DB Power Limited

CIN: U40109MP2006PLC019008
Business Office : Village – Badadarha, Post – Kanwali, Dist – Sakti, Chhattisgarh, PIN – 495695
Tel. :- 07762-252569

No. DBPL/ENV/179 Date: 21.04.2025

To,
Inspector General of Forests
Ministry of Environment, Forest and Climate Change,
Integrated Regional Office, AranyaBhawan,
North Block, Sector-19, Naya Raipur,
Atal Nagar, Chhattisgarh – 492002
iro.raipur-mefcc@gov.in, moefcccoalash@gov.in

Sub- Annual certification of operational dyke and Fly ash Generation and Utilization report for the year 2024-25

Dear Sir,

With reference to the above cited subject for 2 x600MW Thermal Power Plant located at Badadarha, Chhattisgarh, Please find the attached:

a) Annual certification/study of our only available operational ash dyke and
b) Fly Ash Generation and Utilization compliance report FY 2024-25 in the prescribed format as per Fly ash Notification 31.12.2021

This is for your information and record please.

Thanking you

Sincerely Yours,

For M/s. DB Power Limited

D.B. POWER LIMITED * BADADARHA *

Head- Environment

Encl -As above
CC:-

The Member Secretary,Central Pollution Control Board,PariveshBhawan, East Arjun Nagar, New Delhi-110032- mscb.cpcb@nic.in&nazim.cpcb@nic.in

The Member Secretary,CECB, ParyavasBhavan, North Block Sector-19, Atal Nagar, Raipur (C.G.) 492002 -hocecb@gmail.com

The Regional Officer,CECB, VyaparVihar, Near Pt. Dindayal Upadhyay Garden Dist: Bilaspur (C.G.)-cecb.robilaspur@gmail.com

Ash Compliance Report
(For the period 1st April 24 -31st March-25)

Sl.No	Details		Response
1	Name of Power Plant		DB POWER LIMITED
2	Name of the company		DB POWER LIMITED
3	District		Sakti
4	State		Chhattisgarh
5	Postal address for communication		Village: Badadarha, Block & Tehsil: Dabhra, District: Sakti- 495695, Chhattisarh
6	E-mail		s.chakraborty@dbpower.in
7	Power Plant Installed Capacity(MW)		1200 MW(2x600MW)
8	Plant Load Factor(PLF)		84.83
9	No.of Units generated(MWh)		8917493
10	Total Area Under Power Plant(ha)(including area under ash ponds)		254.952
11	Quantity of coal consumption during reporting period(Metric Tons per Annum)		6040573
12	Average ash content in percentage(percent)		43.11
13	Quantity of current ash generation during reporting period (Metric Tons per Annum) Fly ash (Metric Tons per Annum) Bottom Ash (Metric Tons per Annum)		Total Ash Generated =2604338, Fly ash= 2083470, Bottom Ash=520868
14	Capacity of dry fly ash storage silo(s)(Metric Tons)		6400 MT - 04 no's of RCC Silo, each of capacity 1600MT
15	Details of utilisation of current ash generated during reporting period		
	a	**Total Quantity of current ash utilised(MTPA) during reporting period:**	2960264
	b	**Quantity of fly ash utilised (MTPA):**	2065003
	i	Fly ash based product(bricks or blocks or tiles or fibre cement sheets or pipes or boards or Panels)	29206
	ii	Cement manufacturing	8962
	iii	Ready mix concrete	0

	iv	Ash and Geo-polymer based construction material	0
	v	Manufacturing of sintered or cold bonded ash aggregate:	0
	vi	Constructions of roads,road and fly over embankment	0
	vii	constructions of dams	0
	viii	Filling up of low lying area	151755
	ix	Filling of mine voids	1778872
	x	Use in overburden dumps	0
	xi	Agriculture	0
	xii	Construction in shoreline protection structures in coastal districts	0
	xiii	Export of ash to other countries	0
	xiv	Others (please specify):	0
	C	**Quantity of bottom ash Utilised (MTPA)**	**895261**
	i	Fly ash based products(bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels)	372
	ii	Cement manufacturing	0
	iii	Ready mix concrete:	0
	iv	Ash and Geo-polymer based construction material:	0
	v	Manufacturing of sintered or cold bonded ash aggregate:	0
	vi	Construction of roads, road and flyover embankment	0
	vii	Construction of dams:	0
	viii	Filling up of low lying area:	50694
	ix	Filling of mine voids:	740740
	x	Use in overburden dumps:	0
	xi	Agriculture:	0
	xii	Construction of shoreline protection structures in coastal districts:	0
	xiii	Export of ash to other countries:	0
	xiv	Others (please specify):	0
Total Quantity of current ash unutilised(MTPA) during reporting period:			**0**

16	Percentage of utilisation of current ash generated during reporting period(Per cent)		113.67
17	**Details of disposal of ash in ponds**		
	a	Total quantity of ash disposed in ash ponds(s) (Metric Tons) as on 31st March 2024 (excluding reporting period)	1226779
	b	Quantity of ash disposed in ash ponds during reporting period(Metric Tons)	-355926
	c	Total quantity of water consumption for slurry discharge into ash ponds during reporting period(m3)	0
	d	Total number of ash pond	One
	i	Active	One ash pond with two lagoon
	ii	Exhausted(yet to be reclaimed)	NA
	iii	Reclaimed	NA
	e	Total area under ash ponds(ha)	48.56
18	**Individual ash pond details** **Ash pond-1,2, etc (please provide below mentioned details separately, if number of ash ponds is more than one)**		NA
	a	Status: Under construction or Active or Exhausted or reclaimed	Only one ash pond with two lagoons(Active)
	b	Date of start of ash disposal in ash pond(DD/MM/YYYY or MMYYYY)	03-11-2014
	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)	NA
	d	Area (hectares)	48.56
	e	dyke height(m)	9.0 from NGL
	f	Volume(m3)	3300095
	g	Quantity of ash disposed as on 31st march2025 (Metric Tons)	870853
	h	Available volume in percentage(percent) and quantity of ash can be further disposed(Metric Tons)	73.6 % & 24.3 Lakh MT

