदवाडा (म.प्र.)- 480001 (ई-मेल: romppcbcwh@gmail.com)
2. कार्यपालक निदेशक (संचा.संधा.: उत्पा.), म.प्र.पा.ज.कं.लि., जबलपुर।

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कार्यालय वनमंडलाधिकारी उत्तर बैतूल (सां0) वनमंडल

07141-234204(कार्यालय), E-Mail -- dfonbetul@mp.gov.in

बैतूल, दिनांक/28/03/2024

क्रमांक/मा0चि0/2024/ 1764

प्रति,

मुख्य अभियंता,
(उत्पादन)
म.प्र.पा.ज.कं.लि.
सतपुड़ा ताप विद्युत गृह सारनी

7247
28/3/24

विषय :- सतपुड़ा ताप विद्युत गृह सारनी के 373 हेक्टेयर वनभूमि पर स्थित पुराने राखड़ बांध में राख के भराव की समयावधि बढ़ाने के संबंध में।

संदर्भ :- 1.- अपर प्रधान मुख्य वन संरक्षक (भू-प्रबंध) म.प्र. भोपाल का पत्र क्रमांक/एफ-4/विद्युत/2022/10-11/1737 दिनांक 21.03.2024

2.- अधीक्षण यंत्री (सिविल) सताविगृ. म.प्र.पा.ज.कं.लि. सारनी का पत्र क्रमांक/अयसि/सतापि/2605 दिनांक 22.03.2024

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विषयांतर्गत अपर प्रधान मुख्य वन संरक्षक (भू-प्रबंध) म.प्र. भोपाल के संदर्भित पत्र दिनांक 21.03.2024 द्वारा दिये गये निर्देशों के तारतम्य में आपके संदर्भित पत्र दिनांक 22.03.2024 से अभिमत अनुसार वचन पत्र प्रस्तुत किया गया है, तदानुसार राख बांध के गड्डो में राख भरने की समयावधि 30.09.2024 तक बढ़ाई जाती है।

वनमण्डलाधिकारी
उत्तर बैतूल (सा0) वनमंडल

बैतूल, दिनांक/28/03/2024

पृ.क्र./मा0चि0/2024/ 1765

प्रतिलिपि :- 1- अपर प्रधान मुख्य वन संरक्षक (भू-प्रबंध) म.प्र. भोपाल की ओर आपके संदभित पत्र के तारतम्य में सूचनार्थ सादर सम्प्रेषित।

2- मुख्य वन संरक्षक बैतूल वृत्त बैतूल की ओर सूचनार्थ सादर सम्प्रेषित।

3- उपवनमंडलाधिकारी सारनी एवं परिक्षेत्र अधिकारी सारनी (सा.) की ओर सूचनार्थ एवं आवश्यक कार्यवाही हेतु अग्रेषित।

वनमण्डलाधिकारी
उत्तर बैतूल (सा0) वनमंडल

EE(FAV)

EE OPN-III

ANNEXURE_V

M.P. POWER GENERATING COMPANY LIMITED
OFFICE OF THE CHIEF ENGINEER (Gen.)
Satpura Thermal Power Station
Sarni Distt. – Betul – 460447
Phone : 07146-278422, Email - stps1@rediffmail.com

No. 08-004/Env/Gen/Sarni/ 50 **Sarni Dtd.** 12 APR 2023

To

The Member Secretary
Madhya Pradesh Pollution Control Board
Bhopal (M.P.)

Sub: STPS, Sarni, designation of ash ponds for STPS Sarni as per provisions of MOEF&CC Fly Ash Utilization Notification.

Ref: Government of India Ministry of Environment, Forest & Climate Change New Delhi Notification No. S.O. 5481 (E) dated 31.12.2021, amended by Notification No. S.O. 6169 (E) dated 30.12.2022.

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The Government of India Ministry of Environment, Forest & Climate Change New Delhi has issued the Notification No. S.O. 5481 (E) dated 31.12.2021, amended by Notification No. S.O. 6169 (E) dated 30.12.2022 for utilization & safe disposal of fly ash by thermal power plants, With reference to the Para No. A (6) this Notification it is to inform that. At present the STPS Sarni is having following two operational ash ponds:-

(i) Ash pond No. – 01 (Situated on 111 – hectares forest land acquired for use from Forest Department, near Sarni town having coordinates : 22* 06' 11.94" N 78* 09' 19.93" E):- Net area available for temporary storage of ash is 90 hectares.

(ii) Ash pond No. – 02 (Situated on 130 – hectare land acquired from private land owners, near village Dhased having coordinates: 22* 06' 08.21" N 78* 06' 47.56" E): Area available for temporary storage of ash is 94.50 hectares.

In view of above, at STPS Sarni the total area available for temporary storage of ash is 184.50 hectare.

However, the area permitted as per Para-A (6) of the said MOEF&CC Notification is as follows:

(i) For Power House No. II commissioned in the year 1980 having installed capacity of 410 MW (1x210 MW units) and Power House No. III commissioned in the year 1984 having installed capacity of 420 MW (2x210 MW units) having total installed capacity of 830 MW. However, specification of 0.1 hectare per Mega Watt (MW) of an operational ash pond or dyke is not applicable for the thermal power plants commissioned before 03rd November, 2009. (90 ha)

(ii) For Power House No. IV commissioned in the year 2014 having installed capacity of 500 MW (2x250 MW units): (50 ha)

Further, for proposed supercritical unit of 1x660 MW on land vacated by dismantling of old decommissioned 6x62.50 MW units of Power House No. I, for which MOEF & CC has already granted the TOR in December 2019 and as per the EAC meeting for Environmental Clearance is also convened on dated 28.12.2022 by MOEF & CC this project shall have to utilize 66 hectare out of net available 90 ha of available area of 111 ha.

Therefore, as of now, out of total area of 184.5 ha (90+94,5) available for temporary storage, the area permitted is 140 ha (90+50) i.e. 44.5 ha is in excess which shall be reclaimed / stabilized as per the stipulations of MoEF&CC Notification dated 30.12.2022.

Submitted for your information please.

Encl :- Location map.

(V.K. Kaithwar)
Chief Engineer (Gen.)
STPS: MPPGCL: Sarni

Copy to :-

01. The Member Secretary Central Pollution Control Board, New Delhi.
02. The Regional Officer, M.P. Pollution Control Board, Chhindwara (M.P.)
03. The Executive Director (PRG), M.P.P.G.C.L. Jabalpur.
04. The Chief Engineer (Civil-Engg.), M.P.P.G.C.L. Jabalpur.

(V.K. Kaithwar)
Chief Engineer (Gen.)
STPS : MPPGCL : Sarni

O/C RH SE(C)

(18)

ANNEXURE_VI

Indian Institute of Technology Indore
DEPARTMENT OF CIVIL ENGINEERING
Simrol Campus, Khandwa Road, Simrol
Indore - 453 552 (M.P.) India

भारतीय प्रौद्योगिकी संस्थान इन्दौर
जनपद अभियांत्रिकी विभाग
सिमरोल केम्पस, खण्डवा रोड़, सिमरोल
इन्दौर –453 552 (म. प्र.) भारत

Office : +91-7324-240 750
Fax : +91-7324-240 761
E-mail : hodce@iiti.ac.in

IIT Indore

S.E.(C) C&M - SARNI
Receive No. 676
Dtd. 24/05/2023

Dated – 17-05-2023

In reference with letter no. EEC/C&M-2/STPS/90 dated 29-04-2023, field visit has been done to 1330 MW coal based Satpura thermal power plant Sarni district – Betul of Madhya Pradesh Power Generating Company limited to inspect the ash dyke on 111 hec land.

A.E.(C) H.Q.

The ash dyke was inspected by the undersigned and critical section details along with geotechnical properties are provided by the client were used for the slope stability analysis. The detailed report is attached along with this letter with recommendations. The ash dyke 111 hec is safe and is in stable condition at present and also it is properly maintained and structurally safe.

S.E.(C) Sarni

24/05

17-5-23

Prof. Neelima Satyam
Department of Civil Engineering
IIT Indore

Dr. Neelima Satyam D.
Professor
Department of Civil Engineering
Indian Institute of Technology Indore
Simrol, Indore 453 552, India

Report on
Inspection of Ash Dyke on 111 hec land at Satpura Thermal Power Station, MPPGCL, Sarni

Reference No: EEC/C&M-2/STPS/90 dated 29-04-2023

By
Prof. Neelima Satyam
Department of Civil Engineering
Indian Institute of Technology Indore
Simrol, Indore – 453552 M.P.

17.5.23

Dr. Neelima Satyam D.
Professor
Department of Civil Engineering
Indian Institute of Technology Indore
Simrol, Indore 453 552, India

Introduction

Satpura Thermal Power Plant is located at Sarni town near Ghoradongri Railway station in the Betul district of Madhya Pradesh, India. The power plant is one of the coal-based power plants of MPPGCL with an installed capacity of 1330 MW. The Water for the plant has been procured from the nearby Tawa Dam Lake area and the coal for the plant has been procured by Rail/Road/Belt from Western Coal Fields.

The powerplant has an abandoned ash pond of 373 hectares and the ash dyke no. 111 is being used for storage of pond ash was inspected (Fig 1). The pond has ash dykes raised in six different stages and all the raisings except the first, second, and third are provided with vertical chimney drains and downstream toe drains.

As per the request from the Superintending Engineer STPS Sarni, Prof Neelima Satyam, IIT Indore visited the site on 29th April 2023. During the visit, it was observed that the surface of the downstream slope was in stable condition. There were no seepage issues and gully formations. The loose surface material looked constrained, and the seepage has been controlled by providing drains at regular lengths along the periphery of the raising (Fig 2). After a detailed inspection of the ash dyke no. 111 of STPS Sarni and slope stability analysis of the existing ash dyke considering seepage, the following recommendations are provided.

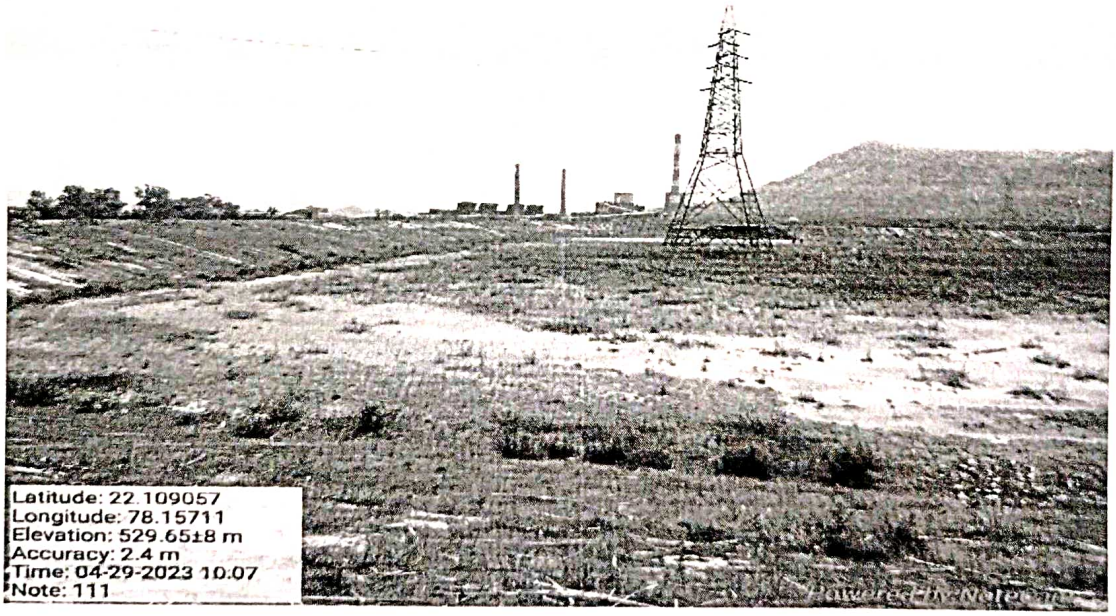


Fig 1: Side view of Ash dyke no 111

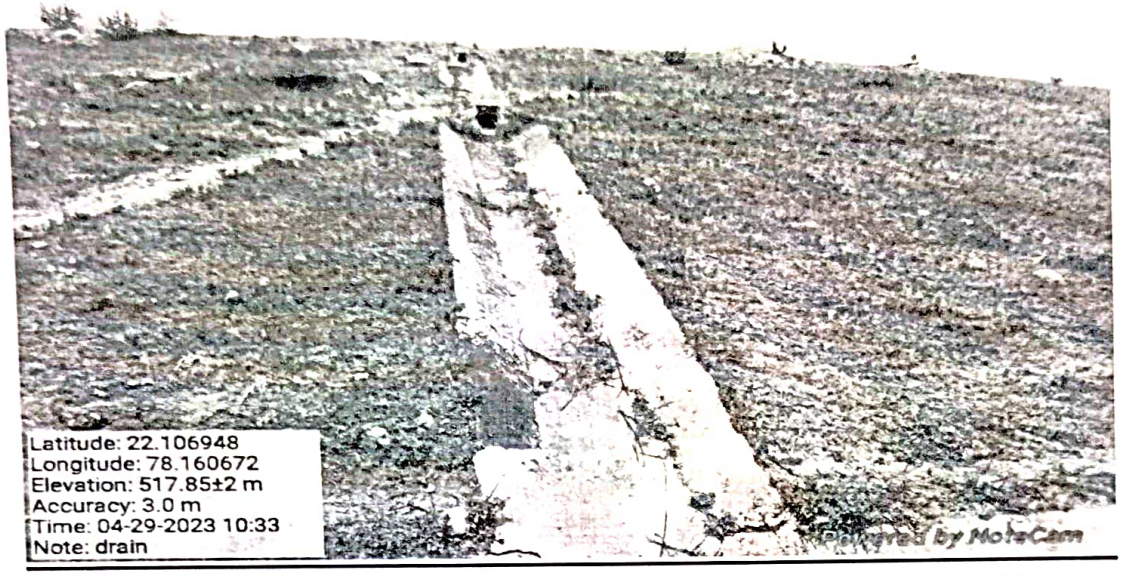


Fig 2: Draining across the ash dyke no. 111 using Plain cement concrete (PCC) pipes

Scope

To carry-out the slope stability analysis for the ash dyke no. 111 at compartment B of STPS Sarni and provide necessary recommendations for the probable raising of dyke in future

Design Consideration

Table 1: Data considered from CAD design provided by the client

Downstream toe level	453 m
Top level of ash dyke	463 m
RL of foundation	450 m
Width of dyke	70 m

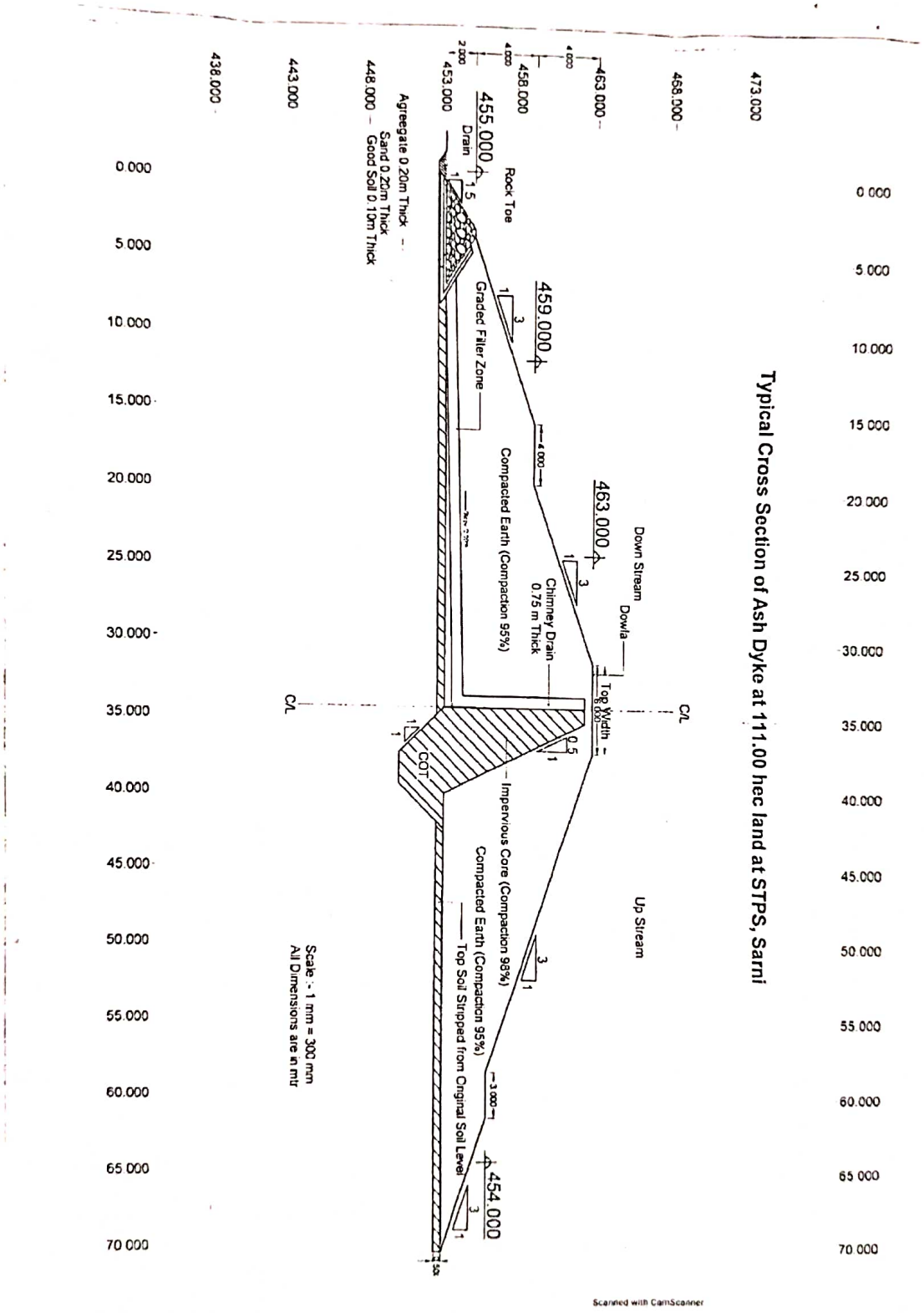


Fig 3: Plan view of ash dyke no. 111 under inspection (provided by client)

Two staged analysis was conducted for slope stability, the first stage is used to develop the hydraulic conditions and the second stage was for slope stability analysis.

Boundary Conditions: The upstream and downstream water levels and drainage conditions were taken as the hydraulic boundary conditions. The boundary conditions were varied as per the requirement of the analysis.

Design Conditions:

As per IS 7894:1975, the following cases are critical for the stability of the earthen dam.

1. Construction with or without a partial pool (u/s and d/s slope)
2. Reservoir pool level (u/s slope)
3. Sudden drawdown (u/s slope)
4. Steady Seepage (d/s slope)
5. Steady Seepage with sustained rainfall (d/s slope)
6. Earthquake condition (u/s and d/s slope)

Since the dyke is constrained completely and with no sign of any leakage or failure, only condition no. (3) sudden drawdown for the upstream slope and (4) steady seepage for the downstream slope has been considered for the analysis. Since there are no issues of seepage, the possible infiltration during rainfall is not considered. District Betul falls under seismic zone 3 as per IS 1893(1)-2016 with a low to moderate chance of earthquake hence condition (6) has been considered for both upstream and downstream slope.

The material properties provided by the client are tabulated below in Table 2.

Table 2: Physical properties of soil materials considered for analysis (provided by client)

Material	Specific Gravity	Unit Weight (kg/m^3)	Cohesion (KPa)	Angle of Internal friction	Permeability (cm/s)
Sample no - 1	2.54	2079	150	10	$1.0395 * 10^{-5}$
Sample no - 2	2.53	2073	100	10	$1.035 * 10^{-5}$
Sample no - 3	2.55	2091	124	11	$1.038 * 10^{-5}$
Sample no - 4	2.56	2093	125	11	$1.0398 * 10^{-5}$

The dyke has 3 layers of soil embankment (Fig 4) which stores the pond ash with the provision of a chimney drain adjacent to the impervious core of the dam. The limit equilibrium analysis for both the conditions (steady state and rapid drawdown) has been done by Morgenstern-price method which is considered one of the most accurate method for stability analysis of embankments.

Below mentioned are the results of the analysis carried out for the stability check of the ash dyke at 111 compartments of STPS Sarni. The FoS obtained after different analyses are listed in Table 3.