	i	Expected life of ash pond(number of years and months)	Assumption (PLF- 85%,SCC-0.67& Ash % - 44%): 1. Dyke Balance Capacity as on 31st March 2025= 24.3 Lakh MT 2. If No FA diversion= 58.5months &4.9 years 3. If No 5% diversion= 48.9months &4.1 years 4. If 10% FA diversion = 42 months &3.5 years 5.If 20% FA diversion = 32.5 months & 2.7 years
	j	co-ordinates (Lat andLong) (please specify minimum 4 co-ordinates)	1. 21' 54' 42.25''N, 83' 11' 51.36.99''E 2. 21' 54' 42.83''N, 83' 11' 53.00''E 3. 21' 54' 17.99''N 83' 11' 536.68''E 4. 21' 54' 17.79' 83' 11' 35.10''E
	k	type of lining carried in ash pond: HDPE lining or LDPE lining or clay lining or No lining	LDPE lining
	l	mode of disposal: Dry disposal or wet slurry (in case of wet slurry please specify whether HCSD or MCSD or LCSD)	Wet Disposal (LCSD)
	m	Ratio of ash: water in slurry mix (1:___):	1:2.6
	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):	0
	p	Last date when the dyke stability study was conducted and name of the organisation who conducted the study:	February -2025 Department of Mining Engineering ,Indian Institute of Technology Kharagpur
	q	Last date when the audit was conducted and name of the organisation who conducted the audit:	**Dr. Rabi Narayan Behera, Assistant Professor** **Department of Civil Engineering, National Institute of Technology** **Rourkela, Rourkela-769008, Odisha**
19	**Quantity of legacy ash utilised (MTPA):**		

D.B. POWER LIMITED * BADADARHA *

	i	Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels):	NA
	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 flyover 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	Others (please specify):	

	Summary			
20	Details	Quantity generated (MTPA)	Quantity utilised (MTPA) and (percent)	Balance quantity (MTPA)
	Current ash during reporting period	2604338	2960264 & 113.67 %	-355926
	Legacy ash	-	NA	NA
	Total	2604338	2960264 & 113.67 %	-355926
21	Any Other information Soft copy of the annual compliance report, and shape files of power plant and ash ponds may be e-mailed to:- moefcccoalash@gov.in			
22				

Signature of Authorised Signatory

NUMERICAL MODELING FOR STABILITY ANALYSIS OF ASH DYKE AT 2X600 MW THERMAL POWER PLANT OF DB POWER LIMITED, AT VILLAGE BADADARHA, DIST - SAKTI (CHHATTISGARH)

Sponsored by

D B Power Limited

Consultant-in-charge

D Chakravarty, Professor, Mining Engineering Department, IIT Kharagpur
B Samanta, Professor, Mining Engineering Department, IIT Kharagpur

प्राध्यापक/Professor
खनन अभियांत्रिकी विभाग
Department of Mining Engineering
भा.प्रौ. सं. खड़गपुर-७२१३०२, भारत
I.I.T. Kharagpur - 721302, India

Dr. Biswajit Samanta
Professor
Department of Mining Engineering
Indian Institute of Technology Kharagpur
Kharagpur-721302, West Bengal, India

Department of Mining Engineering
Indian Institute of Technology, Kharagpur

February 2025

DISCLAIMER

The geo-technical properties which are used for numerical modeling are basically obtained from the laboratory test values carried out by M/s Shayga Testing and Research (Raigarh).

These profiles were obtained from a material testing lab situated in Raigarh (CG) and were analyzed for their stability aspects in the previous year by the IITKGP study team. In this study, the profiles are newly captured and analysed for stability analysis by numerical modelling using the latest available geotechnical data received from DB power.

However it is known that the factor of safety values for different slope conditions rely highly on these parameter values. The variations in geotechnical properties due to weathering and other associated external agents may significantly change the safety factor, as computed from numerical analysis.

Plant authority is regularly checking the embankment slope. IIT KGP study team has also visited the site and assessed the condition with physical verification. As such no imminent endangered condition is anticipated at this moment.

Hence, time to time monitoring of slope and relevant geotechnical properties is required to be assessed for managing the stability of the structure(s).

Table of Contents

1. INTRODUCTION

M/s D.B power limited is operating a coal based Super Thermal Power Plant with an installed capacity of 1200 MW (2x600 MW), situated in village Baradarha, Block - Dabhara, District- Sakti, State - Chhattisgarh (Figure 1). Coal for this Project has been linked with SECL mines for part load and to meet balance demand, coal is being sourced from MCL & CCL mines. The process for power generation system comprises of Boiler (steam generator), Turbine with accessories, Generator unit, Transformer and equipment all arranged to operate as complementary parts of a complete monolithic set. The super saturated steam from the boiler of designated pressure and temperature drives the turbine thereby converting thermal energy into mechanical energy, which in turn drives the generator where mechanical energy is converted into electrical energy. The process diagram and aerial view of the plant is shown in Figure 2 (Parts A and B respectively). Coal is brought to site through trucks & trailers by road mode and through Rakes by Rail mode. Coal is being stored in the coal yard. The coal is transferred from the yard to bunkers through stacker-reclaimer and conveyors. The coal consumption is around 18000 TPD at 85% PLF on an average of two plants. Fuel oil - LDO is used in a meager manner for start-up. Water intake is from upstream of Kalma Barrage at Mahanadi River through the river water intake pump house. This raw water is clarified and processed through an ion exchange process to make DM water. The raw water after clarification is used for cooling tower makeup, service water and potable water.