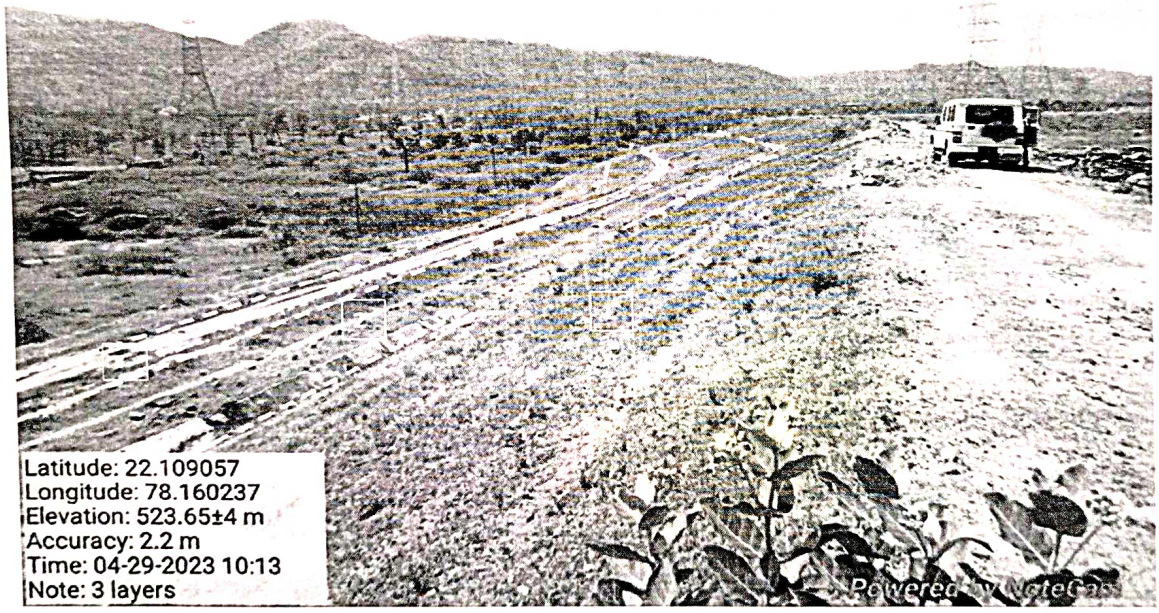


Fig 4: Soil embankment is raised in three zones for ash dyke at 111 hec land

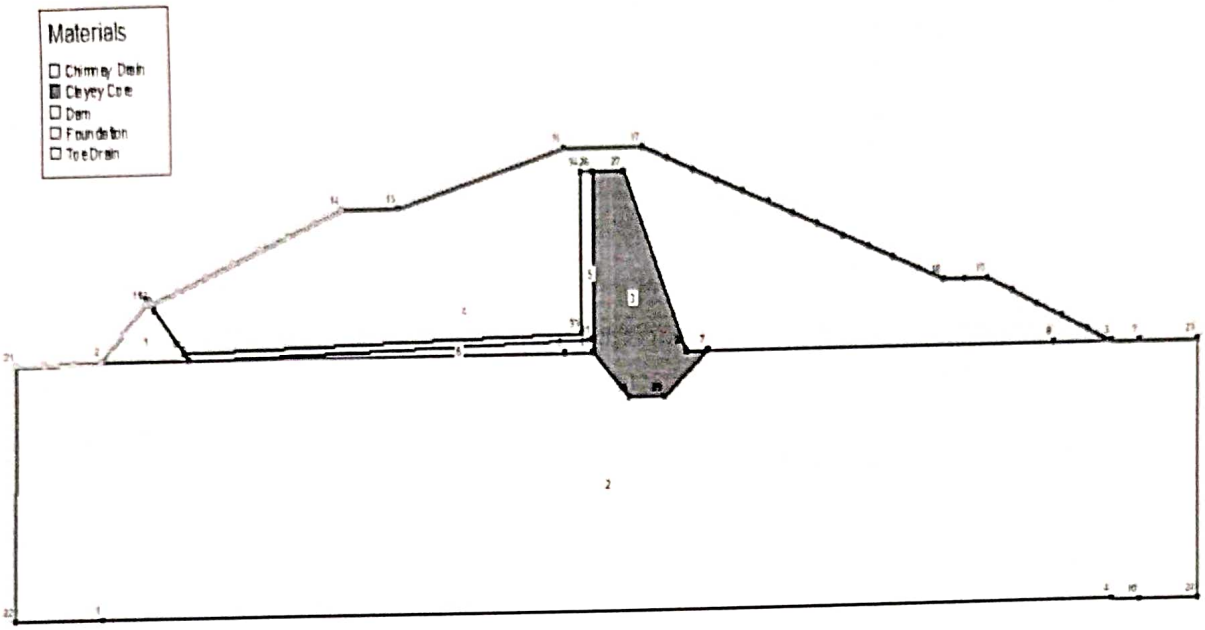


Fig 5 – Cross-section of ash dyke used for analysiS

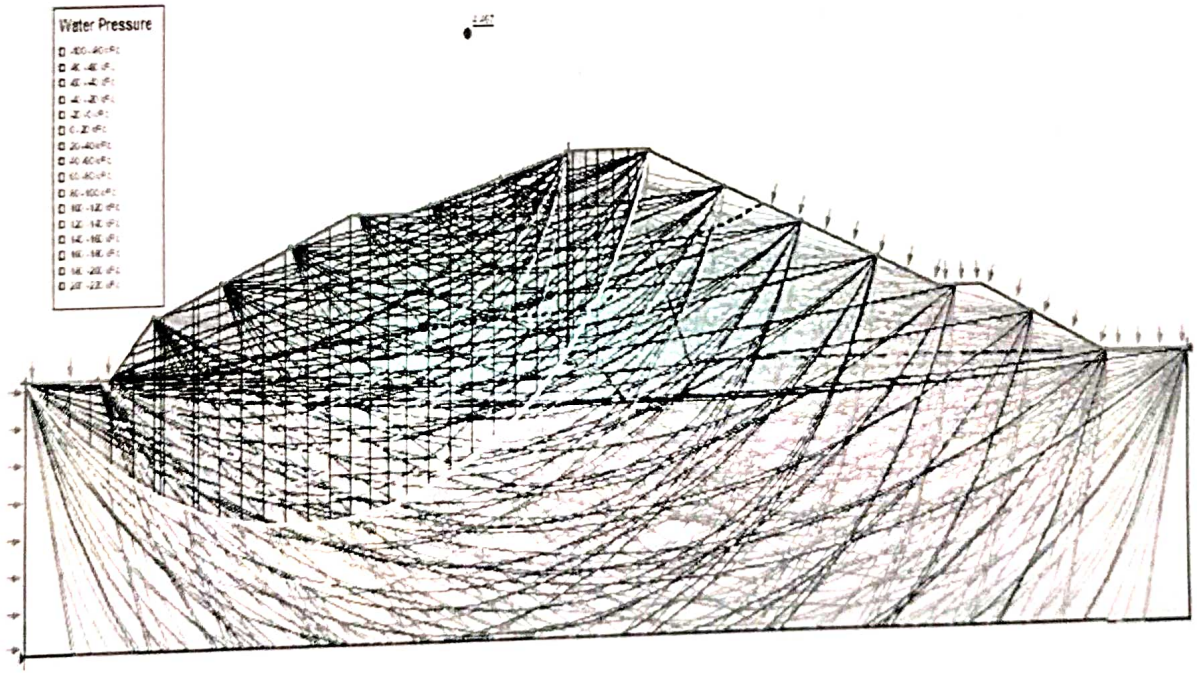


Fig 6 – Slip surfaces considered for analysis for steady-state seepage for downstream slope

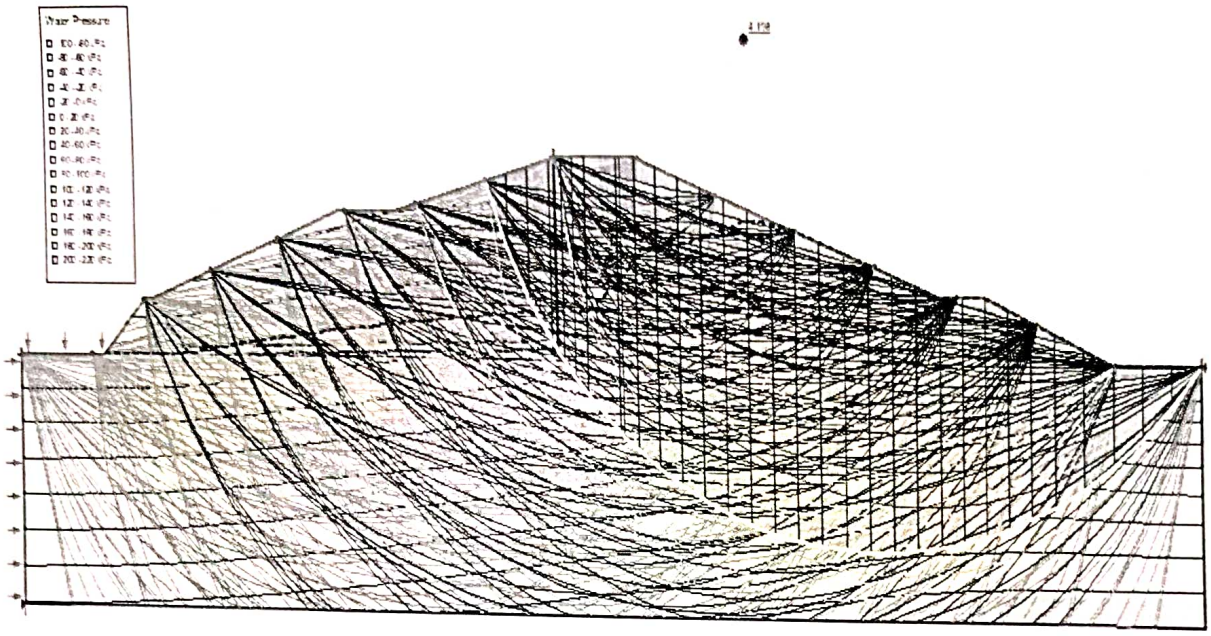


Fig 7 – Slip surfaces considered for analysis of sudden drawdown in Upstream slope

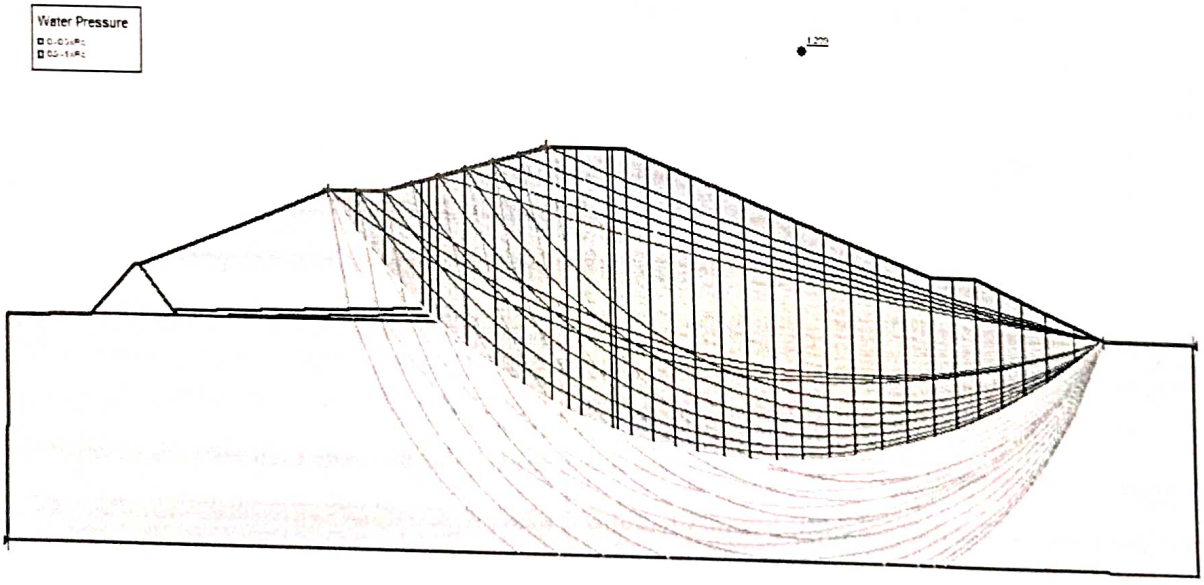


Fig 8 – Slip surfaces considered for analysis of upstream of slope in earthquake condition

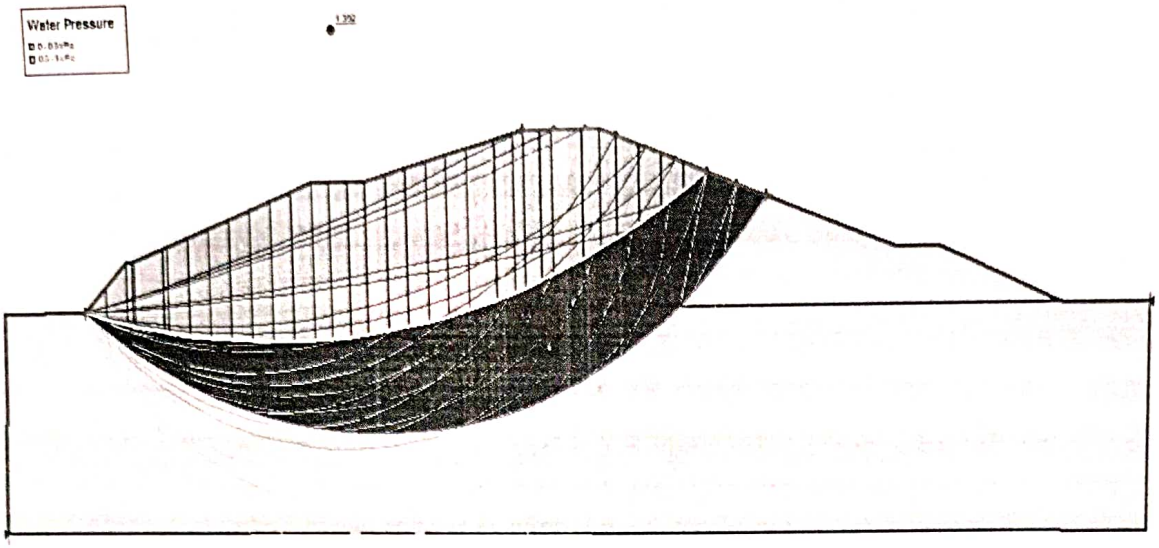


Fig 8 – Slip surfaces considered for analysis of downstream of slope in earthquake condition

Table 3: Results of slope stability analysis for the ash dyke 111

Condition	Method	Minimum required FoS	Obtained FoS	Safe/ Unsafe
Steady seepage (for d/s slope)	Morgenstern-price	1.5	4.467	**Safe**
Sudden drawdown (for u/s slope)	Morgenstern-price	1.5	4.198 (min)	**Safe**
Earthquake condition (for u/s slope)	Morgenstern-price	1	1.299	**Safe**
Earthquake condition (for d/s slope)	Morgenstern-price	1	1.392	**Safe**

Inferences from site inspection and slope stability analysis

- No new gully formations or seepage was observed during the field visit. Prima facie dykes are properly maintained and no. 111 was inspected for stability analysis.
- Samples from dyke no. 111 were used to calculate geotechnical properties to be used in the analysis
- From the stability analysis of the ash dyke it is observed that it is stable and can be used for future possibilities
- Seepage analysis for both steady and sudden drawdown conditions indicates water will drain out in 12 hours' time considering the level to be $2/3^{rd}$ of F.R.L.
- The phreatic line goes well below the surface indicating surface and toe drains are well connected.

Recommendation for slope stability

Though the ash dyke is stable in all the conditions, however regular inspection of dykes is recommended. The surface and toe drains need to be maintained regularly. The focus should be given to the deaccumulation of water near the slopes

In case of heavy seepage (presumably), water can be drawn by pumping out and thorough checking should be carried out to verify any blockage in the PCC drain provided from the toe of the soil embankment to the ash storage.

Annexure

Details of critical slip surface: Steady seepage (for d/s slope)

Slip Surface: 9
Factor of Safety: 4.467
Volume: 450.04439 m³
Weight: 9,305.3314 kN
Resisting Moment: 2,05,526.7 kN-m
Activating Moment: 46,013.34 kN-m
Resisting Force: 6,526.6816 kN
Activating Force: 1,461.153 kN
Slip Rank: 1 of 405 slip surfaces
Exit: (37.729842, 24.918229) m
Entry: (-5.884278, 13.900266) m
Radius: 26.267607 m
Center: (12.599586, 32.563974) m

Slip Columns

Column	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength
Column 1	37.614921 m	24.559099 m	-29.357127 kPa	-53.979955 kPa	-10.49264 kPa	100 kPa	0 kPa
Column 2	37.158879 m	23.296028 m	-33.605076 kPa	-20.903391 kPa	-4.0632075 kPa	100 kPa	0 kPa
Column 3	36.508879 m	21.711583 m	-29.542171 kPa	7.2065601 kPa	0.63049231 kPa	125 kPa	0 kPa
Column 4	35.650000 m	20.020386 m	-19.343963 kPa	49.925712 kPa	4.3679338 kPa	125 kPa	0 kPa
Column 5	34.550000 m	18.170904 m	-10.276793 kPa	92.983024 kPa	8.1349605 kPa	125 kPa	0 kPa
Column 6	33.600000 m	16.799270 m	-0.67914903 kPa	145.66086 kPa	53.016218 kPa	0 kPa	0 kPa
Column 7	32.699113 m	15.670479 m	10.222119 kPa	145.42455 kPa	26.28069 kPa	100 kPa	0 kPa

Column 8	32.099113 m	14.964719 m	17.015528 kPa	175.21977 kPa	57.581635 kPa	0 kPa	0 kPa
Column 9	31.903221 m	14.750033 m	19.062321 kPa	178.7313 kPa	58.114755 kPa	0 kPa	0 kPa
Column 10	31.495028 m	14.322581 m	24.484521 kPa	170.54382 kPa	28.391052 kPa	100 kPa	0 kPa
Column 11	30.420498 m	13.294260 m	35.257166 kPa	182.42045 kPa	28.605644 kPa	125 kPa	0 kPa
Column 12	28.894267 m	11.984297 m	47.031319 kPa	203.45029 kPa	30.404768 kPa	125 kPa	0 kPa
Column 13	27.368037 m	10.860793 m	56.798792 kPa	221.1295 kPa	31.942654 kPa	125 kPa	0 kPa
Column 14	25.841807 m	9.895721 m	64.912251 kPa	236.23419 kPa	33.301611 kPa	125 kPa	0 kPa
Column 15	24.315576 m	9.069387 m	71.611449 kPa	249.24959 kPa	34.529356 kPa	125 kPa	0 kPa
Column 16	22.789346 m	8.367479 m	77.061299 kPa	260.47005 kPa	35.65105 kPa	125 kPa	0 kPa
Column 17	21.263115 m	7.779363 m	81.385665 kPa	270.05472 kPa	36.673549 kPa	125 kPa	0 kPa
Column 18	19.850000 m	7.325881 m	84.496977 kPa	280.88245 kPa	38.173469 kPa	125 kPa	0 kPa
Column 19	18.550000 m	6.987923 m	86.590233 kPa	293.22722 kPa	40.166161 kPa	125 kPa	0 kPa
Column 20	17.250000 m	6.719735 m	88.007579 kPa	304.49968 kPa	42.081801 kPa	125 kPa	0 kPa
Column 21	15.842857 m	6.508528 m	88.782962 kPa	309.71978 kPa	42.945766 kPa	125 kPa	0 kPa
Column 22	14.328571 m	6.364317 m	88.828473 kPa	308.36185 kPa	42.672966 kPa	125 kPa	0 kPa
Column 23	12.814286 m	6.308159 m	88.040055 kPa	304.84343 kPa	42.142306 kPa	125 kPa	0 kPa
Column 24	11.300000 m	6.339489 m	86.431489 kPa	298.94829 kPa	41.309082 kPa	125 kPa	0 kPa
Column 25	9.785714 m	6.458622 m	84.004849 kPa	290.45768 kPa	40.130366 kPa	125 kPa	0 kPa
Column 26	8.271429 m	6.666774 m	80.761069 kPa	279.16367 kPa	38.565559 kPa	125 kPa	0 kPa
Column 27	6.757143 m	6.966124 m	76.694078 kPa	264.88271 kPa	36.580164 kPa	125 kPa	0 kPa

Column 28	5.832258 m	7.183660 m	73.904455 kPa	254.90414 kPa	35.182776 kPa	125 kPa	0 kPa
Column 29	4.632258 m	7.557272 m	69.433235 kPa	240.04477 kPa	33.163524 kPa	125 kPa	0 kPa
Column 30	3.500000 m	7.923086 m	65.175259 kPa	224.7013 kPa	31.008721 kPa	125 kPa	0 kPa
Column 31	3.200000 m	8.036660 m	63.887374 kPa	222.47632 kPa	30.826568 kPa	125 kPa	0 kPa
Column 32	2.250000 m	8.435002 m	59.460081 kPa	197.22068 kPa	26.777948 kPa	125 kPa	0 kPa
Column 33	0.750000 m	9.136039 m	51.908436 kPa	147.94995 kPa	18.668578 kPa	125 kPa	0 kPa
Column 34	-0.735535 m	9.949097 m	43.43492 kPa	114.65123 kPa	13.843049 kPa	125 kPa	0 kPa
Column 35	-2.206604 m	10.885169 m	33.95774 kPa	95.578956 kPa	11.977951 kPa	125 kPa	0 kPa
Column 36	-3.677674 m	11.968852 m	23.244721 kPa	72.79995 kPa	9.6325607 kPa	125 kPa	0 kPa
Column 37	-5.148743 m	13.225222 m	10.939327 kPa	46.867992 kPa	6.9838249 kPa	125 kPa	0 kPa

Details of critical slip surface: Sudden drawdown (for u/s slope)

Slip Surface: 359
Factor of Safety: 4.198
Volume: 576.71238 m³
Weight: 11,957.818 kN
Resisting Moment: 2,47,616.77 kN-m
Activating Moment: 58,983.09 kN-m
Resisting Force: 7,216.5681 kN
Activating Force: 1,718.9889 kN
Slip Rank: 1 of 405 slip surfaces
Exit: (75.959087, 14) m
Entry: (27.09632, 23.720779) m
Radius: 28.344227 m
Center: (54.166324, 32.12376) m

Slip Columns

Column	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength	Suction Strength
Column 1	27.836219 m	21.828491 m	-53.044183 kPa	-15.777396 kPa	-3.0668151 kPa	100 kPa	0 kPa
Column 2	29.316018 m	18.578749 m	-20.334013 kPa	65.877076 kPa	12.805206 kPa	100 kPa	0 kPa
Column 3	30.795816 m	16.139493 m	4.3201393 kPa	125.45034 kPa	23.545327 kPa	100 kPa	0 kPa
Column 4	31.693808 m	14.851994 m	17.379409 kPa	177.12919 kPa	58.144166 kPa	0 kPa	0 kPa
Column 5	31.925950 m	14.552571 m	20.849644 kPa	164.76884 kPa	27.975059 kPa	100 kPa	0 kPa
Column 6	32.186781 m	14.229422 m	25.708656 kPa	171.96014 kPa	28.428408 kPa	100 kPa	0 kPa
Column 7	32.786781 m	13.524998 m	34.468331 kPa	180.97881 kPa	28.478752 kPa	125 kPa	0 kPa
Column 8	33.600000 m	12.628031 m	44.5042 kPa	205.39893 kPa	31.274768 kPa	125 kPa	0 kPa
Column 9	35.100000 m	11.203544 m	61.231481 kPa	236.96033 kPa	34.158228 kPa	125 kPa	0 kPa
Column 10	36.350000 m	10.079791 m	74.869064 kPa	261.50077 kPa	36.277528 kPa	125 kPa	0 kPa
Column 11	37.000000 m	9.577861 m	81.063866 kPa	271.879 kPa	37.090704 kPa	125 kPa	0 kPa
Column 12	38.250000 m	8.687807 m	91.869643 kPa	285.48652 kPa	37.635308 kPa	125 kPa	0 kPa
Column 13	39.750000 m	7.735120 m	103.33764 kPa	295.80514 kPa	37.411893 kPa	125 kPa	0 kPa
Column 14	41.250000 m	6.907621 m	113.35439 kPa	304.99344 kPa	37.250856 kPa	125 kPa	0 kPa
Column 15	42.815000 m	6.167039 m	122.44788 kPa	313.68319 kPa	37.17238 kPa	125 kPa	0 kPa
Column 16	44.445000 m	5.512894 m	130.68421 kPa	320.93585 kPa	36.981172 kPa	125 kPa	0 kPa
Column 17	46.075000 m	4.972288 m	137.72572 kPa	326.35387 kPa	36.665598 kPa	125 kPa	0 kPa
Column 18	47.705000 m	4.538514 m	143.64599 kPa	329.95589 kPa	36.214977 kPa	125 kPa	0 kPa
Column 19	49.335000 m	4.206572 m	148.48671 kPa	331.69942 kPa	35.612943 kPa	125 kPa	0 kPa
Column 20	50.965000 m	3.972847 m	152.28087 kPa	331.49392 kPa	34.835489 kPa	125 kPa	0 kPa
Column 21	52.595000 m	3.834895 m	155.03172 kPa	329.21168 kPa	33.857154 kPa	125 kPa	0 kPa
Column 22	54.225000 m	3.791314 m	156.74926 kPa	324.69762 kPa	32.645856 kPa	125 kPa	0 kPa

Column 23	55.855000 m	3.841664 m	157.4142 kPa	317.77883 kPa	31.171727 kPa	125 kPa	0 kPa
Column 24	57.485000 m	3.986452 m	156.99184 kPa	308.27401 kPa	29.406276 kPa	125 kPa	0 kPa
Column 25	59.050000 m	4.213812 m	155.55344 kPa	302.21143 kPa	28.507426 kPa	125 kPa	0 kPa
Column 26	60.550000 m	4.518483 m	153.10344 kPa	299.79201 kPa	28.513371 kPa	125 kPa	0 kPa
Column 27	62.083333 m	4.919889 m	149.46854 kPa	287.79783 kPa	26.888491 kPa	125 kPa	0 kPa
Column 28	63.650000 m	5.426119 m	144.41147 kPa	265.84347 kPa	23.60399 kPa	125 kPa	0 kPa
Column 29	65.216667 m	6.036188 m	137.82667 kPa	240.7883 kPa	20.013713 kPa	125 kPa	0 kPa
Column 30	67.000000 m	6.876313 m	127.89571 kPa	208.21859 kPa	15.613188 kPa	125 kPa	0 kPa
Column 31	69.000000 m	7.999516 m	113.01264 kPa	167.0279 kPa	10.499502 kPa	125 kPa	0 kPa
Column 32	71.000000 m	9.353692 m	92.220732 kPa	129.69726 kPa	7.2846996 kPa	125 kPa	0 kPa
Column 33	72.989772 m	10.973881 m	63.840616 kPa	96.335506 kPa	6.3163667 kPa	125 kPa	0 kPa
Column 34	74.969315 m	12.927390 m	24.541531 kPa	57.88438 kPa	6.4811932 kPa	125 kPa	0 kPa