Fly ash is being utilized in manufacturing of cement and fly ash based bricks. The unutilized fly ash is being disposed of into abandoned quarry / mine voids, by transporting through trucks. The bottom ash is being disposed of in lean slurry form by pumping it to the existing ash pond extending to about 120 acres.

Evacuation of pond ash has also commenced and is being utilized for reclamation of low lying areas, backfilling of abandoned mines, construction of embankment for roads and railway siding etc. Coordinates of DBPL ash dyke are latitudes (21º 54' 47.167", 83º 11' 42.719") and longitudes (21º 54' 12.931", 83º 11' 42.194").

Originally the ash dyke had a single storage lagoon and a water settling pond (as shown in Annexure I). The starter dyke was constructed with top level at RL 232.5 for about half length approximately 450 m in the northern embankment and the remaining length of the dyke with top level varying from 232.5 m to 241 m. The dyke has been further raised up to RL 235.5 m, using upstream method in the water pond area and by downstream method for outer bund. To facilitate further dyke raising in dry condition, the existing single lagoon was divided into two parts, namely- Lagoon-1 and Lagoon-2 (as shown in Annexure I). Due to division of the lagoon and subsequent raising, the associated water management structures have also been modified / raised.

M/s D.B. Power Limited (hereinafter referred to as DBPL) approached IIT Kharagpur for conducting the scientific study for their existing ash pond. In this regard, two members of the IIT study team visited and inspected the ash pond, on 16 December 2024. As a part of this study, the IIT study team conducted an in-depth investigation regarding structural stability of ash dyke through numerical modeling. Other aspects of the ash dyke are studied through a detailed discussion with management and existing scientific study reports made available to the study team by the sponsors.

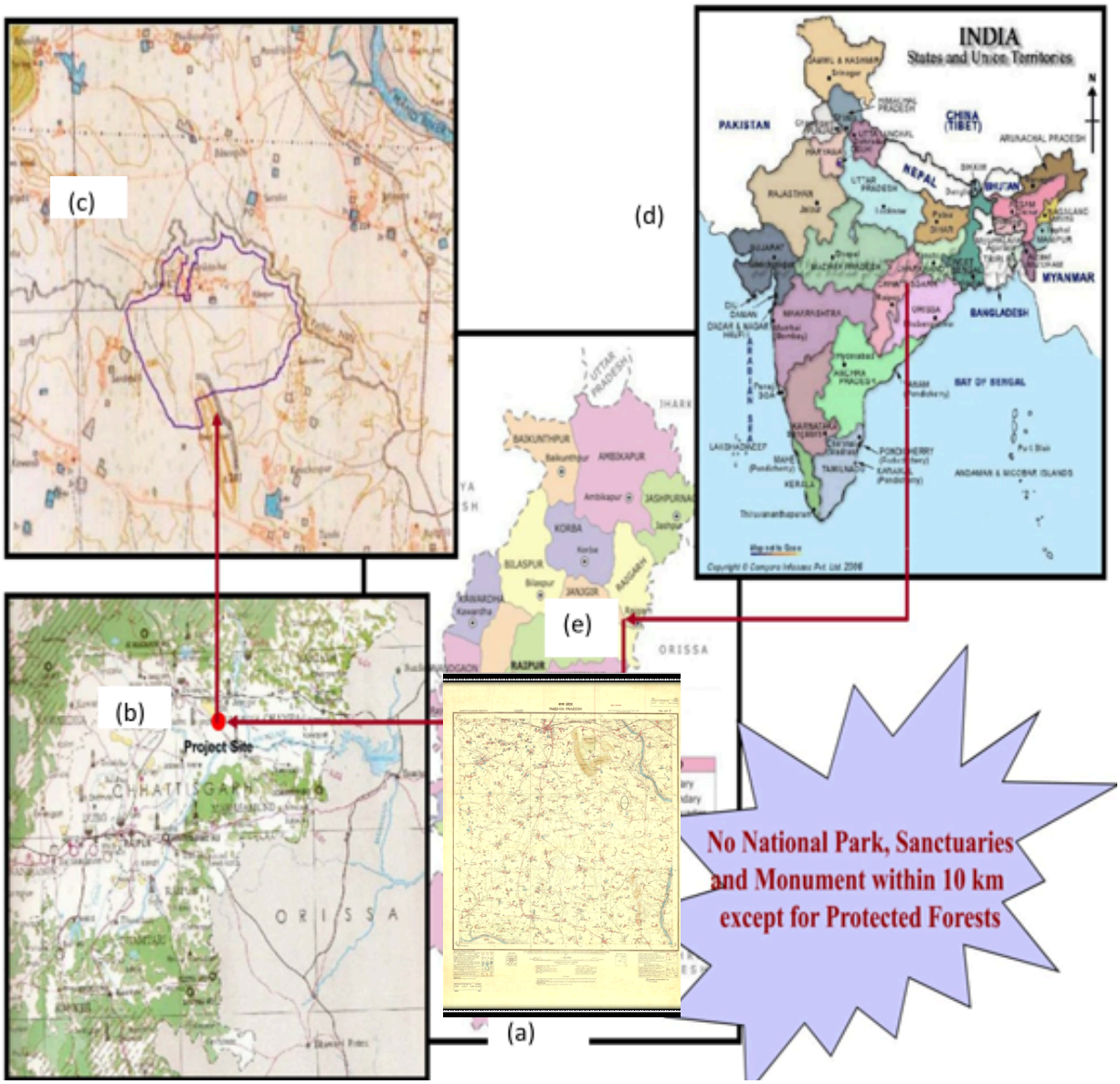
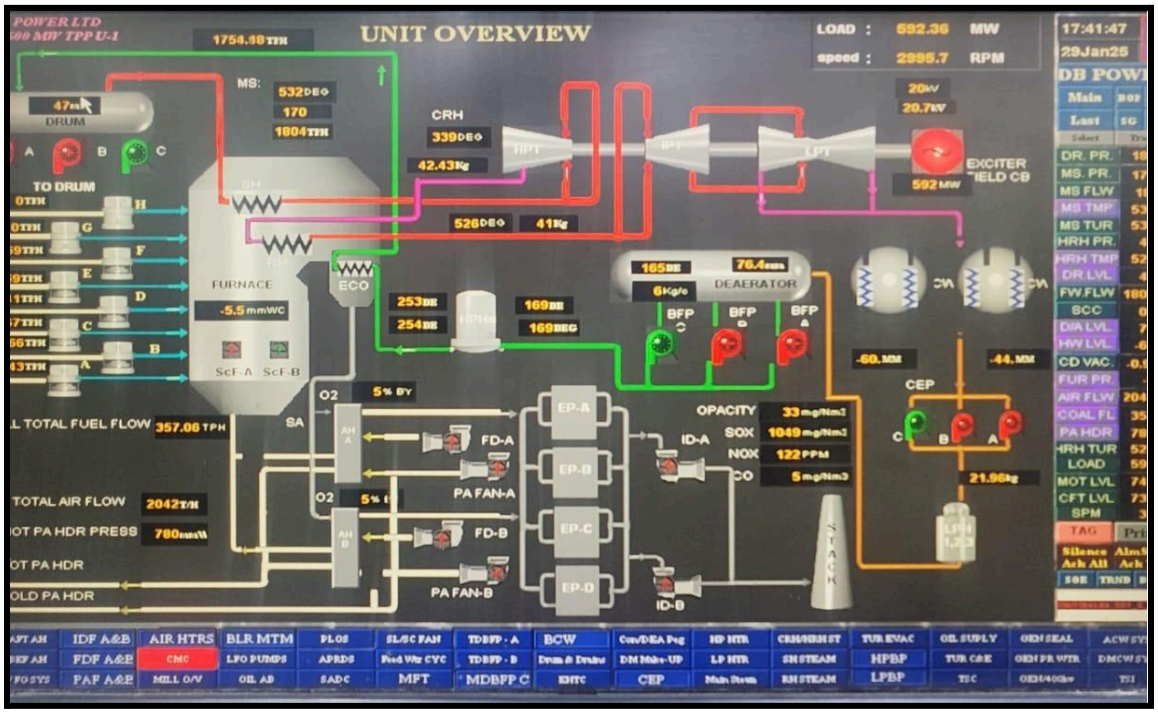


Figure 1: Location of DB Power Plant (a) the toposheet of the plant area, (b) map of the region, (c) actual location on toposheet of the plant area, (d) map of India and (e) the map of Chhattisgarh state.



(A)

(B)

Figure 2: (A) Process Diagram and (B) Aerial view of D.B. Power Plant including the lagoons.

2. DETAILS OF THE EMBANKMENT

The present ash disposal area extends to about 120 acres, having two storage lagoons and a water collection and settling pond. The starter dyke was constructed with top level at RL 232.5 .The starter dyke has been further raised up to RL 239 m in two stages. 1st Raising up to RL 235.5 m by using upstream method in the water pond area and by downstream method for outer bund. The dumped length of ash dyke has also been strengthened by flattening and protecting the slopes. 2nd raising up to RL 239 m has also been done by using the upstream method in the West side & North side and downstream method for the South side. East side area was already having high levels. Divide bund has also been constructed to divide ash ponds in 2 lagoons. Bottom level of divide bund is RL 232.5 m and top level is RL 239 m as per approved drawings.

The eastern part of the area has natural hilly terrain covering 80% of the length. The surface gradient is from the southern to the northern direction. The embankment of the southern portion has the advantage of holding the ash with minimal raising required. The northern side has the water collection which has an automatic overflow arrangement. This water is later recycled for use in different industrial work. The IIT KGP team selected the critical sections identified in consultation with the DBPL Team for this study. The conditions have been modeled for numerical simulations and analyses to interpret the stability of the proposed embankment raising operations as decided by the administration.

3. Structural stability of the active ash pond as per IS 7894

IIT KGP study team conducted numerical modeling and analyses one year back. Since then no failure and/or compaction cases occurred; the following numerical modelling of the current scenario of the ash dyke profile are presented herewith for preparation of this part of the document in connection with the structural stability of ash dyke.

For this purpose, six different 2-D sections are chosen and analyzed for the stability study. The sections are:

1. West side bund lagoon 1 & lagoon 2:
   i) Existing dyke up to RL 235.5 m + 1st raising up to RL 239 m lagoon 1.
   ii) Existing dyke up to RL 235.5 m + 1st raising up to RL 239 m lagoon 2.
2. Divider bund between Lagoons# 1 & 2:
   i) Dyke from 232.5 m up to RL 239 m.
3. Dyke on the East side bund (hillside):
   i) Dyke from 234.5 m up to RL 239 m.
4. Dyke between overflow pond and Lagoon #1(north side):
   i) Dyke from 234.5 m up to RL 239 m
5. Dyke on south side of Lagoon #2:
   i) Dyke from 238.0 m to 239 m.

3.1. Theoretical background for slope stability assessment

The Morgenstern-Price method (developed on the basis of limit equilibrium) is used for kinematic assessment of stability of each of the sections that needs to be analyzed. This method of stability assessment considers both shear and normal inter slice forces between the blocks. It also satisfies both moment and force equilibrium, and allows for a variety of user-selected inter slice force functions. This approach was used in the dumps for dry and saturated geo-technical conditions when they were subject to seismic and wind loading along with pore water pressure.