Details of critical slip surface: Earthquake condition (for u/s slope)

Slip Surface: 3
Factor of Safety: 1.299
Volume: 598.69287 m^3
Weight: 12,374.561 kN
Resisting Moment: 3,62,956.72 kN-m
Activating Moment: 2,79,390.62 kN-m
Resisting Force: 8,822.3578 kN
Activating Force: 6,788.9799 kN
Slip Rank: 1 of 45 slip surfaces
Exit: (70, 14) m
Entry: (16.6, 22) m
Radius: 37.157543 m
Center: (47.082543, 43.248472) m
Horizontal Seismic Coef.: 0.5886
Verticle Seismic Coef.: 0.2943

Column	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength
Column 1	17.575000 m	20.722797 m	0 kPa	-56.982354 kPa	0 kPa	100.94716 kPa
Column 2	19.525000 m	18.365783 m	0 kPa	16.431756 kPa	0 kPa	110.41245 kPa

Column 3	21.813533 m	16.064950 m	0 kPa	77.21311 kPa	0 kPa	120.70938 kPa
Column 4	23.370506 m	14.642139 m	0 kPa	137.37113 kPa	0 kPa	55.236547 kPa
Column 5	23.889516 m	14.220174 m	0 kPa	121.45193 kPa	0 kPa	129.91967 kPa
Column 6	25.144450 m	13.282995 m	0 kPa	137.43491 kPa	0 kPa	159.33854 kPa
Column 7	27.103178 m	11.940994 m	0 kPa	170.88394 kPa	0 kPa	166.7061 kPa
Column 8	29.061907 m	10.772555 m	0 kPa	200.54061 kPa	0 kPa	173.47198 kPa
Column 9	31.020636 m	9.759394 m	0 kPa	228.60671 kPa	0 kPa	179.74362 kPa
Column 10	32.600000 m	9.035691 m	0 kPa	248.93087 kPa	0 kPa	183.93883 kPa
Column 11	33.600000 m	8.625940 m	0 kPa	263.73369 kPa	0 kPa	186.82512 kPa
Column 12	35.100000 m	8.095221 m	0 kPa	280.8746 kPa	0 kPa	189.50697 kPa
Column 13	36.350000 m	7.675014 m	0 kPa	296.21924 kPa	0 kPa	191.60348 kPa
Column 14	37.000000 m	7.488782 m	0 kPa	303.92245 kPa	0 kPa	192.43168 kPa
Column 15	38.250000 m	7.164224 m	0 kPa	315.32159 kPa	0 kPa	192.89017 kPa
Column 16	39.750000 m	6.829638 m	0 kPa	327.04792 kPa	0 kPa	192.42194 kPa
Column 17	41.250000 m	6.559404 m	0 kPa	341.23698 kPa	0 kPa	191.90575 kPa
Column 18	42.905556 m	6.337698 m	0 kPa	359.55012 kPa	0 kPa	191.26603 kPa
Column 19	44.716667 m	6.177429 m	0 kPa	381.12866 kPa	0 kPa	190.23087 kPa
Column 20	46.527778 m	6.106111 m	0 kPa	403.33515 kPa	0 kPa	188.79719 kPa
Column 21	48.338889 m	6.123230 m	0 kPa	424.86424 kPa	0 kPa	186.94059 kPa
Column 22	50.150000 m	6.228910 m	0 kPa	444.01373 kPa	0 kPa	184.63662 kPa
Column 23	51.961111 m	6.423913 m	0 kPa	458.71852 kPa	0 kPa	181.86205 kPa
Column 24	53.772222 m	6.709676 m	0 kPa	466.66246 kPa	0 kPa	178.59603 kPa
Column 25	55.583333 m	7.088353 m	0 kPa	465.48708 kPa	0 kPa	174.82108 kPa
Column 26	57.394444 m	7.562913 m	0 kPa	453.09473 kPa	0 kPa	170.52391 kPa
Column 27	59.050000 m	8.079803 m	0 kPa	438.29426 kPa	0 kPa	167.24185 kPa
Column 28	60.550000 m	8.626760 m	0 kPa	423.75425 kPa	0 kPa	165.06262 kPa
Column 29	62.083333 m	9.264269 m	0 kPa	390.78276 kPa	0 kPa	161.11457 kPa

Column 30	63.650000 m	10.000369 m	0 kPa	339.12119 kPa	0 kPa	155.3799 kPa
Column 31	65.216667 m	10.828865 m	0 kPa	280.03772 kPa	0 kPa	149.24499 kPa
Column 32	67.000000 m	11.902434 m	0 kPa	206.29807 kPa	0 kPa	141.74731 kPa
Column 33	69.000000 m	13.268920 m	0 kPa	120.07896 kPa	0 kPa	132.76925 kPa

Details of critical slip surface: Earthquake condition (for d/s slope)

Slip Surface: 32
Factor of Safety: 1.392
Volume: 327.5005 m³
Weight: 6,727.2016 kN
Resisting Moment: 3,64,661.03 kN-m
Activating Moment: 2,61,876.78 kN-m
Resisting Force: 6,645.9911 kN
Activating Force: 4,773.4024 kN
Slip Rank: 1 of 45 slip surfaces
Exit: (45.058596, 22.310884) m
Entry: (0, 14) m
Radius: 52.660862 m
Center: (13.928574, 64.785443) m
Horizontal Seismic Coef.: 0.5886
Vertical Seismic Coef.: 0.2943

Column	X	Y	PWP	Base Normal Stress	Frictional Strength	Cohesive Strength
Column 1	44.254334 m	21.744221 m	0 kPa	-19.178668 kPa	-3.7279554 kPa	100 kPa
Column 2	42.645810 m	20.654207 m	0 kPa	29.100438 kPa	5.6565522 kPa	100 kPa
Column 3	41.037286 m	19.647831 m	0 kPa	66.344373 kPa	12.89604 kPa	100 kPa
Column 4	39.428762 m	18.719601 m	0 kPa	95.565478 kPa	18.576047 kPa	100 kPa
Column 5	38.062250 m	17.984461 m	0 kPa	116.16685 kPa	10.163282 kPa	125 kPa
Column 6	36.850000 m	17.380239 m	0 kPa	130.36605 kPa	11.405552 kPa	125 kPa
Column 7	35.100000 m	16.582811 m	0 kPa	142.15668 kPa	12.437098 kPa	125 kPa
Column 8	33.600000 m	15.938586 m	0 kPa	139.18703 kPa	50.659936 kPa	0 kPa
Column 9	32.600000 m	15.549963 m	0 kPa	149.8778 kPa	29.133294 kPa	100 kPa
Column 10	31.618191 m	15.186254 m	0 kPa	153.78457 kPa	29.892693 kPa	100 kPa
Column 11	30.555445 m	14.823472 m	0 kPa	136.41285 kPa	49.650216 kPa	0 kPa

Column 12	28.865828 m	14.298431 m	0 kPa	159.38706 kPa	30.981705 kPa	100 kPa
Column 13	27.121434 m	13.809593 m	0 kPa	175.9596 kPa	34.203081 kPa	125 kPa
Column 14	25.650004 m	13.451195 m	0 kPa	185.35538 kPa	36.029436 kPa	125 kPa
Column 15	24.178574 m	13.137197 m	0 kPa	195.94813 kPa	38.088459 kPa	125 kPa
Column 16	22.707145 m	12.866792 m	0 kPa	207.59154 kPa	40.351707 kPa	125 kPa
Column 17	21.235715 m	12.639300 m	0 kPa	220.00669 kPa	42.764968 kPa	125 kPa
Column 18	19.850000 m	12.462645 m	0 kPa	234.81712 kPa	45.643824 kPa	125 kPa
Column 19	18.550000 m	12.331815 m	0 kPa	251.86587 kPa	48.957765 kPa	125 kPa
Column 20	17.250000 m	12.233465 m	0 kPa	268.90439 kPa	52.269719 kPa	125 kPa
Column 21	15.842857 m	12.164840 m	0 kPa	281.50535 kPa	54.719097 kPa	125 kPa
Column 22	14.328571 m	12.131544 m	0 kPa	287.78844 kPa	55.940406 kPa	125 kPa
Column 23	12.814286 m	12.141818 m	0 kPa	289.97591 kPa	56.365607 kPa	125 kPa
Column 24	11.300000 m	12.195688 m	0 kPa	286.92268 kPa	55.77212 kPa	125 kPa
Column 25	9.785714 m	12.293289 m	0 kPa	277.71684 kPa	53.982686 kPa	125 kPa
Column 26	8.271429 m	12.434864 m	0 kPa	261.81856 kPa	50.892372 kPa	125 kPa
Column 27	6.757143 m	12.620772 m	0 kPa	239.16171 kPa	46.488328 kPa	125 kPa
Column 28	5.832258 m	12.750962 m	0 kPa	222.45301 kPa	43.240485 kPa	125 kPa
Column 29	4.632258 m	12.962233 m	0 kPa	197.62215 kPa	38.413854 kPa	125 kPa
Column 30	3.500000 m	13.167609 m	0 kPa	171.66919 kPa	33.369111 kPa	125 kPa
Column 31	3.200000 m	13.229431 m	0 kPa	167.11441 kPa	32.48375 kPa	125 kPa
Column 32	2.250000 m	13.441644 m	0 kPa	130.39051 kPa	25.345349 kPa	125 kPa
Column 33	0.750000 m	13.806119 m	0 kPa	60.959028 kPa	11.849235 kPa	125 kPa

कार्यपालन यंत्री (सि.) नि.द.द. की
म.प्र.पा.ज.कं.लि., सारनी
आ.क्र. 1526
दिनांक 07/03/2024

ANNEXURE_VII

IIT Indore

Indian Institute of Technology Indore

Department of Civil Engineering

Khandwa Road, Simrol, Indore 453552, India

E-mail: neelima.satyam@iiti.ac.in

From,
Dr. Neelima Satyam
Professor
Department of Civil Engineering
Indian Institute of Technology Indore
28th February, 2024

The Executive Engineer (Civil)
C&M Civil Division-II,
STPS MPPGCL Sarni

Sub: stability report of ash dykes named as 130-hectare ash dykes at Satpura Thermal Power Station, MPPGCL, Sarni (District -Betul) M.P.

Dear Sir,

This letter is to proceed with the submission of this report in reference with your work order No. EEC/C&M/II/Ord/IITI/2023-24/1130 Sarni dated 18.01.2024 on stability analysis of ash pond130-hectare, Satpura Thermal Power Station, MPPGCL, Sarni. The two lagoons of existing ash dyke are used for HCSD and bottom ash disposal, and as per the request the site has been visited by Professor Neelima Satyam, IIT Indore on 1st February 2024. After field inspection and on the basis of design and drawing for the embankment, the report is attached. The ash dyke 130 hectare is structurally safe and is in stable condition and also it is properly maintained.

Regards,

W/S AE(C) Ash bund & EE(C) II
7/3

Neelima Satyam

Dr. Neelima Satyam D.
Professor
Department of Civil Engineering
Indian Institute of Technology Indore
Simrol, Indore 453 552, India

(Prof. Neelima Satyam)

Report on
Inspection of Ash Dyke on 130 hec land at Satpura Thermal Power Station, MPPGCL, Sarni

Reference No- EEC/C&M/II/IITI/2023-24/1130 Sarni dated 18.01.2024

By
Prof. Neelima Satyam
Department of Civil Engineering
Indian Institute of Technology Indore
Simrol, Indore – 453552 M.P

Introduction

The Satpura Thermal Power Station (STPS) is located at Sarni town near Ghoradongri railway station in the Betul district of Madhya Pradesh, India. The power plant is one of the coal-based power plants of MPPGCL with an installed capacity of 1330 MW. The Water for the plant has been procured from the nearby Satpura Dam Reservoir and the coal for the plant has been procured by Rail/Road/Belt from Western Coal Field Limited (WCL).
The power plant has recently raised an ash pond dyke of 130 hectares. The Ash Dyke being used for storage of pond ash was analyzed (Fig 1-3).

As per the request from the Superintending Engineer STPS Sarni, Prof Neelima Satyam, IIT Indore visited the site for a field survey on 01/02/2024 (Fig. 4) and investigated the ash dykes at the 130-hectare area of STPS, MPPGCL, Sarni in District-Betul (M.P.). Later after slope stability analysis, it was observed that the bund in the downstream/upstream slope was in unstable condition in all critical conditions. After a detailed analysis of the Pond cross-section of STPS Sarni and slope stability analysis of the existing ash dyke considering seepage, conclusions are provided for further scope of improvement.

Fig 1: Starter dyke for fly ash pond at 130 hec area

Fig 2: Starter dyke for bottom ash pond

Fig. 3: Toe rock and drain configuration for seepage exit

Fig 4: Reconnaissance survey of IIT Indore and STPS officials at 130 hec site

Scope

- ✓ Checking of structural safety, and stability of the ash dyke in respect of technical soundness, structural strength, and safety.
- ✓ Physical visit at site Sarni.
- ✓ Any other test required to ascertain the above.

Boundary Conditions: The upstream and downstream water levels and drainage conditions were taken as the hydraulic boundary conditions. The boundary conditions were varied as per the requirement of the analysis.

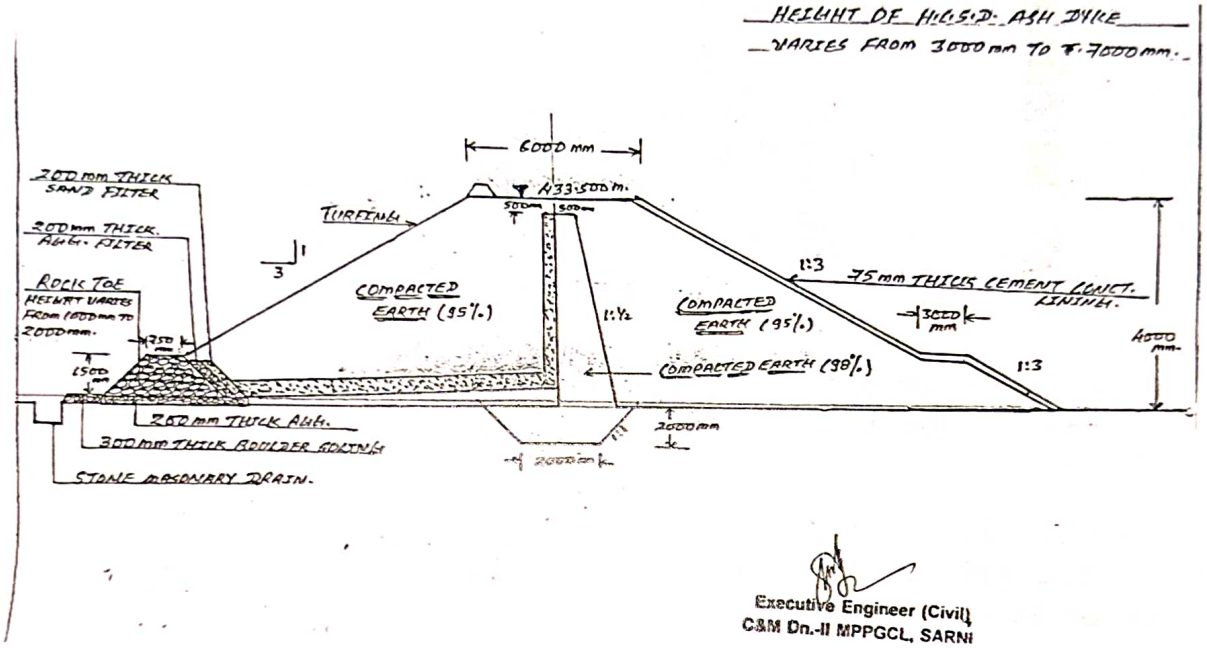
Design Conditions:

As per IS 7894:1975, the following cases are critical for the stability of the earthen dam.

1. Construction condition (u/s slope and d/s slope)- This condition was not checked as the dyke was raised already.
2. Reservoir pool level (u/s slope)- This condition was not checked as construction of dyke was already done.
3. Sudden drawdown (u/s slope)- Stability was checked for this condition
4. Steady Seepage (d/s slope)- Stability was checked for this condition

5. Rainfall- This condition was not checked as annual rainfall in Betul District was below the threshold level to be considered in the IS code.
6. Earthquake condition (u/s and d/s slope)- Stability was checked considering horizontal peak ground acceleration as 0.1g since Betul falls in Zone-2 as per IS 1893:2016.

1. Design Details for Fly ash dyke



Executive Engineer (Civil)
C&M Dn.-II MPPGCL, SARNI

Fig 5: typical cross-section of fly ash dyke at STPS

Table 1: Data considered from CAD design provided by the client

Location	**Satpura Thermal Power Station** - Power station Sarni, Madhya Pradesh 460447
Gross area	130 hectares (1.30 km^2)
Latitude	22° 6'3.25"N
Longitude	78° 8'23.02"E
Min. ground level	429m
T.B.L.	433m
F.S.L.	432m
Width of berm	6m
Height of starter dyke	4m

Table 2: Geotechnical properties of materials considered for analysis (provided by client)

Material	Bulk Density (kN/m^3)	Saturated Density (kg/m^3)	Cohesion-(kPa)	Angle of Internal friction-^{o}	Legend
Dam	18.7		0.388	16	
Aggregate filter	24		20	10	
Sand filter	18		0.1	35	
Clayey ore	18		20	5	
Cement concrete lining	24		10	10	
Rock toe	30		20	10	

The slope stability analysis for all the conditions has been done by Bishop simplified method, Morgenstern- -price method, and Janbu Method which are considered one of the most accurate methods for stability analysis of embankments (Fig. 6-10).

Below mentioned are the results of the analysis carried out for the stability check of the fly ash dyke cross-section compartments of STPS Sarni. The FoS obtained after different analyses are listed in Table 3. The comparison with the least factor of safety as per IS code and obtained is mentioned in Table 4.

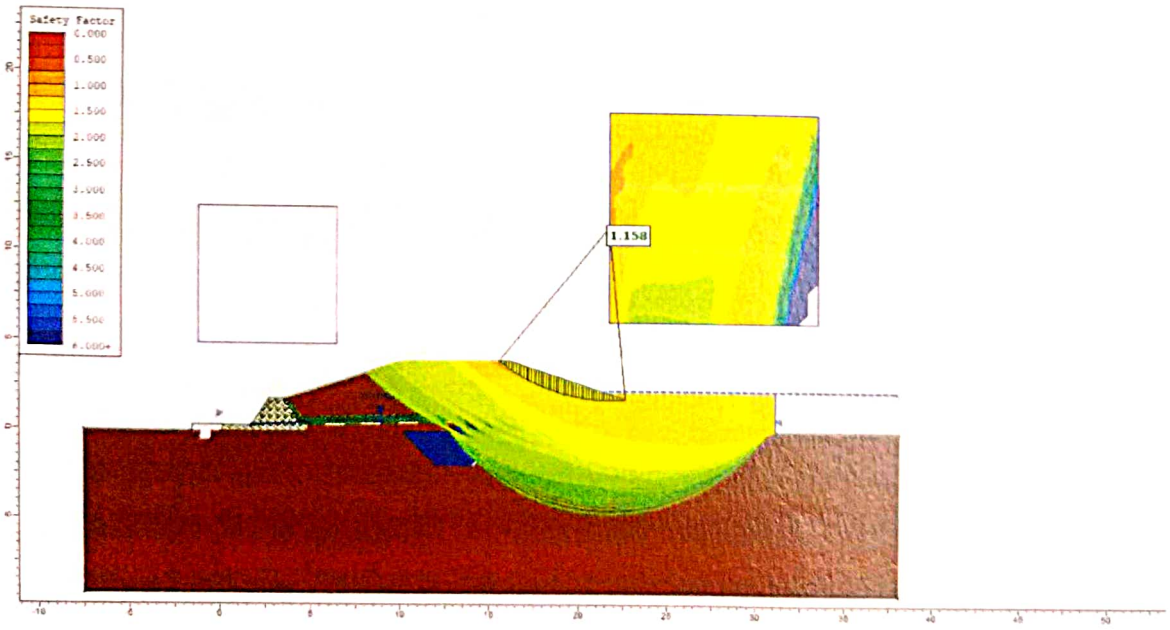


Fig 6: Minimum FOS obtained for sudden draw down at upstream

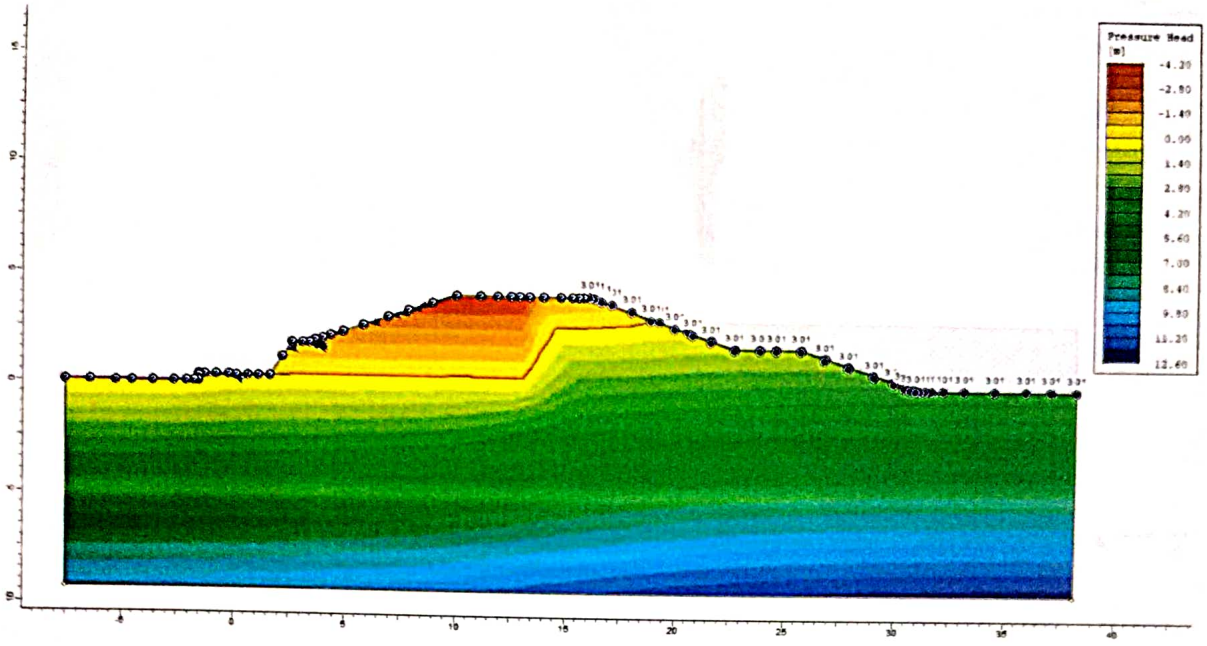


Fig 7: Total Pressure head distribution in steady seepage condition

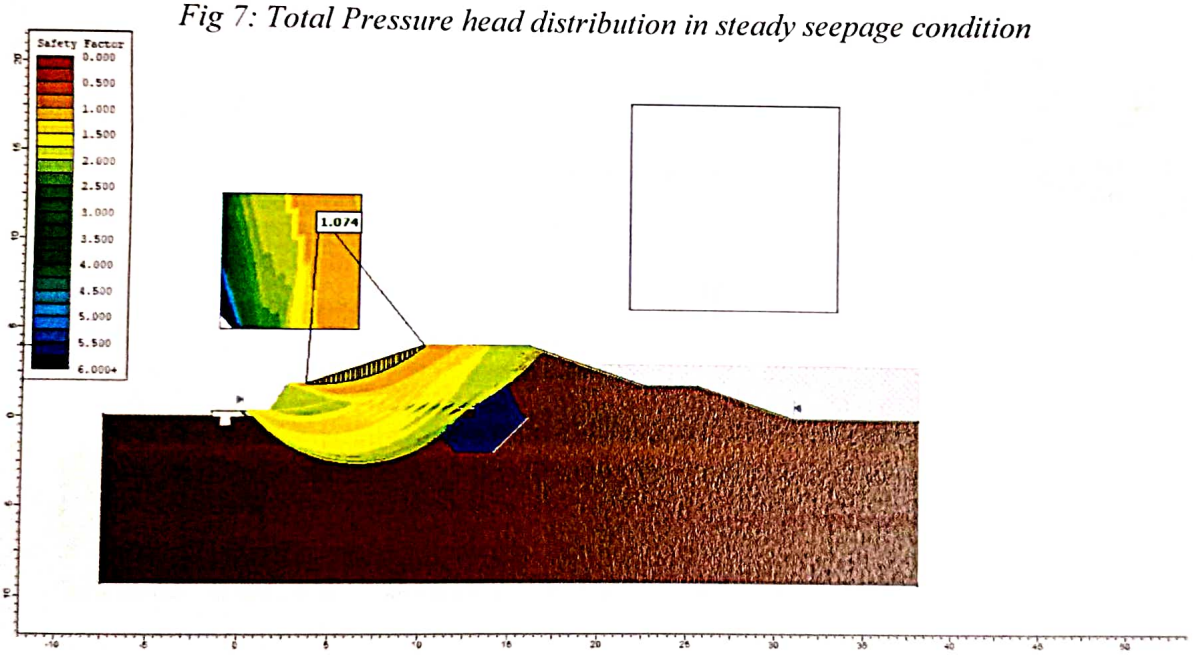


Fig 8: Minimum FOS obtained for steady seepage condition downstream.