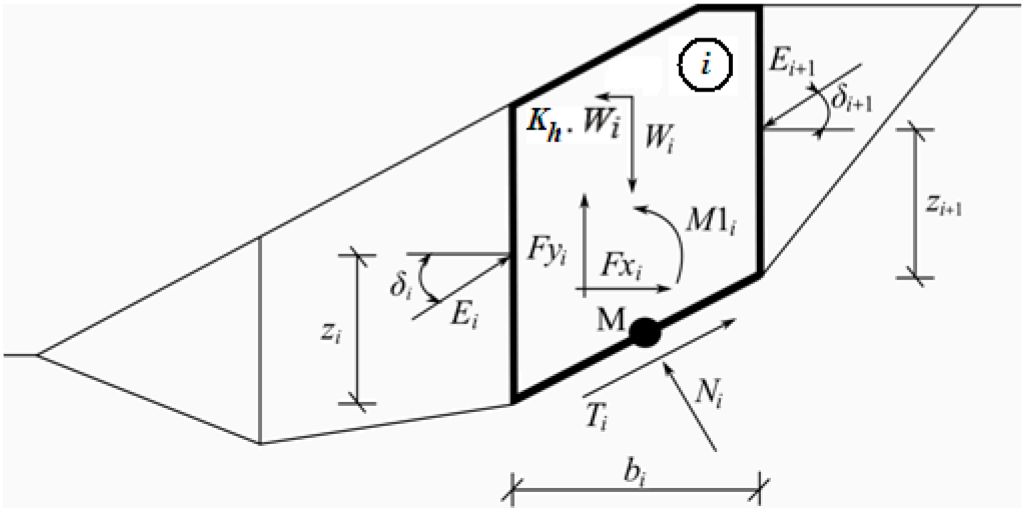


Figure 3: Static scheme (Morgenstern-price analysis)

3.1.1. Morgenstern-Price Analysis

Morgenstern-Price is a general method of slices developed on the basis of limit equilibrium. It requires satisfying equilibrium of forces and moments acting on individual blocks. The blocks are created by dividing the material above the slip surface by dividing planes. Forces acting on individual blocks are displayed in Figure 3.

Each block is assumed to contribute due to the same forces as in the Spencer method. Choice of inclination angles δi of forces Ei acting between the blocks is realized with the help of Half-sine function - one of the functions in Figure 4 is automatically chosen. This choice of the shape of function has a minor influence on final results, but suitable choice can improve the convergence of method. Functional value of Half-sine function f(xi) at boundary point xi multiplied by parameter λ results in the value of inclination angle δi.

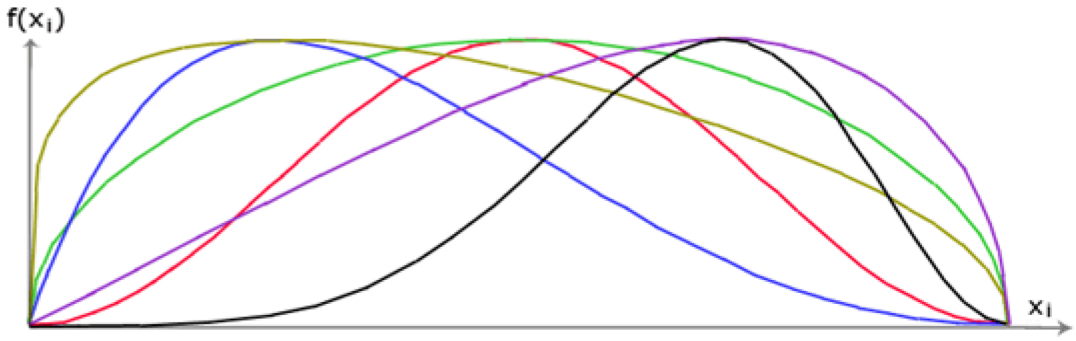


Figure 4: The half-sine function

$$Z_{i+1} = \frac{\frac{bi}{2}\left[E_{i+1}\left(sin\,\delta_{i+1} - \cos\delta_{i+1}.\tan\alpha_i\right) + E_i\left(sin\,\delta_i - cos\,\delta_i\,.\tan\alpha_i\right) + E_i.Z_i.\cos\delta_i - M\right.}{E_{i+1}.cos\delta_{i+1}}$$

(1)

This formula allows us to calculate all arms Zi of forces acting between blocks for a given value of δi, knowing the value on the left at the slip surface origin, where z1 = 0.

The factor of safety SF is determined by employing the following iteration process:

(a) The initial value of angles δi is set according to Half-sine function (δi = λ*f(xi)).

(b) The factor of safety SF for a given value of δi, while assuming the value of En+1 = 0 at the end of the slip surface.

(c) The value of δi is provided by equation (1) using the values of Ei determined in the previous step with the requirement of having the moment on the last block equal to zero. Functional values f(xi) are the same all the time during the iteration, only the parameter λ is iterated. Equation (1) does not provide the value of zn+1 as it is equal to zero.

Steps b and c are then repeated until the value of δi (resp. parameter λ) does not change.

3.2. Stability assessment of Structures in DB Power Ash Dyke

We have analyzed existing ash dykes at six distinct sections of embankment that have been selected as a standard practice..

The geotechnical parameters concerning the different materials that have been used in different embankments have been provided by the DBPL. Different material properties are primarily those that characterize the shear strength and the density (unit weight) of the different formations that make up the combined slope structures and the intervening ground.

This section analyzes the stability of different structures, present in the investigation site using the Morgenstern-Price Method. This LEM based technique is used in each of the sections for predicting the Factor of Safety of the slopes for different geotechnical conditions. The different loading conditions studied in this slope stability assessment are described below. Each of the loading conditions is further subject to wind load as described below.

a) **Static (dry) condition:** In completely dry conditions, the slopes are assumed to be in completely dry conditions. The materials of the slope are assumed to be fully dry. In these conditions, the pore water pressure present in the slope is zero.
b) **Saturated with steady seepage condition:** Here, the slopes are subject to saturated conditions where the water table is assumed to be up to the height of the freeboard. Steady seepage is considered and the materials of the slope are considered to be undrained.
c) **Seismic loading with saturated steady seepage condition**: Here, the slope is subject to seismic loading along with statured condition. Here, seismic loading coefficient is considered to be 0.1g for the horizontal stress loading, and the vertical loading is considered to be zero.

3.2.1. Assumptions for Morgenstern–Price method of slope stability assessment

The following assumptions are introduced in the Morgenstern-Price method to calculate the limit equilibrium of forces and moments on individual blocks:

- Dividing planes between blocks is always vertical.
- The line of action of the weight of block Wi passes through the center of the ith segment of slip surface, represented by point M.
- The normal force Ni is acting in the center of the ith segment of slip surface, at point M.
- Inclination of forces Ei acting between blocks is different on each block (δi) at slip surface end points is $\delta = 0$.

3.3. Results and Analyses of Numerical Modelling

3.3.1. Analysis of different bunds

Numerical modelings for six different critical sections selected from different parts of bunds are analysed for examine the stability of the bunds . Geotechnical properties used in the models are provided in Tables 1 and 2.

Table 1: Geo-material properties used for different bunds studied (SOIL)

Material Type	Unit weight (kN)	Cohesion (kPa)	Internal \Friction Angle (degree)
Divide Bund	26.75	10	21
East side Bund	26.75	10	21
North side Bund	26.85	7	22
South side Bund	26.85	12	18
West side Lagoon 1	26.75	9	20
West side Lagoon 2	26.85	7	21

Table 2: Geo-material properties used for different bunds studied (ASH)

Material Type	Unit weight (kN)	Cohesion (kPa)	Internal \Friction Angle (degree)
Divide Bund	23.62	0	27
East side Bund	23.62	0	27
North side Bund	23.81	0	27
South side Bund	23.62	0	27
West side Lagoon 1	23.13	0	25
West side Lagoon 2	23.32	0	26

3.3.1.1 Analyses of Divide Bund

Figure 5 presents the section along Divide Bund and the corresponding model geometry for numerical analysis using Slide2 software tool, respectively. The resulting failure surface and the corresponding FOS value for each of the aforementioned conditions are presented in Figures 6(a) to 6(c) and Table 3, respectively.

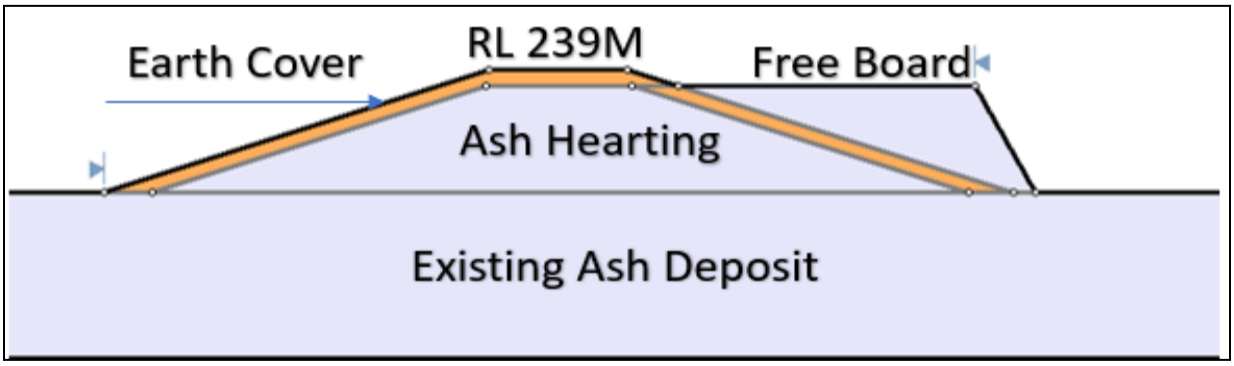


Figure 5: cross-section of Divide Bund

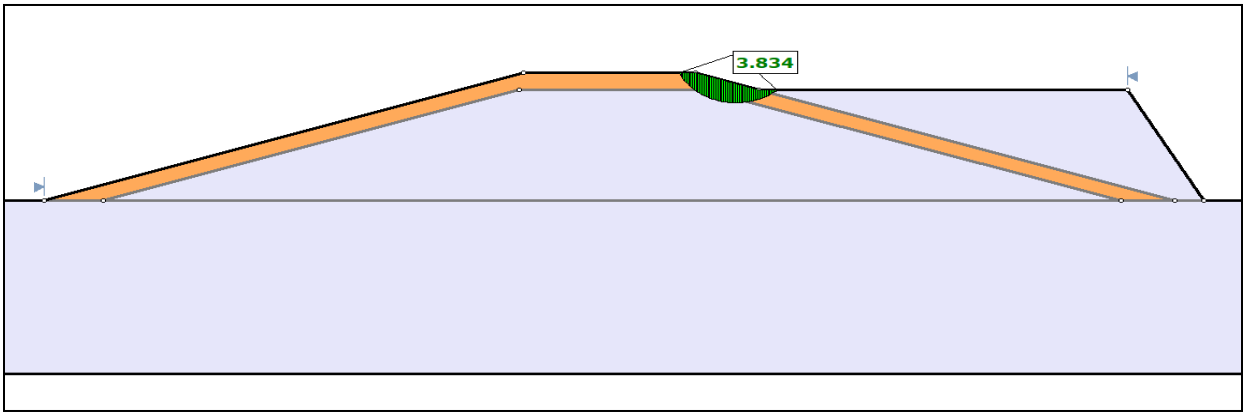


Figure 6 (a): Critical slip surface, *Divide Bund* (Dry condition)