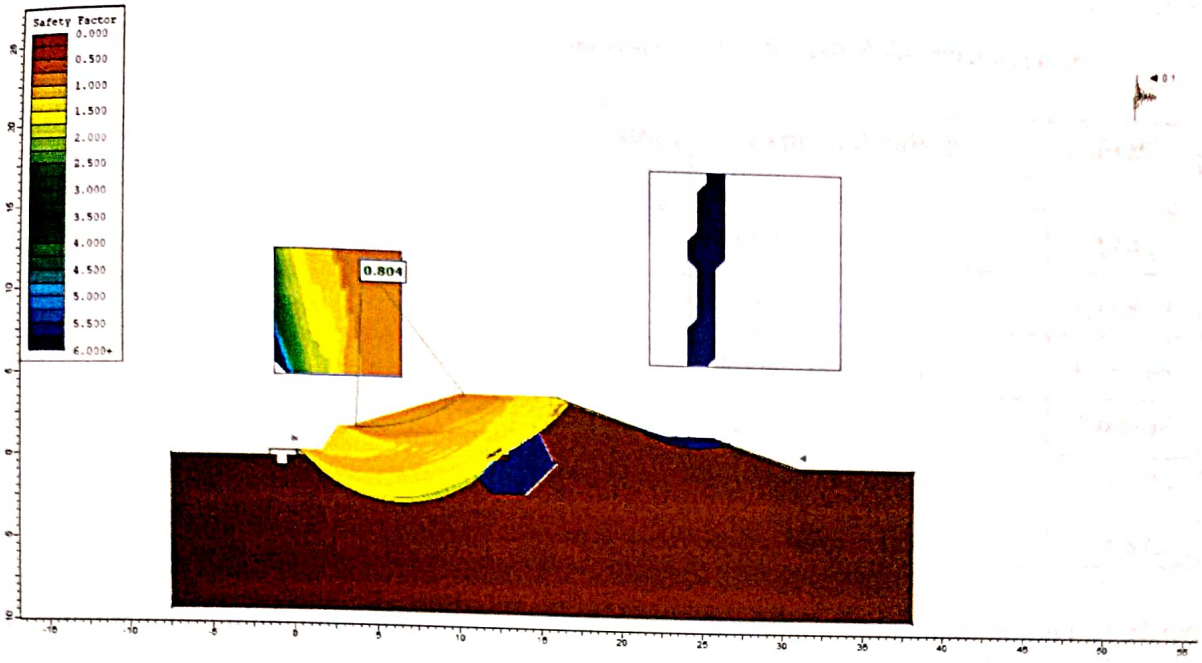


Fig 9: Minimum FOS obtained for Earthquake conditions downstream.

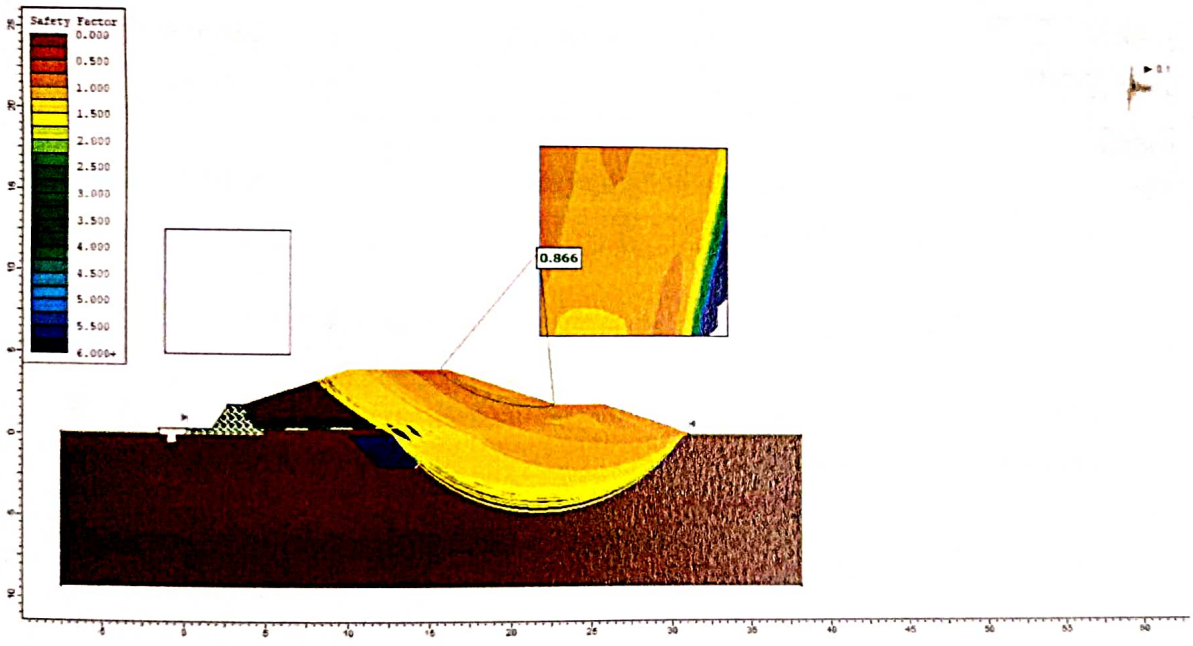


Fig 10: Minimum FOS obtained for Earthquake condition upstream.

Table 3: Results of slope stability analysis for the fly ash dyke cross-section

S. No.	Seepage	Critical slope	Type of Analysis	FOS
1	Sudden drawdown	Upstream	Janbu	**1.1149**
2			Bishop	1.15819
3			Morgenstern- price	1.15316
1	Steady seepage	Downstream	Janbu	**1.03576**
2			Bishop	1.07374
			Morgenstern- price	1.06875
1	Rainfall	As per the last ten years' annual rainfall data of Betul District, the average rainfall is less than the required rainfall for slope stability analysis in rainfall condition. http://mpwrd.gov.in/tapti-basin/		
1	Earthquake	Downstream	Janbu	**0.7738**
2			Bishop	0.8035
3			Morgenstern- price	0.7998
1	Earthquake	Upstream	Janbu	**0.8309**
2			Bishop	0.8656
3			Morgenstern- price	0.8630

Table 4: Comparison of obtained FOS and required FOS

Sl. No.	Seepage	Critical slope	Min. FOS obtained	Min. FOS required
1	Sudden drawdown	Upstream	**1.158**	**1.3**
2	Steady seepage	Downstream	**1.074**	**1.50**
3	Rainfall Induced	---		
4	Earthquake	Downstream	**0.804**	**1**
5	Earthquake	Upstream	**0.866**	**1**

2. Design Details for bottom ash dyke

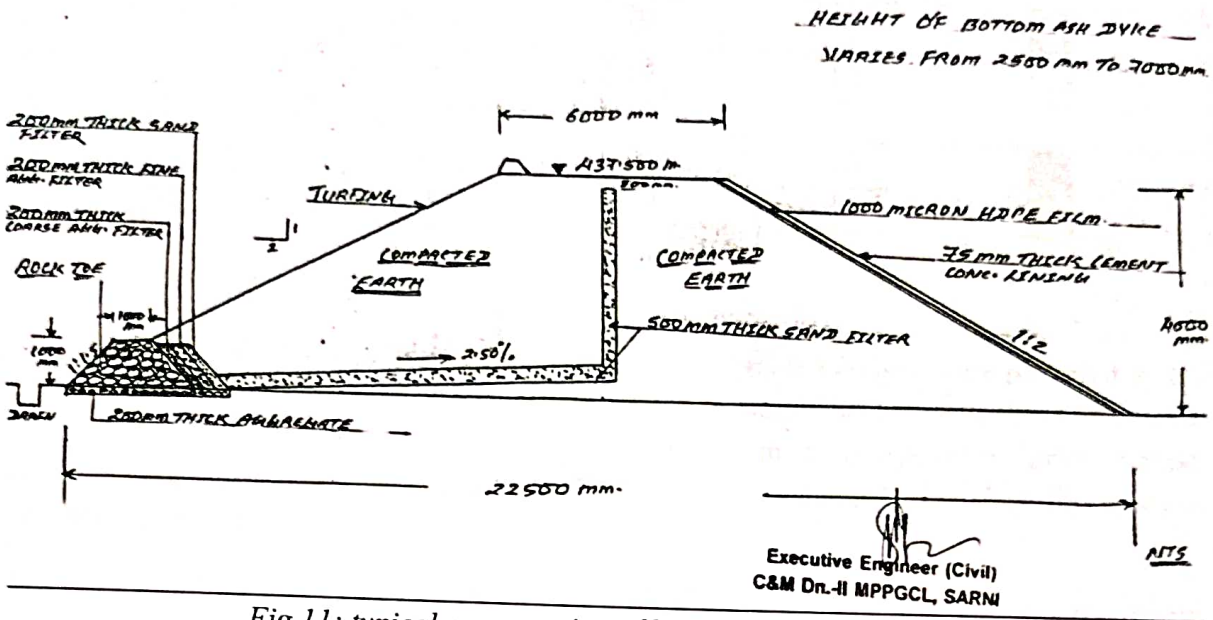


Fig 11: typical cross section of bottom ash dyke at STPS

Table 5: Data considered from CAD design provided by the client

Location	**Satpura Thermal Power Station** - Power station Sarni, Madhya Pradesh 460447
Gross area	130 hectares (1.30 km^2)
Latitude	22° 6'3.25"N
Longitude	78° 8'23.02"E
Min. ground level	433m
T.B.L.	437m
F.S.L.	436m
Width of berm	6m
Height of starter dyke	4m

Table 6: Geotechnical properties of materials considered for analysis (provided by client)

Material	Bulk Density (kN/m^3)	Saturated Density (kg/m^3)	Cohesion-(kPa)	Angle of Internal friction-^{o}	Legend
Dam	18.7		0.388	16	
Coarse aggregate filter	24		5	30	
Sand drain	18		0.1	35	

Fine aggregate filter	18		20	5	
Cement concrete lining	24		20	10	
Rock toe	20		20	10	
HDPE lining	0.1		20	1	

The geotechnical properties of the material used in the bottom ash dyke were provided by the client (i.e. STPS) after sample collection from 5 random sites. The slope stability analysis for all the conditions has been done by Bishop simplified method, Morgenstern- -price method, and Janbu Method which are considered one of the most accurate methods for stability analysis of embankments (Fig. 12-16).

Below mentioned are the results of the analysis carried out for the stability check of the fly ash dyke cross-section compartments of STPS Sarni. The FoS obtained after different analyses are listed in Table 7. The comparison with the least factor of safety as per IS code and obtained is mentioned in Table 8.

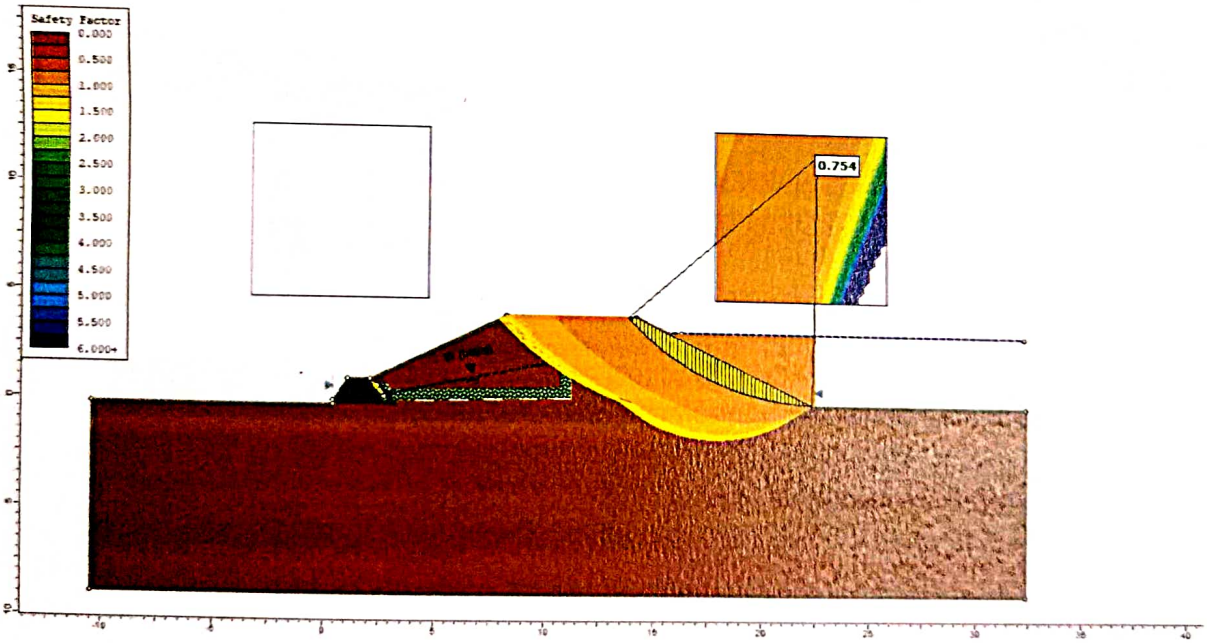


Fig 12: Minimum FOS obtained for sudden draw down at upstream.

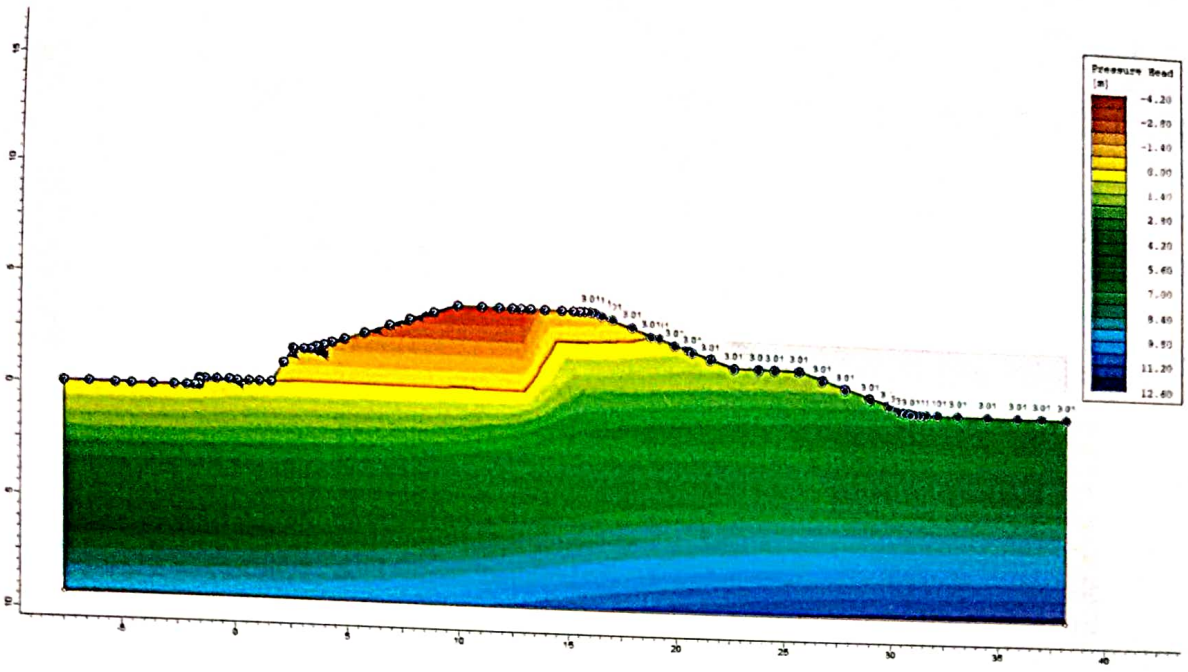


Fig 13: Total Pressure head distribution in steady seepage condition

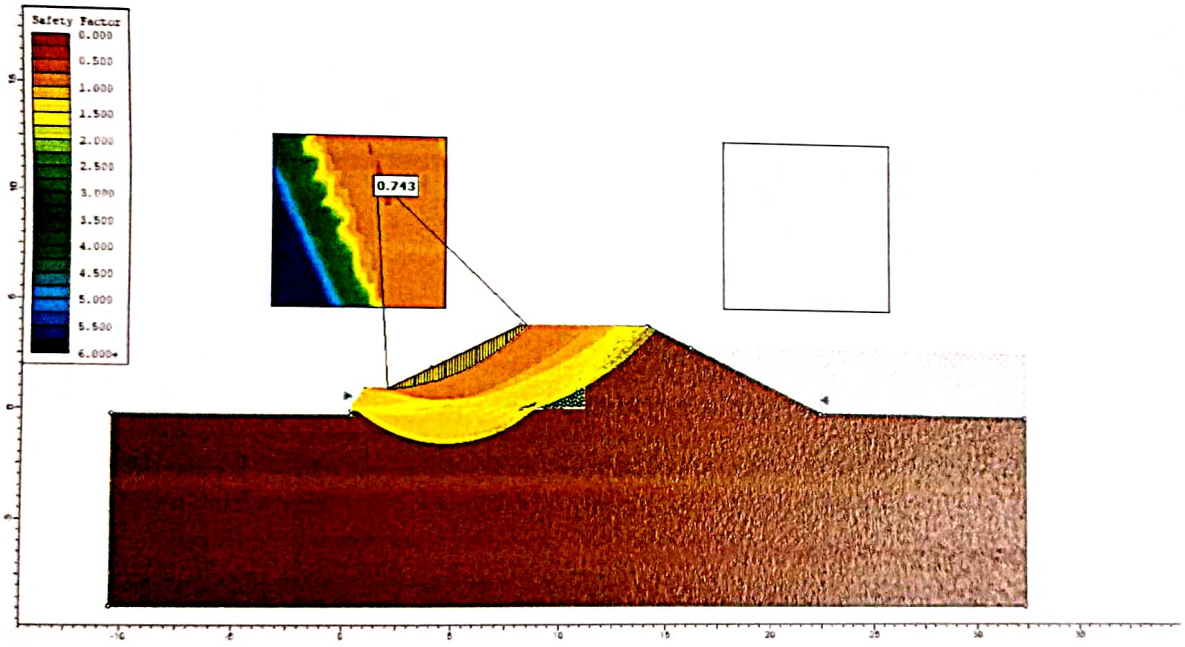


Fig 14 : Minimum FOS obtained for steady seepage condition at downstream.

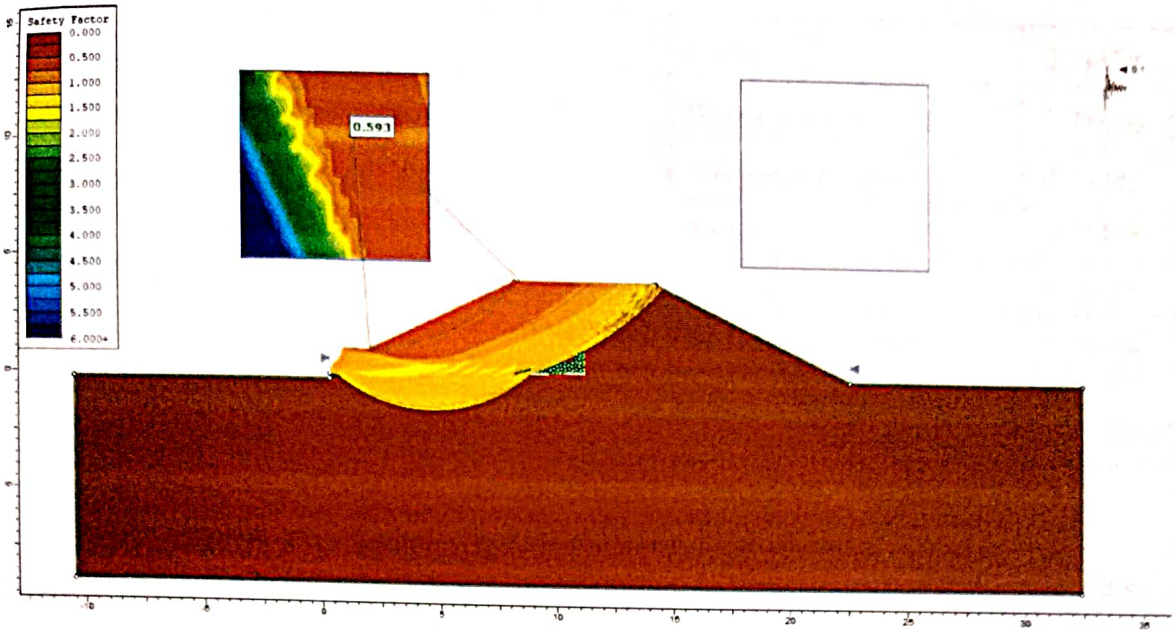


Fig 15 : Minimum FOS obtained for Earthquake conditionat downstream.