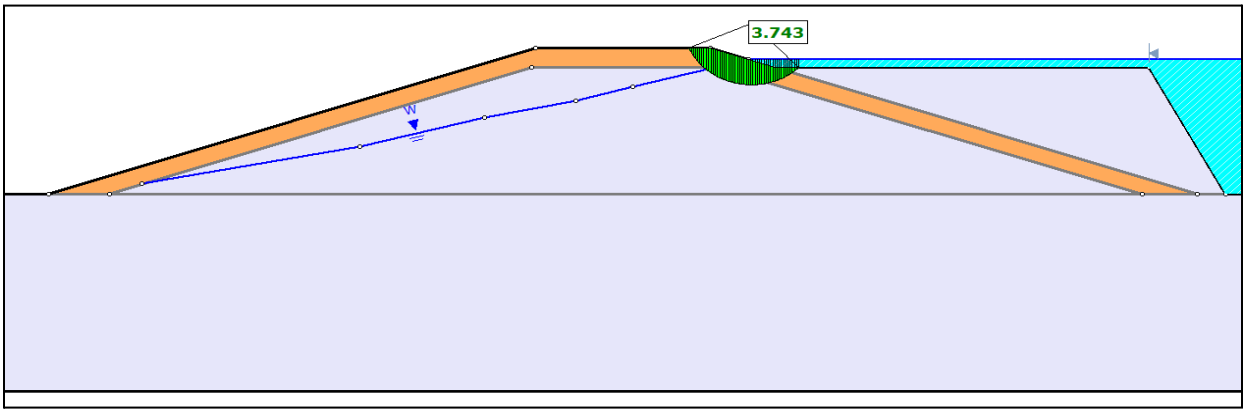


Figure 6 (b): Critical slip surface, *Divide Bund* (Saturated condition)

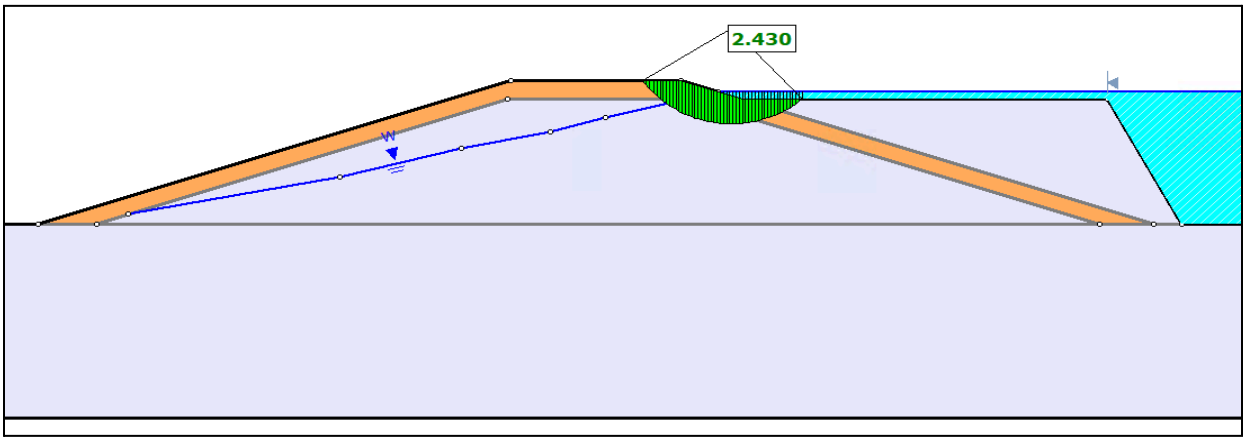


Figure 6 (c): Critical slip surface, *Divide Bund* (Seismic condition)

Figure 6 presents the most critical slip surfaces for the section, for dry condition, saturated steady seepage condition and seismic with saturated steady seepage condition respectively. The FOS values obtained from the numerical modeling runs are provided in Table 3

Table 3 Critical FOS values Along Divide Bund

Dry condition	3.83
Saturated condition	3.74
Seismic condition	2.43

From Table 3, it can be seen that this section is found to be stable for all the loading conditions studied, as FOS values are above the reference value of 1.5 for long term stability.

3.3.1.2 Analyses of East side Bund

Figure 7 presents sections along East side Bund and the corresponding model geometry for numerical analysis using Slide2 software tool, respectively. The resulting failure surface and the corresponding FOS value for each of the above conditions are presented in Figures 8(a) to 8(c) and Table 4, respectively.