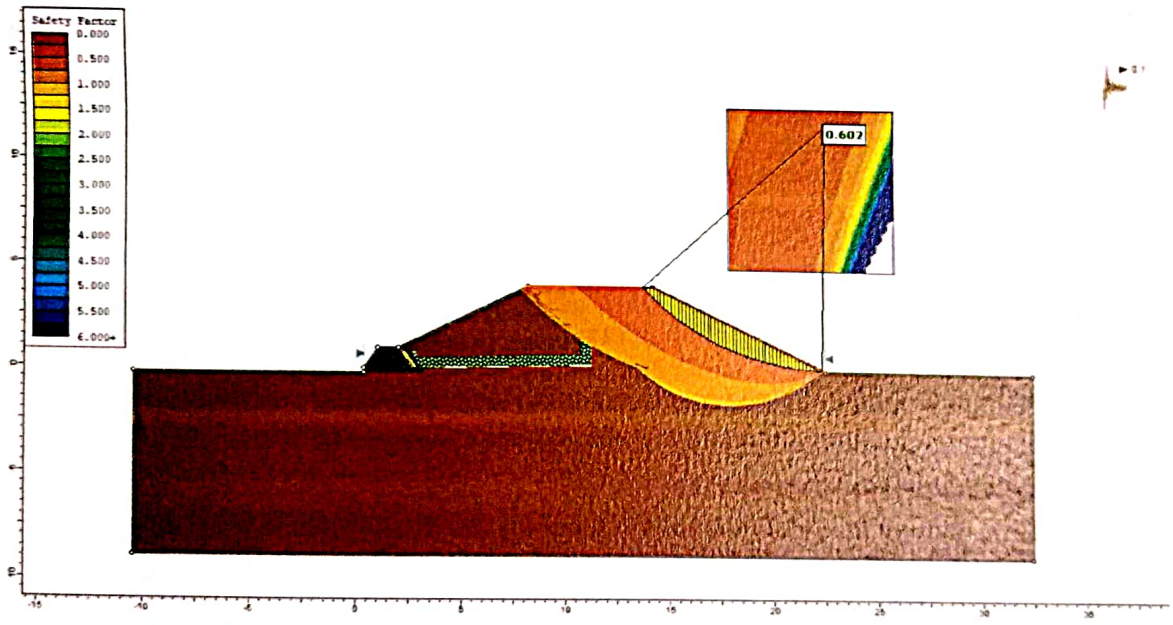


Fig 16 : Minimum FOS obtained for Earthquake conditionat upstream.

Table 7: Results of slope stability analysis for the top ash dyke pond cross-section

Sl. No.	Seepage	Critical slope	Type of Analysis	FOS

1	Sudden draw down	Upstream	Janbu	**0.71572**
2			Bishop	0.75406
3			Morgenstern- price	0.75245
1	Steady seepage	Downstream	Janbu	0.71486
2			Bishop	0.74318
			Morgenstern- price	0.74096
1	Rainfall	As per last five years annual rainfall data of Betul District, the average rainfall is which is less than the required rainfall for slope stability analysis. http://mpwrd.gov.in/tapti-basin/		
1	Earthquake	Downstream	Janbu	**0.56852**
2			Bishop	0.59282
3			Morgenstern- price	0.58939
1	Earthquake	Upstream	Janbu	**0.56954**
2			Bishop	0.60248
3			Morgenstern- price	0.60096

Table 8: Comparison of obtained FOS and required FOS

Sl. No.	Condition	Critical slope	Min. FOS obtained	Min. FOS required
1	Sudden drawdown	Upstream	**0.754**	**1.3**
2	Steady seepage	Downstream	**0.743**	**1.50**
3	Rainfall Induced	---		
4	Earthquake	Downstream	**0.593**	**1**
5	Earthquake	Upstream	**0.602**	**1**

Inferences from site inspection and slope stability analysis

- No new gully formations or seepage was observed during the field visit. Prima facie dykes are properly maintained and area 130 hec was inspected for stability analysis.
- All the obtained FOS were below the permissible limit of minimum FOS as per IS 7894:1975 for both embankments.

- Since there is no provision for a clayey/rocky core in the bottom ash dyke which substantially reduced the FOS and hence increased instability.
- From the stability analysis of the ash dyke, it is observed that it is in transition between stability and instability.
- The material property (geotechnical) provided by the client didn't fit the general range of the soil matrix and thus embankment appears weak against shearing.
- Seepage analysis for steady and sudden drawdown conditions indicates water will not drain out in 12 hours considering the level to be 2/3rd of F.R.L.
- The phreatic line goes well below the surface indicating surface and toe drains are well connected.

Recommendation for slope stability

- Prima facie it looked like the geotechnical data provided by the client is inaccurate and hence a fresh investigation of soil profile with testing of shear and index properties is the need of the hour. Separate geotechnical properties for embankment soil, clayey core, sand drain, rock toe, and foundation should be determined.
- In case FOS is still below the permissible limit, the redesigning of the ash dyke is recommended at the 130-hectare site for both embankments following IS 12169:1987 and IS 9423:1999.

Annexure-1

1. Sudden draw down condition at upstream

Slice Number	Width (m)	Weight (kN)	Angle of Slice Base	Base Material	Base Cohesion kPa	Base friction Angle	Shear stress kPa	Shear strength kPa	Base normal stress kPa	Pore pressure kPa	Eff. Normal stress kPa	Base vertical stress kPa	Eff. vertical stress kPa
1	0.139442	0.148051	-39.1577	Soil	0.388	16	0.513531	0.572536	0.643553	-24.6043	0.643553	1.06175	1.06175
2	0.139442	0.438666	-38.1026	Soil	0.388	16	0.962912	1.07355	2.3908	-23.3143	2.3908	3.14589	3.14589
3	0.139442	0.732772	-37.0624	Soil	0.388	16	1.42314	1.58666	4.18022	-22.0648	4.18022	5.25506	5.25506
4	0.139442	1.03379	-36.0364	Soil	0.388	16	1.8994	2.11764	6.03198	-20.8539	6.03198	7.41381	7.41381
5	0.139442	1.22413	-35.0235	Soil	0.388	16	2.2079	2.46159	7.23149	-19.6803	7.23149	8.77883	8.77883
6	0.139442	1.35339	-34.0231	Soil	0.388	16	2.4235	2.70196	8.06975	-18.5426	8.06975	9.70584	9.70584
7	0.139442	1.47346	-33.0343	Soil	0.388	16	2.6265	2.92828	8.85901	-17.4394	8.85901	10.5669	10.5669
8	0.139442	1.58465	-32.0565	Soil	0.388	16	2.8171	3.14079	9.60011	-16.3697	9.60011	11.3643	11.3643
9	0.139442	1.68725	-31.089	Soil	0.388	16	2.99552	3.3397	10.2938	-15.3322	10.2938	12.1	12.1
10	0.139442	1.78151	-30.1313	Soil	0.388	16	3.16192	3.52523	10.9408	-14.3262	10.9408	12.776	12.776
11	0.139442	1.86768	-29.1828	Soil	0.388	16	3.31649	3.69756	11.5418	-13.3505	11.5418	13.394	13.394
12	0.13944	1.94599	-28.243	Soil	0.388	16	3.45939	3.85687	12.0974	-12.4045	12.0974	13.9556	13.9556
13	0.139442	2.01665	-27.3114	Soil	0.388	16	3.59074	4.00332	12.6081	-11.4872	12.6081	14.4623	14.4623
14	0.139442	2.07985	-26.3876	Soil	0.388	16	3.71071	4.13707	13.0745	-10.598	13.0745	14.9155	14.9155
15	0.139442	2.13577	-25.4711	Soil	0.388	16	3.81941	4.25826	13.4972	-9.7362	13.4972	15.3166	15.3166
16	0.139442	2.18458	-24.5615	Soil	0.388	16	3.91696	4.36702	13.8765	-8.90114	13.8765	15.6666	15.6666
17	0.139442	2.22644	-23.6585	Soil	0.388	16	4.00347	4.46347	14.2128	-8.09223	14.2128	15.9668	15.9668
18	0.139442	2.26148	-22.7616	Soil	0.388	16	4.07905	4.54773	14.5067	-7.30894	14.5067	16.2181	16.2181
19	0.139442	2.28986	-21.8707	Soil	0.388	16	4.14376	4.61988	14.7583	-6.55075	14.7583	16.4216	16.4216
20	0.139442	2.31169	-20.9852	Soil	0.388	16	4.19771	4.68003	14.9681	-5.81718	14.9681	16.5782	16.5782
21	0.139442	2.32709	-20.105	Soil	0.388	16	4.24096	4.72825	15.1363	-5.1078	15.1363	16.6887	16.6887
22	0.139442	2.33617	-19.2297	Soil	0.388	16	4.27359	4.76462	15.2631	-4.42219	15.2631	16.7538	16.7538
23	0.139442	2.33904	-18.3591	Soil	0.388	16	4.29563	4.7892	15.3488	-3.75996	15.3488	16.7744	16.7744
24	0.139442	2.33579	-17.4928	Soil	0.388	16	4.30715	4.80204	15.3936	-3.12074	15.3936	16.751	16.751
25	0.139442	2.32651	-16.6306	Soil	0.388	16	4.3082	4.80321	15.3976	-2.50422	15.3976	16.6845	16.6845
26	0.139442	2.31129	-15.7723	Soil	0.388	16	4.29879	4.79272	15.3611	-1.91006	15.3611	16.5753	16.5753
27	0.139442	2.29019	-14.9176	Soil	0.388	16	4.27898	4.77063	15.284	-1.33799	15.284	16.424	16.424
28	0.139442	2.26329	-14.0663	Soil	0.388	16	4.24876	4.73694	15.1666	-0.787737	15.1666	16.2311	16.2311
29	0.139442	2.23067	-13.2181	Soil	0.388	16	4.20816	4.69168	15.0087	-0.259042	15.0087	15.9971	15.9971
30	0.144447	2.27024	-12.3578	Soil	0.388	16	4.15609	4.63363	14.8063	0	14.8063	15.7168	15.7168
31	0.144447	2.2229	-11.4852	Soil	0.388	16	4.09216	4.56235	14.5577	0	14.5577	15.3891	15.3891
32	0.144447	2.16939	-10.6152	Soil	0.388	16	4.01709	4.47865	14.2658	0	14.2658	15.0187	15.0187
33	0.144447	2.10976	-9.74775	Soil	0.388	16	3.93086	4.38252	13.9305	0	13.9305	14.6058	14.6058

34	0.144447	2.04405	-8.88253	Soil	0.388	16	3.83346	4.27392	13.5518	0	13.5518	14.1509	14.1509
35	0.144447	1.97231	-8.01935	Soil	0.388	16	3.72484	4.15282	13.1295	0	13.1295	13.6543	13.6543
36	0.144447	1.89458	-7.158	Soil	0.388	16	3.60497	4.01918	12.6635	0	12.6635	13.1162	13.1162
37	0.144447	1.8109	-6.29827	Soil	0.388	16	3.4738	3.87294	12.1534	0	12.1534	12.5368	12.5368
38	0.144447	1.7213	-5.43997	Soil	0.388	16	3.33128	3.71404	11.5992	0	11.5992	11.9165	11.9165
39	0.144447	1.6258	-4.58288	Soil	0.388	16	3.17733	3.5424	11.0007	0	11.0007	11.2554	11.2554
40	0.144447	1.52443	-3.72683	Soil	0.388	16	3.01188	3.35795	10.3575	0	10.3575	10.5536	10.5536
41	0.144447	1.41721	-2.8716	Soil	0.388	16	2.83486	3.16058	9.66914	0	9.66914	9.81134	9.81134
42	0.144447	1.30416	-2.01702	Soil	0.388	16	2.64616	2.9502	8.93549	0	8.93549	9.02868	9.02868
43	0.144447	1.18527	-1.16288	Soil	0.388	16	2.44568	2.72669	8.15601	0	8.15601	8.20566	8.20566
44	0.144447	1.06057	-0.309005	Soil	0.388	16	2.23332	2.48993	7.33029	0	7.33029	7.34233	7.34233
45	0.144447	0.930059	0.544804	Soil	0.388	16	2.00894	2.23977	6.45788	0	6.45788	6.43877	6.43877
46	0.144447	0.793728	1.39873	Soil	0.388	16	1.77241	1.97606	5.53823	0	5.53823	5.49496	5.49496
47	0.144447	0.651577	2.25297	Soil	0.388	16	1.52359	1.69865	4.57079	0	4.57079	4.51085	4.51085
48	0.144447	0.503597	3.10771	Soil	0.388	16	1.26232	1.40736	3.55493	0	3.55493	3.48639	3.48639
49	0.144447	0.349777	3.96315	Soil	0.388	16	0.98842	1.10199	2.48998	0	2.48998	2.4215	2.4215
				cement									
50	0.18689	0.175577	4.94546	concrete lining	10	10	9.2445	10.3067	1.73937	0	1.73937	0.939446	0.939446

2. Steady seepage condition at downstream

Slice Number	Width (m)	Weight (kN)	Angle of Slice Base	Base Material	Base Cohesion kPa	Base friction Angle	Shear stress kPa	Shear strength kPa	Base normal stress kPa	Pore pressure kPa	Eff. Normal stress kPa	Base vertical stress kPa	Eff. vertical stress kPa
1	0.126462	0.071846	-8.40186	Soil	0.388	16	0.554507	0.574336	0.64983	-15.8158	0.64983	0.56793	0.56793
2	0.126462	0.212875	-7.40092	Soil	0.388	16	0.871903	0.903082	1.7963	-15.6414	1.7963	1.68305	1.68305
3	0.126462	0.348598	-6.40225	Soil	0.388	16	1.17413	1.21612	2.88798	-15.4874	2.88798	2.75624	2.75624
4	0.126462	0.479046	-5.40553	Soil	0.388	16	1.46151	1.51377	3.92604	-15.3539	3.92604	3.78774	3.78774
5	0.126462	0.604249	-4.41045	Soil	0.388	16	1.73435	1.79637	4.91157	-15.2418	4.91157	4.7778	4.7778
6	0.126462	0.724231	-3.4167	Soil	0.388	16	1.99292	2.06419	5.84558	-15.1501	5.84558	5.72659	5.72659
7	0.126462	0.839009	-2.42398	Soil	0.388	16	2.23749	2.3175	6.72898	-15.0798	6.72898	6.63426	6.63426
8	0.126462	0.948597	-1.43199	Soil	0.388	16	2.46828	2.55655	7.56262	-15.0308	7.56262	7.50091	7.50091
9	0.126462	1.05301	-0.440423	Soil	0.388	16	2.68551	2.78154	8.34726	-15.0025	8.34726	8.32662	8.32662
10	0.126462	1.15224	0.551009	Soil	0.388	16	2.88937	2.99269	9.0836	-14.9957	9.0836	9.11138	9.11138
11	0.126462	1.24629	1.54261	Soil	0.388	16	3.08004	3.19018	9.77238	-15.0102	9.77238	9.85533	9.85533
12	0.126462	1.33517	2.53467	Soil	0.388	16	3.25768	3.37417	10.414	-15.0455	10.414	10.5582	10.5582
13	0.126462	1.41885	3.52749	Soil	0.388	16	3.42243	3.54482	11.0092	-15.1021	11.0092	11.2201	11.2201

14	0.126462	1.49733	4.52137	Soil	0.388	16	3.57444	3.70226	11.5582	-15.1799	11.5582	11.8408	11.8408
15	0.126462	1.57058	5.51662	Soil	0.388	16	3.7138	3.84661	12.0616	-15.2785	12.0616	12.4203	12.4203
16	0.126462	1.63859	6.51354	Soil	0.388	16	3.84064	3.97798	12.5197	-15.3988	12.5197	12.9582	12.9582
17	0.126462	1.70132	7.51245	Soil	0.388	16	3.95502	4.09645	12.9329	-15.5409	12.9329	13.4545	13.4545
18	0.126462	1.75874	8.51366	Soil	0.388	16	4.05703	4.20211	13.3014	-15.705	13.3014	13.9087	13.9087
19	0.126462	1.8108	9.5175	Soil	0.388	16	4.14673	4.29502	13.6254	-15.8929	13.6254	14.3206	14.3206
20	0.126462	1.85747	10.5243	Soil	0.388	16	4.22418	4.37524	13.9052	-16.1031	13.9052	14.6899	14.6899
21	0.126462	1.8987	11.5344	Soil	0.388	16	4.2894	4.44279	14.1407	-16.336	14.1407	15.0161	15.0161
22	0.126462	1.93442	12.5481	Soil	0.388	16	4.34243	4.49772	14.3323	-16.5916	14.3323	15.2988	15.2988
23	0.126462	1.96458	13.5659	Soil	0.388	16	4.38328	4.54003	14.4799	-16.8704	14.4799	15.5375	15.5375
24	0.126462	1.9891	14.588	Soil	0.388	16	4.41195	4.56972	14.5834	-17.1736	14.5834	15.7317	15.7317
25	0.126462	2.00792	15.6149	Soil	0.388	16	4.42843	4.58679	14.6429	-17.5007	14.6429	15.8806	15.8806
26	0.126462	2.02094	16.647	Soil	0.388	16	4.43271	4.59122	14.6583	-17.8517	14.6583	15.9837	15.9837
27	0.126462	2.02807	17.6847	Soil	0.388	16	4.42473	4.58296	14.6296	-18.2272	14.6296	16.0404	16.0404
28	0.126462	2.02922	18.7284	Soil	0.388	16	4.40448	4.56198	14.5564	-18.6274	14.5564	16.0496	16.0496
29	0.126462	2.02427	19.7785	Soil	0.388	16	4.37186	4.5282	14.4386	-19.0529	14.4386	16.0107	16.0107
30	0.126462	2.01311	20.8357	Soil	0.388	16	4.32684	4.48157	14.276	-19.5043	14.276	15.9227	15.9227
31	0.126462	1.99561	21.9003	Soil	0.388	16	4.26931	4.42198	14.0682	-19.9818	14.0682	15.7845	15.7845
32	0.126462	1.97163	22.973	Soil	0.388	16	4.19919	4.34935	13.8149	-20.4862	13.8149	15.595	15.595
33	0.126462	1.94102	24.0542	Soil	0.388	16	4.11635	4.26355	13.5157	-21.018	13.5157	15.3531	15.3531
34	0.126462	1.90361	25.1447	Soil	0.388	16	4.02068	4.16446	13.1701	-21.578	13.1701	15.0573	15.0573
35	0.126462	1.85922	26.2449	Soil	0.388	16	3.91204	4.05193	12.7777	-22.1675	12.7777	14.7064	14.7064
36	0.126462	1.80765	27.3557	Soil	0.388	16	3.79026	3.9258	12.3377	-22.7868	12.3377	14.2987	14.2987
37	0.126462	1.7487	28.4778	Soil	0.388	16	3.65517	3.78588	11.8498	-23.4366	11.8498	13.8326	13.8326
38	0.126462	1.68212	29.6119	Soil	0.388	16	3.50659	3.63199	11.3132	-24.1181	11.3132	13.3061	13.3061
39	0.126462	1.60766	30.7589	Soil	0.388	16	3.34433	3.46392	10.727	-24.8322	10.727	12.7173	12.7173
40	0.126462	1.52504	31.9197	Soil	0.388	16	3.16812	3.28141	10.0905	-25.58	10.0905	12.064	12.064
41	0.126462	1.43396	33.0954	Soil	0.388	16	2.97774	3.08422	9.40287	-26.363	9.40287	11.3437	11.3437
42	0.126462	1.33406	34.2871	Soil	0.388	16	2.77292	2.87208	8.66303	-27.1823	8.66303	10.5537	10.5537
43	0.126462	1.22499	35.4959	Soil	0.388	16	2.55336	2.64467	7.86991	-28.0394	7.86991	9.69093	9.69093
44	0.126462	1.10631	36.7232	Soil	0.388	16	2.31876	2.40168	7.02255	-28.9363	7.02255	8.75236	8.75236
45	0.126462	0.977582	37.9704	Soil	0.388	16	2.06877	2.14275	6.11953	-29.8747	6.11953	7.73411	7.73411
46	0.126462	0.838276	39.2392	Soil	0.388	16	1.80302	1.8675	5.15963	-30.8569	5.15963	6.6322	6.6322
47	0.126462	0.687819	40.5315	Soil	0.388	16	1.52113	1.57553	4.14143	-31.8853	4.14143	5.44204	5.44204
48	0.126462	0.52556	41.8491	Soil	0.388	16	1.22269	1.26641	3.06339	-32.9625	3.06339	4.15849	4.15849
49	0.126462	0.350763	43.1945	Soil	0.388	16	0.90723	0.939673	1.92391	-34.0916	1.92391	2.7757	2.7757
50	0.126462	0.141332	44.5703	Soil	0.388	16	0.537708	0.556936	0.589148	-35.2756	0.589148	1.11885	1.11885

3.1 Earthquake condition at downstream

Slice Number	Width (m)	Weight (kN)	Angle of Slice Base	Base Material	Base Cohesion kPa	Base friction Angle	Shear stress kPa	Shear strength kPa	Base normal stress kPa	Pore pressure kPa	Eff. Normal stress kPa	Base vertical stress kPa	Eff. vertical stress kPa
1	0.128001	0.071614	-7.67139	Soil	0.388	16	0.745953	0.577238	0.659952	0	0.659952	0.559475	0.559475
2	0.128001	0.212222	-6.70706	Soil	0.388	16	1.16661	0.902753	1.79516	0	1.79516	1.65797	1.65797
3	0.128001	0.347608	-5.74463	Soil	0.388	16	1.56608	1.21188	2.8732	0	2.8732	2.71565	2.71565
4	0.128001	0.477798	-4.78383	Soil	0.388	16	1.94491	1.50502	3.89551	0	3.89551	3.73275	3.73275
5	0.128001	0.602818	-3.82437	Soil	0.388	16	2.30358	1.78257	4.86345	0	4.86345	4.70946	4.70946
6	0.128001	0.722686	-2.86599	Soil	0.388	16	2.64256	2.04488	5.77821	0	5.77821	5.64592	5.64592
7	0.128001	0.837418	-1.90841	Soil	0.388	16	2.96226	2.29227	6.64097	0	6.64097	6.54226	6.54226
8	0.128001	0.947025	-0.951359	Soil	0.388	16	3.26306	2.52504	7.45274	0	7.45274	7.39856	7.39856
9	0.128001	1.05151	0.00542284	Soil	0.388	16	3.54534	2.74348	8.21453	0	8.21453	8.21486	8.21486
10	0.128001	1.15088	0.962206	Soil	0.388	16	3.80944	2.94784	8.92724	0	8.92724	8.99123	8.99123
11	0.128001	1.24514	1.91926	Soil	0.388	16	4.05564	3.13836	9.59163	0	9.59163	9.72753	9.72753
12	0.128001	1.33426	2.87685	Soil	0.388	16	4.28423	3.31525	10.2086	0	10.2086	10.4239	10.4239
13	0.128001	1.41825	3.83524	Soil	0.388	16	4.49549	3.47873	10.7787	0	10.7787	11.08	11.08
14	0.128001	1.49709	4.79471	Soil	0.388	16	4.68963	3.62896	11.3025	0	11.3025	11.6959	11.6959
15	0.128001	1.57076	5.75553	Soil	0.388	16	4.86699	3.76613	11.7809	0	11.7809	12.2714	12.2714
16	0.128001	1.63923	6.71798	Soil	0.388	16	5.02745	3.89037	12.2143	0	12.2143	12.8064	12.8064
17	0.128001	1.70248	7.68233	Soil	0.388	16	5.17155	4.00184	12.603	0	12.603	13.3006	13.3006
18	0.128001	1.76048	8.64888	Soil	0.388	16	5.29919	4.10065	12.9476	0	12.9476	13.7536	13.7536
19	0.128001	1.81317	9.61792	Soil	0.388	16	5.41067	4.18692	13.2484	0	13.2484	14.1653	14.1653
20	0.128001	1.86053	10.5897	Soil	0.388	16	5.50608	4.26075	13.5058	0	13.5058	14.5353	14.5353
21	0.128001	1.9025	11.5647	Soil	0.388	16	5.58551	4.32221	13.7202	0	13.7202	14.8632	14.8632
22	0.128001	1.93903	12.543	Soil	0.388	16	5.64906	4.37139	13.8918	0	13.8918	15.1486	15.1486
23	0.128001	1.97005	13.525	Soil	0.388	16	5.69682	4.40835	14.0206	0	14.0206	15.391	15.391
24	0.128001	1.99551	14.5112	Soil	0.388	16	5.72886	4.43314	14.1071	0	14.1071	15.5899	15.5899
25	0.128001	2.01533	15.5017	Soil	0.388	16	5.74522	4.4458	14.1512	0	14.1512	15.7447	15.7447
26	0.128001	2.02943	16.497	Soil	0.388	16	5.74593	4.44635	14.1532	0	14.1532	15.8549	15.8549
27	0.128001	2.03773	17.4975	Soil	0.388	16	5.73103	4.43482	14.113	0	14.113	15.9197	15.9197
28	0.128001	2.04012	18.5035	Soil	0.388	16	5.70053	4.41122	14.0306	0	14.0306	15.9384	15.9384
29	0.128001	2.03652	19.5154	Soil	0.388	16	5.65441	4.37553	13.9062	0	13.9062	15.9102	15.9102
30	0.128001	2.0268	20.5338	Soil	0.388	16	5.59267	4.32775	13.7396	0	13.7396	15.8343	15.8343
31	0.128001	2.01085	21.5589	Soil	0.388	16	5.51526	4.26785	13.5306	0	13.5306	15.7097	15.7097

32	0.128001	1.98855	22.5914	Soil	0.388	16	5.42215	4.1958	13.2794	0	13.2794	15.5355	15.5355
33	0.128001	1.95973	23.6316	Soil	0.388	16	5.31327	4.11155	12.9855	0	12.9855	15.3103	15.3103
34	0.128001	1.92427	24.6802	Soil	0.388	16	5.18856	4.01504	12.649	0	12.649	15.0333	15.0333
35	0.128001	1.88198	25.7377	Soil	0.388	16	5.0479	3.9062	12.2694	0	12.2694	14.7029	14.7029
36	0.128001	1.83268	26.8047	Soil	0.388	16	4.89122	3.78495	11.8466	0	11.8466	14.3178	14.3178
37	0.128001	1.77619	27.8818	Soil	0.388	16	4.71837	3.6512	11.3801	0	11.3801	13.8765	13.8765
38	0.128001	1.71229	28.9698	Soil	0.388	16	4.52925	3.50485	10.8697	0	10.8697	13.3772	13.3772
39	0.128001	1.64074	30.0693	Soil	0.388	16	4.3237	3.34579	10.315	0	10.315	12.8183	12.8183
40	0.128001	1.5613	31.1812	Soil	0.388	16	4.10154	3.17388	9.71549	0	9.71549	12.1976	12.1976
41	0.128001	1.47368	32.3063	Soil	0.388	16	3.8626	2.98898	9.07072	0	9.07072	11.5131	11.5131
42	0.128001	1.37759	33.4456	Soil	0.388	16	3.60669	2.79095	8.38006	0	8.38006	10.7624	10.7624
43	0.128001	1.27268	34.6	Soil	0.388	16	3.33359	2.57962	7.64306	0	7.64306	9.94276	9.94276
44	0.128001	1.15858	35.7707	Soil	0.388	16	3.04307	2.35481	6.85905	0	6.85905	9.05142	9.05142
45	0.128001	1.03491	36.959	Soil	0.388	16	2.73489	2.11633	6.0274	0	6.0274	8.08522	8.08522
46	0.128001	0.901194	38.166	Soil	0.388	16	2.40878	1.86398	5.14737	0	5.14737	7.04059	7.04059
47	0.128001	0.756943	39.3935	Soil	0.388	16	2.0645	1.59756	4.21823	0	4.21823	5.91364	5.91364
48	0.128001	0.601595	40.6429	Soil	0.388	16	1.70171	1.31683	3.23922	0	3.23922	4.69997	4.69997
49	0.128001	0.416809	41.9162	Soil	0.388	16	1.28168	0.991799	2.1057	0	2.1057	3.25634	3.25634
50	0.128001	0.143936	43.2154	Soil	0.388	16	0.681001	0.526976	0.484667	0	0.484667	1.12451	1.12451

3.2 Earthquake condition at upstream

Slice Number	Width (m)	Weight (kN)	Angle of Slice Base	Base Material	Base Cohesion kPa	Base friction Angle	Shear stress kPa	Shear strength kPa	Base normal stress kPa	Pore pressure kPa	Eff. Normal stress kPa	Base vertical stress kPa	Eff. vertical stress kPa
1	0.141485	0.152378	-39.15	Soil	0.388	16	0.654033	0.543462	0.542161	0	0.542161	1.07463	1.07463
2	0.141485	0.451407	-38.0796	Soil	0.388	16	1.23306	1.0246	2.22007	0	2.22007	3.1862	3.1862
3	0.141485	0.754863	-37.0247	Soil	0.388	16	1.82972	1.52039	3.94913	0	3.94913	5.32916	5.32916
4	0.141485	1.06252	-35.9842	Soil	0.388	16	2.44347	2.03038	5.72767	0	5.72767	7.50192	7.50192
5	0.141485	1.25096	-34.9572	Soil	0.388	16	2.83187	2.35311	6.85313	0	6.85313	8.83287	8.83287
6	0.141485	1.38334	-33.943	Soil	0.388	16	3.11438	2.58786	7.67184	0	7.67184	9.76801	9.76801
7	0.141485	1.50614	-32.9408	Soil	0.388	16	3.38111	2.8095	8.44479	0	8.44479	10.6355	10.6355
8	0.141485	1.61969	-31.9497	Soil	0.388	16	3.63225	3.01818	9.17249	0	9.17249	11.4377	11.4377
9	0.141485	1.7243	-30.9693	Soil	0.388	16	3.86796	3.21404	9.85555	0	9.85555	12.1768	12.1768
10	0.141485	1.82023	-29.9988	Soil	0.388	16	4.08841	3.39722	10.4944	0	10.4944	12.8547	12.8547
11	0.141485	1.90775	-29.0377	Soil	0.388	16	4.29374	3.56784	11.0894	0	11.0894	13.4732	13.4732
12	0.141485	1.98709	-28.0855	Soil	0.388	16	4.4841	3.72602	11.641	0	11.641	14.0339	14.0339
13	0.14148	2.05847	-27.1417	Soil	0.388	16	4.65963	3.87187	12.149	0	12.1497	14.5384	14.5384

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14	0.141485	2.12209	-26.2058	Soil	0.388	16	4.82042	4.00548	12.6156	0	12.6156	14.9882	14.9882
15	0.141485	2.17815	-25.2773	Soil	0.388	16	4.96659	4.12694	13.0393	0	13.0393	15.3845	15.3845
16	0.141485	2.22681	-24.3559	Soil	0.388	16	5.09824	4.23633	13.4207	0	13.4207	15.7287	15.7287
17	0.141485	2.26825	-23.4412	Soil	0.388	16	5.21543	4.33371	13.7604	0	13.7604	16.0217	16.0217
18	0.141485	2.30261	-22.5327	Soil	0.388	16	5.31828	4.41917	14.0583	0	14.0583	16.2648	16.2648
19	0.141485	2.33003	-21.6302	Soil	0.388	16	5.4068	4.49273	14.3149	0	14.3149	16.4589	16.4589
20	0.141485	2.35065	-20.7333	Soil	0.388	16	5.48109	4.55446	14.5302	0	14.5302	16.6049	16.6049
21	0.141485	2.36459	-19.8417	Soil	0.388	16	5.54119	4.6044	14.7043	0	14.7043	16.7038	16.7038
22	0.141485	2.37197	-18.955	Soil	0.388	16	5.58712	4.64256	14.8374	0	14.8374	16.7563	16.7563
23	0.141485	2.37288	-18.0731	Soil	0.388	16	5.6189	4.66897	14.9295	0	14.9295	16.7631	16.7631
24	0.141485	2.36743	-17.1955	Soil	0.388	16	5.63657	4.68365	14.9807	0	14.9807	16.725	16.725
25	0.141485	2.35572	-16.3221	Soil	0.388	16	5.64012	4.6866	14.991	0	14.991	16.6427	16.6427
26	0.141485	2.33782	-15.4526	Soil	0.388	16	5.62954	4.67781	14.9604	0	14.9604	16.5166	16.5166
27	0.141485	2.31382	-14.5867	Soil	0.388	16	5.60485	4.65729	14.8888	0	14.8888	16.3474	16.3474
28	0.141485	2.28379	-13.7243	Soil	0.388	16	5.566	4.62501	14.7762	0	14.7762	16.1355	16.1355
29	0.141485	2.2478	-12.8649	Soil	0.388	16	5.51296	4.58094	14.6225	0	14.6225	15.8816	15.8816
30	0.141485	2.20591	-12.0085	Soil	0.388	16	5.44571	4.52506	14.4276	0	14.4276	15.586	15.586
31	0.141485	2.15818	-11.1548	Soil	0.388	16	5.36418	4.45731	14.1913	0	14.1913	15.2491	15.2491
32	0.141485	2.10467	-10.3037	Soil	0.388	16	5.26831	4.37765	13.9136	0	13.9136	14.8713	14.8713
33	0.141485	2.04541	-9.45477	Soil	0.388	16	5.15804	4.28602	13.594	0	13.594	14.453	14.453
34	0.141485	1.98047	-8.60797	Soil	0.388	16	5.03328	4.18235	13.2325	0	13.2325	13.9944	13.9944
35	0.141485	1.90987	-7.76306	Soil	0.388	16	4.89393	4.06656	12.8287	0	12.8287	13.4959	13.4959
36	0.141485	1.83365	-6.91985	Soil	0.388	16	4.73988	3.93856	12.3823	0	12.3823	12.9576	12.9576
37	0.141485	1.75185	-6.07814	Soil	0.388	16	4.57105	3.79827	11.893	0	11.893	12.3797	12.3797
38	0.141485	1.66449	-5.23775	Soil	0.388	16	4.38728	3.64557	11.3605	0	11.3605	11.7627	11.7627
39	0.141485	1.5716	-4.39849	Soil	0.388	16	4.18845	3.48035	10.7843	0	10.7843	11.1065	11.1065
40	0.141485	1.47319	-3.56017	Soil	0.388	16	3.9744	3.30249	10.164	0	10.164	10.4113	10.4113
41	0.141485	1.36929	-2.72261	Soil	0.388	16	3.74496	3.11184	9.49913	0	9.49913	9.67722	9.67722
42	0.141485	1.25991	-1.88564	Soil	0.388	16	3.49995	2.90825	8.7892	0	8.7892	8.90442	8.90442
43	0.141485	1.14505	-1.04906	Soil	0.388	16	3.23919	2.69157	8.03352	0	8.03352	8.09283	8.09283
44	0.141485	1.02472	-0.212715	Soil	0.388	16	2.96246	2.46163	7.23162	0	7.23162	7.24262	7.24262
45	0.141485	0.898934	0.623589	Soil	0.388	16	2.66954	2.21823	6.38277	0	6.38277	6.35371	6.35371
46	0.141485	0.767679	1.46002	Soil	0.388	16	2.36018	1.96117	5.4863	0	5.4863	5.42615	5.42615
47	0.141485	0.630954	2.29677	Soil	0.388	16	2.03414	1.69025	4.54147	0	4.54147	4.45989	4.45989
48	0.141485	0.488751	3.13401	Soil	0.388	16	1.69112	1.40522	3.54745	0	3.54745	3.45486	3.45486
49	0.141485	0.34106	3.97192	Soil	0.388	16	1.33083	1.10584	2.5034	0	2.5034	2.41099	2.41099
				cement									

50	0.18689	0.175577	4.94546	concrete lining	10	10	12.4638	10.3567	2.02275	0	2.02275	0.944264	0.944264

Annexure-2

1. Sudden draw down condition at upstream

Slice Number	Width (m)	Weight (kN)	Angle of Slice Base	Base Material	Base Cohesion kPa	Base friction Angle	Shear stress kPa	Shear strength kPa	Base normal stress kPa	Pore pressure kPa	Eff. Normal stress kPa	Base vertical stress kPa	Eff. vertical stress kPa
1	0.19157	0.444	-52.3022	soil	0.388	16	0.968703	0.693324	1.06479	-9.56015	1.06479	2.31825	2.31825
2	0.19157	1.28388	-50.5168	soil	0.388	16	2.17155	1.55423	4.06714	-6.66318	4.06714	6.70301	6.70301
3	0.19157	1.81224	-48.7967	soil	0.388	16	2.97251	2.1275	6.06635	-3.90884	6.06635	9.46143	9.46143
4	0.19157	2.24104	-47.1338	soil	0.388	16	3.65283	2.61442	7.76447	-1.2827	7.76447	11.7	11.7
5	0.168619	2.29419	-45.6154	soil	0.388	16	4.25295	3.04394	9.26237	0	9.26237	13.6077	13.6077
6	0.168619	2.56678	-44.2314	soil	0.388	16	4.77799	3.41972	10.5729	0	10.5729	15.2243	15.2243
7	0.168619	2.8146	-42.8793	soil	0.388	16	5.26988	3.77178	11.8006	0	11.8006	16.6942	16.6942
8	0.168619	3.03928	-41.5562	soil	0.388	16	5.72944	4.1007	12.9478	0	12.9478	18.0268	18.0268
9	0.168619	3.24224	-40.2597	soil	0.388	16	6.15743	4.40702	14.016	0	14.016	19.2304	19.2304
10	0.168619	3.42471	-38.9876	soil	0.388	16	6.55455	4.69125	15.0072	0	15.0072	20.3126	20.3126
11	0.168619	3.5878	-37.7379	soil	0.388	16	6.92145	4.95385	15.923	0	15.923	21.2798	21.2798
12	0.168619	3.73248	-36.5091	soil	0.388	16	7.25876	5.19527	16.7649	0	16.7649	22.1379	22.1379
13	0.168619	3.85965	-35.2994	soil	0.388	16	7.56704	5.41591	17.5344	0	17.5344	22.8921	22.8921
14	0.168619	3.97007	-34.1076	soil	0.388	16	7.84681	5.61615	18.2327	0	18.2327	23.5469	23.5469
15	0.168619	4.06447	-32.9323	soil	0.388	16	8.09854	5.79632	18.861	0	18.861	24.1067	24.1067
16	0.168619	4.14348	-31.7725	soil	0.388	16	8.32266	5.95673	19.4205	0	19.4205	24.5752	24.5752
17	0.168619	4.20768	-30.6271	soil	0.388	16	8.5196	6.09768	19.912	0	19.912	24.956	24.956
18	0.168619	4.25761	-29.495	soil	0.388	16	8.68969	6.21942	20.3366	0	20.3366	25.252	25.252
19	0.168619	4.29374	-28.3755	soil	0.388	16	8.83327	6.32218	20.6949	0	20.6949	25.4662	25.4662
20	0.168619	4.31651	-27.2677	soil	0.388	16	8.9506	6.40616	20.9878	0	20.9878	25.6012	25.6012
21	0.168619	4.32634	-26.1708	soil	0.388	16	9.04198	6.47156	21.2159	0	21.2159	25.6594	25.6594
22	0.168619	4.32358	-25.0841	soil	0.388	16	9.10762	6.51854	21.3797	0	21.3797	25.6429	25.6429
23	0.168619	4.30858	-24.007	soil	0.388	16	9.14769	6.54722	21.4797	0	21.4797	25.5539	25.5539
24	0.168619	4.28165	-22.9389	soil	0.388	16	9.16239	6.55774	21.5164	0	21.5164	25.3941	25.3941
25	0.168619	4.24308	-21.8791	soil	0.388	16	9.15185	6.5502	21.4901	0	21.4901	25.1653	25.1653
26	0.168619	4.19312	-20.8271	soil	0.388	16	9.11617	6.52466	21.4011	0	21.4011	24.8689	24.8689
27	0.168619	4.13203	-19.7825	soil	0.388	16	9.05543	6.48119	21.2495	0	21.2495	24.5065	24.5065
28	0.168619	4.06002	-18.7446	soil	0.388	16	8.9697	6.41983	21.0355	0	21.0355	24.0794	24.0794
29	0.168619	3.97731	-17.7131	soil	0.388	16	8.85902	6.34061	20.7592	0	20.7592	23.5887	23.5887
30	0.168619	3.88407	-16.6875	soil	0.388	16	8.72336	6.24352	20.4206	0	20.4206	23.0357	23.0357
31	0.168619	3.78048	-15.6674	soil	0.388	16	8.56273	6.12855	20.0197	0	20.0197	22.4213	22.4213
32	0.168619	3.66671	-14.6523	soil	0.388	16	8.37706	5.99566	19.5563	0	19.5563	21.7465	21.7465
33	0.168619	3.5429	-13.6419	soil	0.388	16	8.16628	5.8448	19.0301	0	19.0301	21.0121	21.0121
34	0.168619	3.40918	-12.6358	soil	0.388	16	7.93031	5.67591	18.4411	0	18.4411	20.219	20.219
35	0.168619	3.26567	-11.6337	soil	0.388	16	7.66899	5.48888	17.7889	0	17.7889	19.3678	19.3678
36	0.168619	3.11248	-10.6352	soil	0.388	16	7.38219	5.28361	17.073	0	17.073	18.4593	18.4593
37	0.168619	2.94972	-9.63991	soil	0.388	16	7.06971	5.05996	16.293	0	16.293	17.4939	17.4939
38	0.168619	2.77746	-8.64757	soil	0.388	16	6.73135	4.81779	15.4485	0	15.4485	16.4722	16.4722
39	0.168619	2.5958	-7.65783	soil	0.388	16	6.36687	4.55692	14.5387	0	14.5387	15.3948	15.3948
40	0.168619	2.40479	-6.67039	soil	0.388	16	5.97598	4.27715	13.5631	0	13.5631	14.262	14.262
41	0.168619	2.20451	-5.68494	soil	0.388	16	5.5584	3.97828	12.5208	0	12.5208	13.0741	13.0741
42	0.168619	1.99499	-4.70117	soil	0.388	16	5.11377	3.66005	11.411	0	11.411	11.8315	11.8315
43	0.168619	1.77629	-3.71879	soil	0.388	16	4.64173	3.3222	10.2328	0	10.2328	10.5345	10.5345

44	0.168619	1.54845	-2.7375	soil	0.388	16	4.14188	2.96444	8.98514	0	8.98514	9.18319	9.18319
45	0.168619	1.31147	-1.75701	soil	0.388	16	3.61375	2.58645	7.66692	0	7.66692	7.77778	7.77778
46	0.168619	1.06539	-0.777045	soil	0.388	16	3.05686	2.18787	6.27688	0	6.27688	6.31833	6.31833
47	0.168619	0.810217	0.202697	soil	0.388	16	2.47067	1.76832	4.81375	0	4.81375	4.80501	4.80501
48	0.168619	0.54595	1.1825	soil	0.388	16	1.85461	1.32739	3.27603	0	3.27603	3.23775	3.23775
49	0.168619	0.272584	2.16265	soil	0.388	16	1.20803	0.864617	1.66216	0	1.66216	1.61654	1.61654
50	0.0626824	0.0251959	2.83516	Cement concrete lining	20	10	28.389	20.3187	1.80726	0	1.80726	0.401341	0.401341

2. Steady seepage condition at downstream

Slice Number	Width (m)	Weight (kN)	Angle of Slice Base	Base Material	Base Cohesion kPa	Base friction Angle	Shear stress kPa	Shear strength kPa	Base normal stress kPa	Pore pressure kPa	Eff. Normal stress kPa	Base vertical stress kPa	Eff. vertical stress kPa
1	0.125333	0.0731165	-0.736299	soil	0.388	16	0.780789	0.558157	0.593406	-11.949	0.593406	0.583372	0.583372
2	0.125333	0.216973	0.190641	soil	0.388	16	1.23552	0.883226	1.72706	-11.933	1.72706	1.73117	1.73117
3	0.125333	0.356077	1.11763	soil	0.388	16	1.6693	1.19332	2.80848	-11.9281	2.80848	2.84105	2.84105
4	0.125333	0.490426	2.04491	soil	0.388	16	2.08251	1.48871	3.83864	-11.9369	3.83864	3.913	3.913
5	0.125333	0.620012	2.97273	soil	0.388	16	2.47551	1.76965	4.8184	-11.9757	4.8184	4.94695	4.94695
6	0.125333	0.744827	3.90133	soil	0.388	16	2.84863	2.03638	5.74857	-12.0302	5.74857	5.94284	5.94284
7	0.125333	0.864855	4.83096	soil	0.388	16	3.20215	2.2891	6.62991	-12.1016	6.62991	6.90055	6.90055
8	0.125333	0.980079	5.76187	soil	0.388	16	3.53636	2.52801	7.4631	-12.188	7.4631	7.81993	7.81993
9	0.125333	1.09048	6.6943	soil	0.388	16	3.85149	2.75329	8.24874	-12.2916	8.24874	8.7008	8.7008
10	0.125333	1.19603	7.62852	soil	0.388	16	4.1478	2.96511	8.98748	-12.4141	8.98748	9.54302	9.54302
11	0.125333	1.29669	8.56478	soil	0.388	16	4.42548	3.16361	9.67969	-12.555	9.67969	10.3462	10.3462
12	0.125333	1.39244	9.50336	soil	0.388	16	4.68472	3.34893	10.326	-12.7103	10.326	11.1102	11.1102
13	0.125333	1.48324	10.4445	soil	0.388	16	4.92569	3.52119	10.9267	-12.8861	10.9267	11.8347	11.8347
14	0.125333	1.56904	11.3885	soil	0.388	16	5.14852	3.68049	11.4823	-13.0823	11.4823	12.5194	12.5194
15	0.125333	1.64979	12.3357	soil	0.388	16	5.35339	3.82694	11.993	-13.2997	11.993	13.1637	13.1637
16	0.125333	1.72545	13.2863	soil	0.388	16	5.54036	3.9606	12.4591	-13.5356	12.4591	13.7674	13.7674
17	0.125333	1.79595	14.2406	soil	0.388	16	5.70954	4.08154	12.8809	-13.7925	12.8809	14.33	14.33
18	0.125333	1.86123	15.199	soil	0.388	16	5.86104	4.18984	13.2586	-14.0709	13.2586	14.8509	14.8509
19	0.125333	1.92122	16.1618	soil	0.388	16	5.99488	4.28552	13.5923	-14.3711	13.5923	15.3296	15.3296
20	0.125333	1.97585	17.1293	soil	0.388	16	6.11113	4.36862	13.8821	-14.6934	13.8821	15.7655	15.7655
21	0.125333	2.02503	18.1018	soil	0.388	16	6.20981	4.43916	14.128	-15.0381	14.128	16.1579	16.1579
22	0.125333	2.06867	19.0798	soil	0.388	16	6.29093	4.49715	14.3303	-15.4065	14.3303	16.5062	16.5062
23	0.125333	2.10668	20.0636	soil	0.388	16	6.35449	4.54259	14.4888	-15.7982	14.4888	16.8096	16.8096
24	0.125333	2.13896	21.0536	soil	0.388	16	6.40049	4.57547	14.6034	-16.2135	14.6034	17.0672	17.0672
25	0.125333	2.16539	22.0502	soil	0.388	16	6.42885	4.59575	14.6742	-16.6529	14.6742	17.2782	17.2782
26	0.125333	2.18585	23.0539	soil	0.388	16	6.43957	4.60341	14.7009	-17.1169	14.7009	17.4415	17.4415

27	0.125333	2.20021	24.0651	soil	0.388	16	6.43253	4.59838	14.6834	-17.6061	14.6834	17.5561	17.5561
28	0.125333	2.20832	25.0844	soil	0.388	16	6.40769	4.58062	14.6214	-18.1212	14.6214	17.6209	17.6209
29	0.125333	2.21004	26.1123	soil	0.388	16	6.36491	4.55004	14.5148	-18.6636	14.5148	17.6346	17.6346
30	0.125333	2.20519	27.1492	soil	0.388	16	6.30409	4.50656	14.3631	-19.2335	14.3631	17.5959	17.5959
31	0.125333	2.19358	28.1959	soil	0.388	16	6.22507	4.45007	14.1661	-19.8313	14.1661	17.5034	17.5034
32	0.125333	2.17504	29.2529	soil	0.388	16	6.12771	4.38047	13.9234	-20.4578	13.9234	17.3555	17.3555
33	0.125333	2.14934	30.321	soil	0.388	16	6.0118	4.29761	13.6345	-21.1137	13.6345	17.1504	17.1504
34	0.125333	2.11624	31.4009	soil	0.388	16	5.87717	4.20137	13.2988	-21.7994	13.2988	16.8864	16.8864
35	0.125333	2.0755	32.4933	soil	0.388	16	5.7236	4.09159	12.9159	-22.516	12.9159	16.5613	16.5613
36	0.125333	2.02683	33.5992	soil	0.388	16	5.55081	3.96807	12.4852	-23.2654	12.4852	16.1731	16.1731
37	0.125333	1.96993	34.7195	soil	0.388	16	5.35858	3.83065	12.0059	-24.0491	12.0059	15.7191	15.7191
38	0.125333	1.90447	35.8551	soil	0.388	16	5.14658	3.6791	11.4775	-24.8682	11.4775	15.1968	15.1968
39	0.125333	1.83008	37.0073	soil	0.388	16	4.91452	3.51321	10.8989	-25.7242	10.8989	14.6033	14.6033
40	0.125333	1.74635	38.1772	soil	0.388	16	4.66204	3.33272	10.2695	-26.6186	10.2695	13.9351	13.9351
41	0.125333	1.65282	39.3663	soil	0.388	16	4.38878	3.13738	9.58823	-27.5543	9.58823	13.1889	13.1889
42	0.125333	1.549	40.5759	soil	0.388	16	4.09436	2.92691	8.85419	-28.5337	8.85419	12.3605	12.3605
43	0.125333	1.43432	41.8078	soil	0.388	16	3.77833	2.70099	8.06633	-29.5579	8.06633	11.4455	11.4455
44	0.125333	1.30815	43.0639	soil	0.388	16	3.44024	2.4593	7.22347	-30.6334	7.22347	10.4387	10.4387
45	0.125333	1.16978	44.3464	soil	0.388	16	3.07963	2.20151	6.32448	-31.7609	6.32448	9.33463	9.33463
46	0.125333	1.0184	45.6575	soil	0.388	16	2.696	1.92727	5.36806	-32.9422	5.36806	8.12666	8.12666
47	0.125333	0.853065	47.0002	soil	0.388	16	2.2888	1.63618	4.35294	-34.1811	4.35294	6.80739	6.80739
48	0.125333	0.672721	48.3775	soil	0.388	16	1.85755	1.32789	3.27779	-35.4821	3.27779	5.36833	5.36833
49	0.125333	0.475921	49.7931	soil	0.388	16	1.40124	1.00169	2.1402	-36.8478	2.1402	3.79794	3.79794
50	0.125333	0.183011	51.2515	soil	0.388	16	0.752516	0.537946	0.522926	-38.2863	0.522926	1.46059	1.46059

3.1 Earthquake condition at downstream

Slice Number	Width (m)	Weight (kN)	Angle of Slice Base	Base Material	Base Cohesion kPa	Base friction Angle	Shear stress kPa	Shear strength kPa	Base normal stress kPa	Pore pressure kPa	Eff. Normal stress kPa	Base vertical stress kPa	Eff. vertical stress kPa
1	0.125333	0.0731165	-0.736299	soil	0.388	16	0.983069	0.558903	0.596008	0	0.596008	0.583374	0.583374
2	0.125333	0.216973	0.190641	soil	0.388	16	1.553	0.882923	1.726	0	1.726	1.73117	1.73117
3	0.125333	0.356077	1.11763	soil	0.388	16	2.09477	1.19094	2.80018	0	2.80018	2.84105	2.84105
4	0.125333	0.490426	2.04491	soil	0.388	16	2.60905	1.48332	3.81983	0	3.81983	3.91298	3.91298
5	0.125333	0.620012	2.97273	soil	0.388	16	3.09641	1.7604	4.78613	0	4.78613	4.94693	4.94693
6	0.125333	0.744827	3.90133	soil	0.388	16	3.55743	2.0225	5.70019	0	5.70019	5.9428	5.9428
7	0.125333	0.864855	4.83096	soil	0.388	16	3.99262	2.26992	6.56304	0	6.56304	6.90048	6.90048
8	0.12533	0.980079	5.76187	soil	0.388	16	4.40245	2.50292	7.37561	0	7.37561	7.81984	7.81984

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9	0.125333	1.09048	6.6943	soil	0.388	16	4.78737	2.72176	8.13883	0	8.13883	8.70074	8.70074
10	0.125333	1.19603	7.62852	soil	0.388	16	5.14779	2.92667	8.85336	0	8.85336	9.54283	9.54283
11	0.125333	1.29669	8.56478	soil	0.388	16	5.48407	3.11785	9.52015	0	9.52015	10.3461	10.3461
12	0.125333	1.39244	9.50336	soil	0.388	16	5.79656	3.29551	10.1397	0	10.1397	11.1101	11.1101
13	0.125333	1.48324	10.4445	soil	0.388	16	6.08556	3.45982	10.7127	0	10.7127	11.8345	11.8345
14	0.125333	1.56904	11.3885	soil	0.388	16	6.35139	3.61095	11.2398	0	11.2398	12.5191	12.5191
15	0.125333	1.64979	12.3357	soil	0.388	16	6.59428	3.74904	11.7213	0	11.7213	13.1634	13.1634
16	0.125333	1.72545	13.2863	soil	0.388	16	6.81448	3.87423	12.1579	0	12.1579	13.7671	13.7671
17	0.125333	1.79595	14.2406	soil	0.388	16	7.0122	3.98664	12.55	0	12.55	14.3296	14.3296
18	0.125333	1.86123	15.199	soil	0.388	16	7.18764	4.08638	12.8978	0	12.8978	14.8505	14.8505
19	0.125333	1.92122	16.1618	soil	0.388	16	7.34094	4.17354	13.2017	0	13.2017	15.3292	15.3292
20	0.125333	1.97585	17.1293	soil	0.388	16	7.47227	4.2482	13.4621	0	13.4621	15.7651	15.7651
21	0.125333	2.02503	18.1018	soil	0.388	16	7.58171	4.31042	13.6791	0	13.6791	16.1574	16.1574
22	0.125333	2.06867	19.0798	soil	0.388	16	7.66941	4.36028	13.853	0	13.853	16.5057	16.5057
23	0.125333	2.10668	20.0636	soil	0.388	16	7.73542	4.39781	13.9839	0	13.9839	16.809	16.809
24	0.125333	2.13896	21.0536	soil	0.388	16	7.77981	4.42305	14.0719	0	14.0719	17.0666	17.0666
25	0.125333	2.16539	22.0502	soil	0.388	16	7.80261	4.43601	14.1171	0	14.1171	17.2775	17.2775
26	0.125333	2.18585	23.0539	soil	0.388	16	7.80386	4.43672	14.1196	0	14.1196	17.4408	17.4408
27	0.125333	2.20021	24.0651	soil	0.388	16	7.78354	4.42517	14.0793	0	14.0793	17.5553	17.5553
28	0.125333	2.20832	25.0844	soil	0.388	16	7.74165	4.40135	13.9962	0	13.9962	17.6201	17.6201
29	0.125333	2.21004	26.1123	soil	0.388	16	7.67813	4.36524	13.8703	0	13.8703	17.6338	17.6338
30	0.125333	2.20519	27.1492	soil	0.388	16	7.59295	4.31681	13.7014	0	13.7014	17.5951	17.5951
31	0.125333	2.19358	28.1959	soil	0.388	16	7.48599	4.256	13.4893	0	13.4893	17.5026	17.5026
32	0.125333	2.17504	29.2529	soil	0.388	16	7.35716	4.18276	13.2339	0	13.2339	17.3546	17.3546
33	0.125333	2.14934	30.321	soil	0.388	16	7.20637	4.09703	12.9349	0	12.9349	17.1495	17.1495
34	0.125333	2.11624	31.4009	soil	0.388	16	7.03347	3.99873	12.5921	0	12.5921	16.8855	16.8855
35	0.125333	2.0755	32.4933	soil	0.388	16	6.83826	3.88775	12.2051	0	12.2051	16.5604	16.5604
36	0.125333	2.02683	33.5992	soil	0.388	16	6.62061	3.76401	11.7735	0	11.7735	16.1721	16.1721
37	0.125333	1.96993	34.7195	soil	0.388	16	6.38029	3.62738	11.2971	0	11.2971	15.7182	15.7182
38	0.125333	1.90447	35.8551	soil	0.388	16	6.11707	3.47773	10.7752	0	10.7752	15.1959	15.1959
39	0.125333	1.83008	37.0073	soil	0.388	16	5.83071	3.31493	10.2074	0	10.2074	14.6023	14.6023
40	0.125333	1.74635	38.1772	soil	0.388	16	5.52095	3.13882	9.59323	0	9.59323	13.9342	13.9342
41	0.125333	1.65282	39.3663	soil	0.388	16	5.18748	2.94923	8.9321	0	8.9321	13.188	13.188
42	0.125333	1.549	40.5759	soil	0.388	16	4.83001	2.746	8.22332	0	8.22332	12.3596	12.3596
43	0.125333	1.43432	41.8078	soil	0.388	16	4.44823	2.52895	7.46637	0	7.46637	11.4446	11.4446
44	0.125333	1.30815	43.0639	soil	0.388	16	4.04176	2.29786	6.66049	0	6.66049	10.4379	10.4379
45	0.125333	1.16978	44.3464	soil	0.388	16	3.6103	2.05256	5.80502	0	5.80502	9.33388	9.33388

46	0.125333	1.0184	45.6575	soil	0.388	16	3.15347	1.79284	4.89926	0	4.89926	8.12596	8.12596
47	0.125333	0.853065	47.0002	soil	0.388	16	2.67093	1.5185	3.94254	0	3.94254	6.80677	6.80677
48	0.125333	0.672721	48.3775	soil	0.388	16	2.16237	1.22937	2.9342	0	2.9342	5.36781	5.36781
49	0.125333	0.475921	49.7931	soil	0.388	16	1.62699	0.92499	1.87271	0	1.87271	3.79752	3.79752
50	0.125333	0.183011	51.2515	soil	0.388	16	0.871384	0.495407	0.374573	0	0.374573	1.46035	1.46035

3.2 Earthquake condition at upstream

Slice Number	Width (m)	Weight (kN)	Angle of Slice Base	Base Material	Base Cohesion kPa	Base friction Angle	Shear stress kPa	Shear strength kPa	Base normal stress kPa	Pore pressure kPa	Eff. Normal stress kPa	Base vertical stress kPa	Eff. vertical stress kPa
1	0.170493	0.352925	-52.4005	soil	0.388	16	1.0422	0.593577	0.716933	0	0.716933	2.07028	2.07028
2	0.170493	1.04001	-50.805	soil	0.388	16	2.32015	1.32143	3.25526	0	3.25526	6.10054	6.10054
3	0.170493	1.50187	-49.2623	soil	0.388	16	3.22905	1.83909	5.06054	0	5.06054	8.80966	8.80966
4	0.170493	1.85321	-47.7664	soil	0.388	16	3.9587	2.25466	6.5098	0	6.5098	10.8705	10.8705
5	0.170493	2.17352	-46.3125	soil	0.388	16	4.64947	2.64808	7.88185	0	7.88185	12.7494	12.7494
6	0.170493	2.46525	-44.8962	soil	0.388	16	5.30192	3.01968	9.17775	0	9.17775	14.4605	14.4605
7	0.170493	2.73049	-43.5141	soil	0.388	16	5.91667	3.36981	10.3988	0	10.3988	16.0163	16.0163
8	0.170493	2.97105	-42.1629	soil	0.388	16	6.49436	3.69883	11.5462	0	11.5462	17.4273	17.4273
9	0.170493	3.18849	-40.84	soil	0.388	16	7.03556	4.00707	12.6212	0	12.6212	18.7027	18.7027
10	0.170493	3.38421	-39.543	soil	0.388	16	7.5409	4.29488	13.6249	0	13.6249	19.8507	19.8507
11	0.170493	3.5594	-38.2699	soil	0.388	16	8.0109	4.56257	14.5585	0	14.5585	20.8783	20.8783
12	0.170493	3.71515	-37.0187	soil	0.388	16	8.44611	4.81044	15.4229	0	15.4229	21.7918	21.7918
13	0.170493	3.85242	-35.7878	soil	0.388	16	8.84701	5.03877	16.2192	0	16.2192	22.597	22.597
14	0.170493	3.97207	-34.5757	soil	0.388	16	9.21404	5.24781	16.9482	0	16.9482	23.2988	23.2988
15	0.170493	4.07487	-33.381	soil	0.388	16	9.54762	5.4378	17.6107	0	17.6107	23.9017	23.9017
16	0.170493	4.16152	-32.2025	soil	0.388	16	9.84811	5.60894	18.2076	0	18.2076	24.4099	24.4099
17	0.170493	4.23264	-31.0391	soil	0.388	16	10.1158	5.76143	18.7394	0	18.7394	24.827	24.827
18	0.170493	4.28882	-29.8898	soil	0.388	16	10.3512	5.89545	19.2067	0	19.2067	25.1565	25.1565
19	0.170493	4.33056	-28.7536	soil	0.388	16	10.5543	6.01113	19.6102	0	19.6102	25.4013	25.4013
20	0.170493	4.35835	-27.6296	soil	0.388	16	10.7254	6.1086	19.9501	0	19.9501	25.5643	25.5643
21	0.170493	4.37262	-26.517	soil	0.388	16	10.8648	6.18798	20.2269	0	20.2269	25.6479	25.6479
22	0.170493	4.37377	-25.4151	soil	0.388	16	10.9725	6.24934	20.441	0	20.441	25.6546	25.6546
23	0.170493	4.36215	-24.3232	soil	0.388	16	11.0488	6.29277	20.5923	0	20.5923	25.5864	25.5864
24	0.170493	4.33812	-23.2407	soil	0.388	16	11.0936	6.31829	20.6814	0	20.6814	25.4454	25.4454
25	0.170493	4.30196	-22.1668	soil	0.388	16	11.107	6.32596	20.7081	0	20.7081	25.2333	25.2333
26	0.170493	4.25397	-21.1011	soil	0.388	16	11.0892	6.31577	20.6726	0	20.6726	24.9517	24.9517
27	0.170493	4.1944	-20.043	soil	0.388	16	11.0399	6.28772	20.5747	0	20.5747	24.6023	24.6023
28	0.170493	4.12349	-18.992	soil	0.388	16	10.9592	6.24177	20.4145	0	20.4145	24.1863	24.1863
29	0.170493	4.04146	-17.9475	soil	0.388	16	10.8471	6.17789	20.1918	0	20.1918	23.7052	23.7052
30	0.170493	3.94851	-16.9092	soil	0.388	16	10.7033	6.09601	19.9062	0	19.9062	23.16	23.16
31	0.170493	3.84483	-15.8766	soil	0.388	16	10.5278	5.99604	19.5576	0	19.5576	22.5518	22.5518
32	0.170493	3.73059	-14.8493	soil	0.388	16	10.3203	5.87788	19.1455	0	19.1455	21.8817	21.8817
33	0.170493	3.60594	-13.8268	soil	0.388	16	10.0807	5.74139	18.6695	0	18.6695	21.1505	21.1505
34	0.170493	3.47102	-12.8088	soil	0.388	16	9.8086	5.58644	18.1291	0	18.1291	20.3591	20.3591
35	0.170493	3.32597	-11.7949	soil	0.388	16	9.50381	5.41285	17.5238	0	17.5238	19.5083	19.5083
36	0.170493	3.17089	-10.7847	soil	0.388	16	9.16598	5.22044	16.8527	0	16.8527	18.5987	18.5987
37	0.170493	3.0059	-9.77796	soil	0.388	16	8.7947	5.00898	16.1153	0	16.1153	17.6309	17.6309
38	0.170493	2.83108	-8.77422	soil	0.388	16	8.38959	4.77825	15.3106	0	15.3106	16.6055	16.6055
39	0.170493	2.64653	-7.77318	soil	0.388	16	7.95015	4.52797	14.4378	0	14.4378	15.523	15.523
40	0.170493	2.45232	-6.77452	soil	0.388	16	7.47588	4.25785	13.4958	0	13.4958	14.3838	14.3838
41	0.170493	2.2485	-5.77793	soil	0.388	16	6.96623	3.96758	12.4835	0	12.4835	13.1884	13.1884
42	0.170493	2.03514	-4.78309	soil	0.388	16	6.42056	3.6568	11.399	0	11.3996	11.9369	11.9369

									6				
43	0.170493	1.81229	-3.7897	soil	0.388	16	5.83824	3.32514	10.243	0	10.243	10.6297	10.6297
44	0.170493	1.57997	-2.79744	soil	0.388	16	5.21852	2.97218	9.01209	0	9.01209	9.26708	9.26708
45	0.170493	1.33822	-1.80602	soil	0.388	16	4.56061	2.59747	7.70535	0	7.70535	7.84915	7.84915
46	0.170493	1.08705	-0.815149	soil	0.388	16	3.86363	2.20051	6.32097	0	6.32097	6.37595	6.37595
47	0.170493	0.826485	0.175483	soil	0.388	16	3.12667	1.78078	4.8572	0	4.8572	4.84762	4.84762
48	0.170493	0.556519	1.16617	soil	0.388	16	2.34871	1.3377	3.31198	0	3.31198	3.26417	3.26417
49	0.170493	0.277147	2.1572	soil	0.388	16	1.52864	0.870632	1.68313	0	1.68313	1.62555	1.62555
				Cement									
50	0.0626824	0.0251959	2.83516	concrete lining	20	10	35.7888	20.3833	2.17402	0	2.17402	0.401643	0.401643

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ANNEXURE_VIII

राष्ट्रीय प्रौद्योगिकी संस्थान, उत्तराखण्ड
National Institute of Technology, Uttarakhand

S.E. (OPN-IV) Receipt No. 6176 Date - 8 FEB 2024

SR CHIEF CHEMIST R.NO 1773 DT 7 FEB 2024

मु.अ. (उ.) सारनी आ.क्र. 8973 दिनांक - 2 FEB 2024

Date: 15.01.2024

To,
Prashant Gargava
Member Secretary
Central Pollution Control Board (CPCB)
Parivesh Bhawan, East Arjuna Nagar,
Delhi - 110032

Subject: Revised Ash Disposal Compliance Report for Satpura Thermal Power Station, Sarni, MPPGCL, Betul, Madhya Pradesh-460447

Dear Sir/madam,

This is to acknowledge the receipt of your email dated 03/01/2024, requesting the submission of the revised Ash Disposal Compliance report along with the certified copy of Annual Implementation Report for Satpura Thermal Power Station, Sarni, operated by Madhya Pradesh Power Generating Co. Ltd. (MPPGCL) in Betul district of Madhya Pradesh, to the Central Pollution Control Board (CPCB).

As per your request, we have enclosed the revised report and the certified copy of Annual Implementation Report as Annexure to this email. This report is based on the previous report that was submitted to CPCB and State Pollution Control Boards (SPCBs) on 01/12/2023.

We appreciate your interest and concern in this matter. We are available to answer any queries or address any issues that you may have regarding the report.

Sincerely

Dr. Amardeep
Department of Civil Engineering
NIT Uttarakhand

SR. CHIEF CHEMIST STPS MPPGCL No. 1029 DT. 07/02/24

EE(AU)

Copy to: -

1. The Regional Officer, M.P. Pollution Control Board, Opposite Mullaji petrol pump, Parasia road, Chhindwara (M.P.) – 480001. Email – romppcbcwh@gmail.com
2. Member Secretary, M.P. Pollution Control Board, E-5, Arera Colony, ParyavaranParisar, Bhopal-16 Email – it_mppcb@rediffmail.com, hq-mppcb@mp.gov.in
3. The Chief Engineer, Satpura Thermal Power Station, Madhya Pradesh Power Generating Company Limited, Sarni District- Betul (M.P.) – 460447. Email – stps1@rediffmail.com

8/2/24 S.E. OPN-IV

chief chemist. SE(OPN)-IV 07.02

Missent. forwarded to the SE(OPN)-IV.

CE(Gen)

Dr. Amardeep
Assistant Professor
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Ash-Disposal Compliance Audit Report for STPS, Sarni

Brief:

The Satpura Thermal Power Station (STPS), Sarni (MPPGCL), Betul, Madhya Pradesh was inspected and audited for fly ash disposal on 12/10/2023. The plant has a total capacity of 1330MW which is consisting of three phases PH-II, PH-III and PH-IV. PH-II and PH-III are out of operation and only PH-IV (500 MW) is operational and contributing to ash generation. The PH-IV of power plant has been Operational since August 2013. The primary fuel source was Coal. The ash generated for F.Y. 2022-23 was 9,27,613MT. The ash stored in ash-ponds at the start of F.Y. 2022-23 was 57,48,898 MT. As per the discussion and visual inspection of the plant, the fly ash generated is collected from Electrostatic precipitators (ESP) to the dry silo. There are also arrangements made in the ESP hoppers for direct transfer to jumbo bags (if required). The installed capacity of dedicated silo for storage of dry fly ash is 2,400MT which is sufficient for approximately 20 hrs of fly-ash generated at peak load. The bottom ash is collected and milled into fine particles and then transferred to the Bottom ash pond.

The ash collected in silos is disposed of using three methods: Dry-Ash disposal using bulkers, Wet-conditioned fly-ash disposal using dumper trucks and lastly the excess ash transported to ash-ponds in the form of Highly Concentrated Slurry Disposal (HCSD) using Pumps (GEHO).The silo contains two different hoppers to facilitate the above-mentioned methods of disposal. The water conditioning is done using pumps which were installed prior to one of the hoppers. Additionally, there are arrangements made to condition the dumper truck using water and then covering it. The loading, unloading, transport, storage, and disposal of ash is done in an environmentally sound manner and that all appropriate precautions to prevent air and water pollution are taken.

Brief Profile for the Plant:

Satpura Thermal Power Station, situated in Sarni within the Betul district of Madhya Pradesh, India, is a coal-fired power plant that stands as a pivotal force in the region's power generation landscape. Commissioned in the 1960s, this power station has been instrumental in fulfilling the energy needs of central India and is operated by Madhya Pradesh Power Generating Company Limited (MPPGCL). With a substantial total installed capacity of 1330 MW, the plant comprises eleven units, of which five have been decommissioned and dismantled, four are non-operational, and the remaining two are actively contributing to the power grid.

Dependent on coal as its primary fuel source, the power plant encompasses multiple units with diverse capacities, collectively playing a significant role in the overall installed capacity. To adapt to evolving standards and environmental concerns, Satpura Thermal Power Station has undergone strategic

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modernization efforts aimed at enhancing operational efficiency while mitigating environmental impacts.

The power station's advantageous location near the Tawa Reservoir ensures a reliable water supply for cooling purposes. In adherence to stringent environmental standards, the facility employs advanced technologies for emission control, demonstrating a commitment to environmental preservation.

Observations:

1. The records of Coal consumption were checked from the record and found to be 24,18,607MT. The average ash content in the Fuel from the feed chemical analysis was reported to be varied from 35-41%, same was verified using records available. Thus, the fly ash generated as per this data is verified with the data provided in the Fly-ash Annual utilization report for F.Y. 2022-23.
2. The fly ash generated was disposed of in compliance to MoEF&CC Notification dated 31.12.2021 & amended on 30.12.2022 in the following areas:

1	Bricks manufacturing industry	21.6%
2	Cement industry	1.2%
3	Concrete manufacturing industry	5.3%
4	Road Construction work (local and NHAI)	11.2%
5	Trading	0.6%
6	Rail Mode	0.3%
7	Filling of Void in Reclamation of Land	59.8%

   The total ash disposed was 12,61,575 MT (Current Year and stored in operational ash bunds). Thus the total Ash-utilized is 136% (current year ash was 100% and 36% was of stored ash) which is more than mandated publication of the gazette.
3. The net ash disposal into operational ash ponds was verified from the records and it is found that 3,33,962 MT has been used from Ash Ponds.
4. There are three ash ponds namely
   - Ash Pond-1, area 373 Hectares,
   - Ash Pond-2 area 130 Hectares,
   - Ash Pond-3 area 111 Hectares respectively.
5. In compliance to MoEF&CC Notification dated 31.12.2021, the Ash Pond 1 of 373 Hectares have been surrendered to the forest department.
6. The Ash Ponds were visited for inspection and found to be as per drawings. The capacity of active ash ponds is 43,00,000 M^3 (of 130 Hectare Ash Pond) and 80,00,000 M^3 out of which 54,14,936 MT has been unutilized. The same was verified.

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7. The water reclamation & recirculation plant was visited. In F.Y. 2022-23 there were no ash-disposed to the ash ponds.

Suggestions:

1. Since at present approximately 60% of generated current Ash is being utilized in filling of voids for land reclamation of Ash Bunds. Therefore, after the expiry of permission of Forest Department (31.03.2024) for such fillings, other avenues of ash disposal need to be explored.
2. There are several mines within 300 km radius of the Power Plant which can be utilized for backfilling of mine voids or mixing of ash with external overburden dumps, under extended producer responsibility. But despite rigours efforts from the Plant Administration the same could not be materialized.
3. The administration of the plant has initiated the disposal of ash through railway network as well. This could further enhance the utilization of the ash generated.
4. STPS Sarni is exploring all possibilities for filling of coal U/G mines at WCL with ash water.

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Photographs:

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Annexure

Ash Compliance Report (for the period 1st April 2022-31st March 2023)

Sl.No.	Details	
1	Name of Power Plant	SATPURA THERMAL POWER STATION, SARNI
2	Name of Company	MADHYPRADESH POWER GENERATING CO. LTD.
3	District	BETUL
4	State	MADHYPRADESH
5	Postal Address for communication	SATPURA THERMAL POWER STATION, M.P.P.G.C.L., P.O. SARNI, DISTT- BETUL (M.P.) 460447
6	E-mail:	stps1@rediffmail.com
7	Power plant installed capacity (MW)	PH-II (1x200+1x210= 410MW), PH-III (2x210= 420MW), PH-IV(2x250= 500MW) = 1330 MW
8	Plant Load Factor (PLF)	34.06%
9	No. of units generated (MWh)	3968034
10	Total area under power (ha): (including area under ash ponds)	3382.91 Hectare
11	Quantity of coal consumption during reporting period (Metric Tons per Annum)	2418607
12	Average ash content in percentage (%):	38.35
13	Quantity of current ash generation during reporting period (Metric Tons per Annum)	927613
	Fly ash (Metric Tons per Annum)	742094
	Bottom Ash (Metric Tons per Annum)	185519
14	Capacity of dry fly ash storage silo (s) (Metric Tons):	1200 X 2 = 2400 MT
15	Details of utilization of current ash generated during reporting period	
(a)	Total quantity of current ash utilized (MTPA) during reporting period :	927613
(b)	Quantity of fly ash utilized (MTPA) :	742094
(i)	Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels)	50157
(ii)	Cement manufacturing :	15034
(iii)	Ready mix concrete :	67052
(iv)	Ash and Geo-polymer based construction material :	-
(v)	Manufacturing of sintered or cold bonded ash aggregate:	-
(vi)	Construction of roads, road and fly over embankment :	6666
(vii)	Construction of dams :	-
(viii)	Filling up of low lying area:	-
(ix)	Filling of mine voids :	-
(x)	Use in overburden dumps :	-
(xi)	Agriculture :	-
(xii)	Construction of shoreline protection structures in coastal districts :	-

(xiii)	Export of ash to other countries:	-
(xiv)	Filling of voids in Ash Bunds (Through Geho Pumps HCSD)	603185
(c)	Quantity of bottom ash utilized (MTPA):	185519
(i)	Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels)	34723
(ii)	Cement manufacturing :	-
(iii)	Ready mix concrete :	-
(iv)	Ash and Geo-polymer based construction material :	-
(v)	Manufacturing of sintered or cold bonded ash aggregate:	-
(vi)	Construction of roads, road and fly over embankment :	-
(vii)	Construction of dams :	-
(viii)	Filling up of low lying area:	-
(ix)	Filling of mine voids :	-
(x)	Use in overburden dumps :	-
(xi)	Agriculture :	-
(xii)	Construction of shoreline protection structures in coastal districts :	-
(xiii)	Export of ash to other countries :	-
(xiv)	Filling of voids in Ash Bunds (Through Ash Pump Series)	150796
16	Percentage utilization of current ash generated during reporting period (%)	100%
17	Details of disposal of ash disposed in ash pond	-
(a)	Total quantity of ash disposed in ash pond(s) (Metric Tons) as on 31st March 2022 (excluding reporting period):	85046542
(b)	Quantity of ash disposed in ash pond (s) during reporting period	0
(c)	Total quantity of water consumption for slurry discharge into ash ponds during reporting period (m3)	1,947,866
(d)	Total number of ash ponds :	03
	(i) Active :	02
	(ii) Exhausted (yet to be reclaimed):	01
	(iii) Reclaimed :	Nil
(e)	Total area under ash pond (ha):	614 Hectare
18	Individual ash pond details	
	Ash pond-1,2 etc (please provide below mentioned details separately, if number of ash pond is more than one)	(i) 373 Hectare
		(ii) 130 Hectare
		(ii) 111 Hectare

(a)	Status : Under construction or active or Exausted or Reclaimed	(i) 373 Ha. - Surrender of old ash bund (373 Ha.) to MP Forest Deptt. has completed on dtd. 29/11/2022 and they have given the permission for filling of voids up to 30/09/2023. Reclaimation under the guidance of MP forest in nearly 100 hectare area is in progress.
		(ii) 130 & 111 Hectare active.
(b)	Date of start of ash disposal in ash pond (DD/MM/YYYY or MMYYYY):	(i) 130 Hectare - 08/2013
		(ii) 111 Hectare - 11/2015
(c)	Date of stoppage of ash disposal in ash pond after completing its capacity (DD/MM/YYYY or MMYYYY): (Not applicable for active ash ponds)	373 hectare - 11/2015,
(d)	area (hectares):	130 Hectare & 111 Hectare
(e)	dyke height (m):	130 Hect. - Average 3 Meter & 111 Hect. - Avergare 10 Meter
(f)	volume (m3)	130 Hect.- 43,00,000 & 111 Hect. - 80,00,000
(g)	quantity of ash disposed as on 31st March 2023 (Metric Tons):	130 Hect.- 31,99,286
		111 Hect. - 22,15,650
		As per ammendment in MoEF&CC notification dated: 30/12/2022, the ash stored within the permitted area of an operational ash pond (i.e.@0.1 ha/MW) for temporary storage shall not constitute / treated as the legacy ash.
(h)	available volume in percentage (%) and quantity of ash can be further disposed (Metric Tons)	130 Hect.- (37.74%) 19,39,214 MT
		111 Hect. - (76.82%) 73,44,350 MT
(i)	expected life of ash pond (number of years and months)	130 Hect. - Approximate 02 Year & 111 Hect. - 07 Year 07 Months (Depending on Ash generation and ash disposal at ash dyke.)
(j)	co-ordinates (Lat and Long): (please specify minimum 4 co-ordinates)	P1 - 22°6'20" N & 78°8'11" E
		P2 - 22°6'30" N & 78°6'54" E
		P3 - 22°5'36" N & 78°7'01" E
		P4 - 22°6'00" N & 78°7'16" E
(k)	type of lining carried in ash pond: HDPE lining or LDPE lining or clay lining or No lining	130 Hect. - HDPE Lining & 111 Hect. - Cement concrete Lining.
(l)	mode of disposal: Dry disposal or wet slurry (in case of wet slurry please specify whether HCSD or MCSD or LCSD)	(i) Dry disposal available only at Silo. (ii) Wet slurry (HCSD) to Ash Dyke.
(m)	Ratio of ash : water in slurry mix	1:5 (Bottom Ash) and 70:30 (HCSD)
(n)	Ash water recycling system (AWRS) installed and functioning : Yes or No	Yes
(o)	Quantity of wastewater from ash pond discharged into land or water body (m3) :	-
(p)	Last date when the dyke stability study was conducted and name of the organisation who conducted the study:	I.I.T. Indore on dated 19.11.2019. Tender has been opened and order is being placed on IIT Indore. They are likely to complete the study by the end of may-2023.
(q)	Last date when the audit was conducted and name of the organisation who conducted the audit :	-

19	Quantity of legacy ash utilised	333962			
	i. Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels) :	199578			
	ii. Cement manufacturing :	–			
	iii. Ready mix concrete :	–			
	iv. Ash and Geo-polymer based consruction material :	–			
	v. Manufacturing of sintered or cold bonded ash aggregate :	–			
	vi. Construction of roads, road and flyover embankment :	134384			
	vii. Construction of dams :	–			
	viii. Filling up of low lying area :	–			
	ix. Filling of mine voids :	–			
	x. Use in overburden dumps:	–			
	xi. Agriculture :	–			
	xii. Construction of shoreline protection structures in coastal districts :	–			
	xiii. Exports of ash to other countries :	–			
	xiv. Others (please specify) Embankment at ash dyke	–			
20	Summary :				
	Details	Quantity generated (MTP)	Quantity utilised (MTP) and (%)		Balance qunatity (MTP)
	Current ash during reporting period	927613	927613	100.00%	0
	Stored Ash as on 31.03.2022	5748898	333962	36.00%	5414936
		79,297,644	79297644 (Bund Surrendered to Forest Deppt.	–	0
	Total	85974155	80559219	–	5414936
21	Any other information :	(1) The old ash bund of 373 Ha. (Stored ash Quantity : 79297644 MT) has been handed over to MP Forest Deptt. for reclaimation / stabilization. (2) The ash stored within the permitted area of operational ash bund for temporary storage shall not constitute / treated as legacy ash. (3) The area available in excess (44.5 Ha) shall be reclaimed / stabilized within stipulated time line as per MoEF&CC Notification dated 30.12.2022.			
	Soft copy of the annual compliance report, and shape files of power plant and ash ponds may be e-mailed to :- moefcc-coalash@gov.in				
22	Signature of Authorised signatory	(C.P. Thakral) NODAL OFFICER (FLY ASH UTILIZATION) STPS, MPPGCL, SARNI			

Audited on 12/10/23
verified

SHASHI NARAYAN
Assistant Professor
Department of Civil Engineering
NIT -hand

ok

Dr. Amardeep
Assistant Professor
Department of Civil Engineering
Institute of Technology , Uttarakhand

सत्यमेव जयते

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय, भारत सरकार)
NATIONAL HIGHWAYS AUTHORITY OF INDIA
(Ministry of Road Transport & Highways, Govt. of India)

परियोजना क्रियान्वयन इकाई - एच.आई.जी.-5/ई-3, अरेरा कॉलोनी, गणेश मंदिर के पास, पुराना हबीबगंज नाका, भोपाल (म.प्र.) - 462016
Project Implementation Unit - HIG-5/E-3, Arera Colony, Near Ganesh Mandir, Old Habibganj Naka, Bhopal (M.P.) - 462016
दूरभाष/Phone : 0755-2465604 & 05, ई-मेल /E-mail: bhopal@nhai.org, वेबसाईट /Website: www.nhai.gov.in

NHAI/PIU/BPL/NGT/2024/ 25506 Date 08/07/2024

ANNEXURE-IX

To,

The Regional Officer,
Madhya Pradesh Pollution Control Board,
In front of Mullaji Petrol Pump,
Parasia Road, Chhindwara, MP
Ph. No. 07162-220311/12,
Email: ropcb-chhindwara@mp.gov.in

Sub:- Notice issued by the Hon'ble NGT, Central Zone in the matter OA No 115/2024 (CZ), applicant Rashid Noor Khan Vs. MoEF&CC and Others - **reg.**

References:

1. Your office letter no. 638 dated 27.06.2024
2. This office letter no. 25470 dated 02.07.2024
3. PIU Nagpur Mail dated 06.07.2024

Sir,

In reference to the above cited subject, please refer your office letter dated 27.06.2024 vide which this office has been directed to send desired information so that it can be presented before the joint inspection committee constituted by Hon'ble NGT.

2. Status of flyash utilization by NHAI in various road construction works has been sought for following projects-

1. Betul to Bhopal under PIU Bhopal & Harda
2. Betul to Harda under PIU Harda
3. Betul to Nagpur under PIU Nagpur-2

3. The details were sought from all PIUs in which information has been received except PIU Nagpur-2. The same has been informed vide this office letter dated 02.07.2024.

4. Now, PIU Nagpur-2 vide mail dated 06.07.2024 has provided the information of the flyash used in the project Betul to Nagpur. The information is as follows in the desired format-

Name of the road stretch	Road Construction Started on	Work completion date	Length of Road	No. of lanes	Qty of Flyash supplied in Metric Tonn	Period of Flyash Utilization	Name of Power Plant	Status of any payment made to Power Plant
Obedullaganj Itarsi Exclusing Ratapani Section (NH-46)	14.11.2017	07.12.2021	46.300	4	10912	14.11.2017 to 07.12.2021	STPSS, Sarni	Nil
Ratapani Section (NH-46)	28.09.2022	25.10.2024	12.380	4	1668.9	28.09.2022 to 25.10.2024	NTPC, Gadarwara	Nil
Itarsi Betul Section (NH-46)	22.02.2018	30.09.2024	73.955	4	109120	22.02.2018 to 30.09.2024	STPSS, Sarni	Nil
Harda Betul P1	10.09.2021	07.09.2023	30.000	4	660000 57200	10.09.2021 to 07.09.2023	NTPC, Gadarwara SSTPP, Dongalia	Nil
Harda Betul P3	15.09.2021	13.12.2023	40.248	4	266200	15.09.2021 to 13.12.2023	NTPC, Gadarwara	Nil
Betul Nagpur	20.01.2012	Feb-2015	174.512	4	8,55,304 (MP Section) 25,68,583 (MH Section)	20.01.2012 to Feb-2015	STPSS, Sarni (MP Section) Khaparkheda Power Plant, Koradi Power Plant (MH Section)	Nil

Note- The quantities has been provided by PIU Harda is in Cum unit. The same has been converted to MT taking density of 1.1 gm/cc.

(Devansh Nuwal)
Project Director
NHAI, PIU-Bhopal

Copy to : The Regional Officer, NHAI, RO-MP, Bhopal kind information and necessary action.

FORM – X
(See Rule - 31)
REPORT BY THE STATE BOARD ANALYST

ANNEXURE_X

Report No. - 08/724
Dated - 15/07/2024

I hereby certify that I **Dr.AjayKhare** State Board Analyst duly appointed under sub – section (3) of Section 53 of the Water (Prevention and Control of Pollution) Act. 1974 (6 of 1974) received on the **10th day of July 2024** from Lab in charge, Regional Office, M. P. Pollution Control Board, Jabalpur (M.P.), a **Water sample from Toe Train of 130Hec.Ash pond** of **M/S Satpura Thermal Power Station, Sarni, Betul (M.P.)** for theanalysis. The sample was in a condition fit for analysis reported below.

I further certify that I have analysed the aforementioned sample on **15/07/2024** and declare the result of analysis to be as follows: -

Sr.No.	Parameter	Unit	Result	Method used for analysis
1.	pH	-	**7.45**	By pH Meter
2.	Colour	fazan	**Colourless**	-
3.	Chloride	mg / l	**69.98**	By Argentometric Method
4.	T. Solids	mg / l	**760.0**	By Gravimetric Method
5.	T.Dissolved Solids	mg / l	**670.0**	By Gravimetric Method
6.	T.Suspended Solids	mg / l	**90.0**	By Gravimetric Method
7.	B.O.D. (3 days' at 27°C)	mg / l	**22.0**	By B.O.D Incubator
8.	C.O.D.	mg / l	**160.0**	By Open Reflux Method
9.	Copper	mg / l	**0.018**	By AAS
10.	Lead	mg / l	**0.001**	By AAS

The Condition of the seals, fastening and container on receipt was proper.

Signed this 15th day of July.2024

Dr.AjayKhare
Laboratory Incharge
ROMPPCB, Jabalpur

Address :-

Dr.AjayKhareSTATE BOARD ANALYST
Scientist
Regional Office
M.P.Pollution Control Board
Vijay Nagar, Jabalpur (M.P.)

To,

Lab Incharge
Regional Office
M.P.Pollution Control Board
Jabalpur (M.P.)

FORM – X
(See Rule - 31)
REPORT BY THE STATE BOARD ANALYST

Report No. - 09/724
Dated - 15/07/2024

I hereby certify that I **Dr.AjayKhare** State Board Analyst duly appointed under sub – section (3) of Section 53 of the Water (Prevention and Control of Pollution) Act. 1974 (6 of 1974) received on the **10th day of July 2024** from Lab in charge, Regional Office, M. P. Pollution Control Board, Jabalpur (M.P.), a **Water sample from Toe Train of 111Hec. Ash pond** of **M/S Satpura Thermal Power Station, Sarni, Betul (M.P.)** for theanalysis. The sample was in a condition fit for analysis reported below.

I further certify that I have analysed the aforementioned sample on **15/07/2024** and declare the result of analysis to be as follows: -

Sr.No.	Parameter	Unit	Result	Method used for analysis
1.	pH	-	**7.30**	By pH Meter
2.	Colour	fazan	**Colourless**	-
3.	Chloride	mg / l	**79.98**	By Argentometric Method
4.	T. Solids	mg / l	**850.0**	By Gravimetric Method
5.	T.Dissolved Solids	mg / l	**755.0**	By Gravimetric Method
6.	T.Suspended Solids	mg / l	**95.0**	By Gravimetric Method
7.	B.O.D. (3 days' at 27°C)	mg / l	**24.0**	By B.O.D Incubator
8.	C.O.D.	mg / l	**184.0**	By Open Reflux Method
9.	Copper	mg / l	**0.02**	By AAS
10.	Lead	mg / l	**0.001**	By AAS

The Condition of the seals, fastening and container on receipt was proper.

Signed this 15th day of July.2024

Dr.AjayKhare
Laboratory Incharge
ROMPPCB, Jabalpur

Address :-

Dr.AjayKhareSTATE BOARD ANALYST
Scientist
Regional Office
M.P.Pollution Control Board
Vijay Nagar, Jabalpur (M.P.)

To,

Lab Incharge
Regional Office
M.P.Pollution Control Board
Jabalpur (M.P.)

ANEXURE_XI

Photographs taken during 10.7.2024

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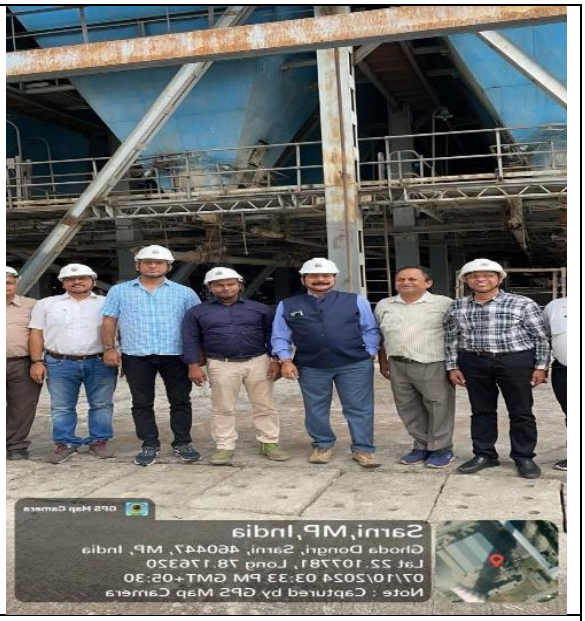
<td>  </td>
</tr>
<tr>
<td>View of the M/s Satpura Thermal Power Plant, Sarani</td>
<td>Joint Committee visiting ESP area</td>
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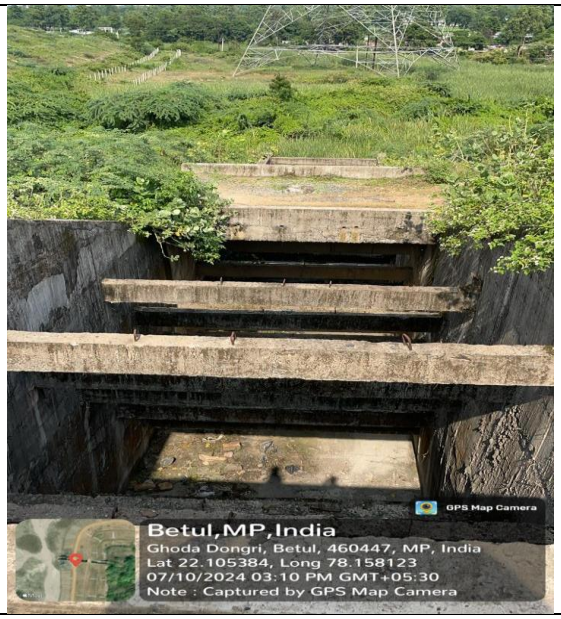
<td> 
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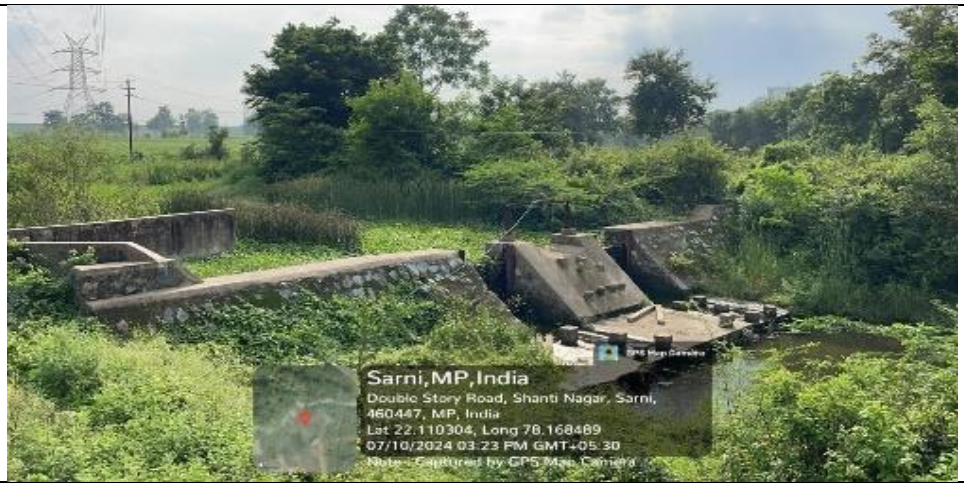
<tr>
<td>The ongoing filling of voids at 373 Ha ash dyke</td>
<td>The overflow channel constructed at 111 Ha dyke require redesigning</td>
</tr>
</table>

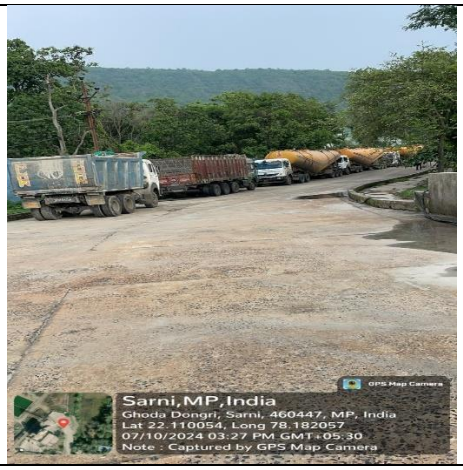


The check dam to pump the water to AWRS pumping station

The view of the fly ash silo

Telescopic arrangement to fill ash in the bulkers

Mist sprinkling to control the dust pollution near the ash silo



The concreate road near ash filling pints were found clean