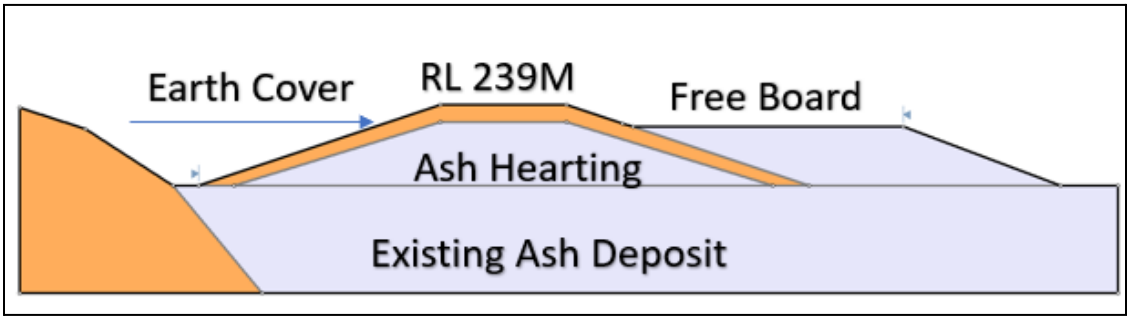


Figure 7: cross-section of East Side Bund

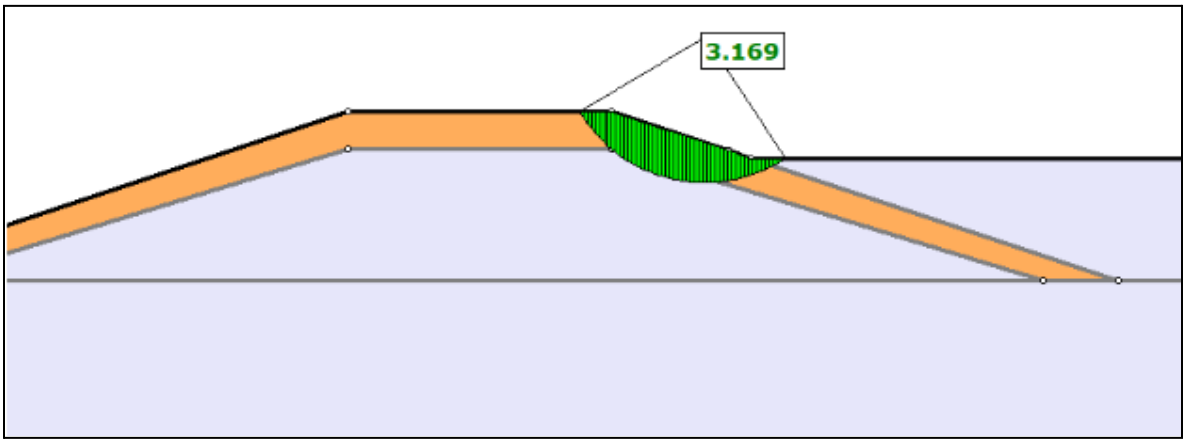


Figure 8 (a): Critical slip surface, *East Side Bund* (Dry condition)

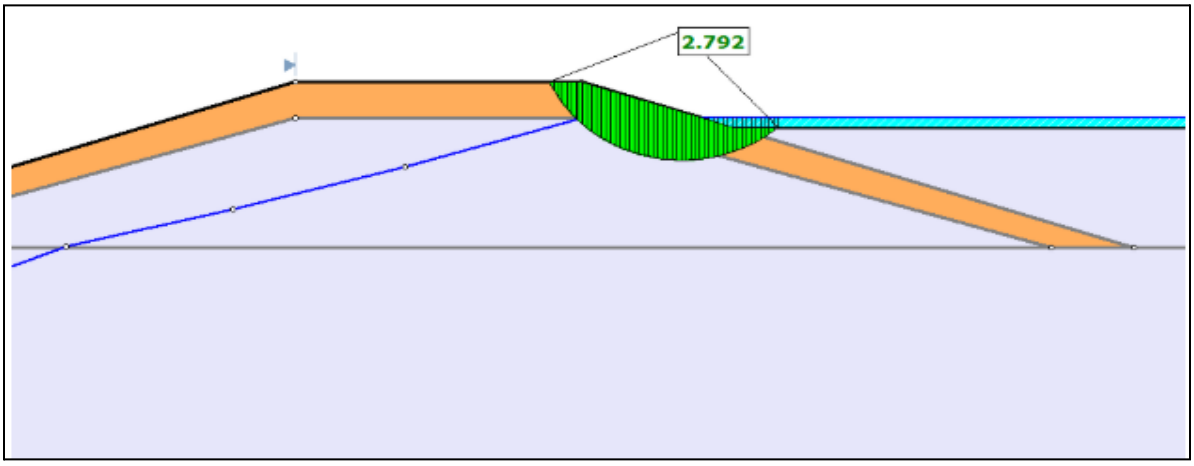


Figure 8 (b): Critical slip surface, *East Side Bund* (Saturated condition)

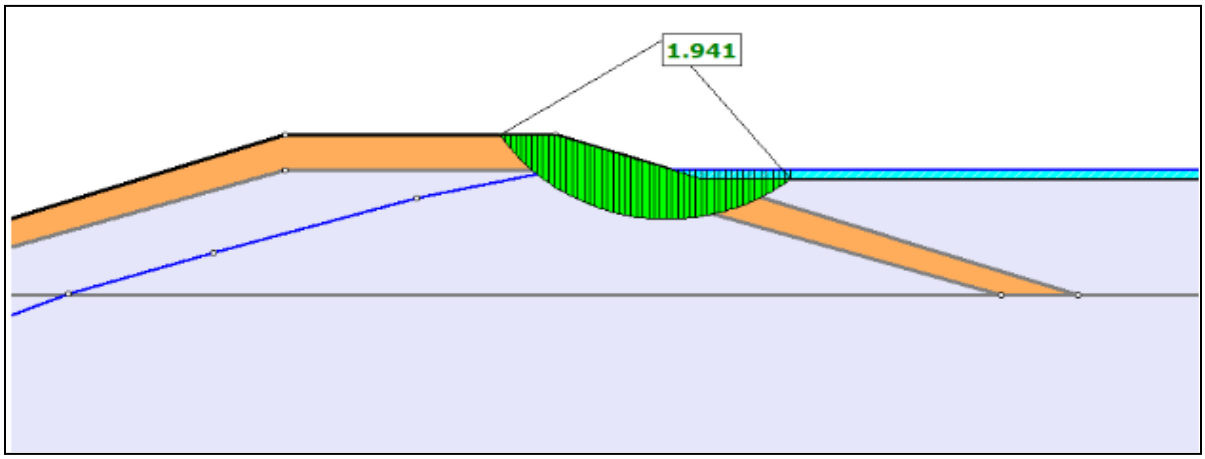


Figure 8 (c): Critical slip surface, *East Side Bund* (Seismic condition)

Figure 8 presents the most critical slip surfaces for the section, for dry condition, saturated steady seepage condition and seismic with saturated steady seepage condition respectively. The FOS values obtained from the numerical modeling runs are provided in Table 4.

From Table 4, it can be seen that this section is found to be stable for all the loading conditions studied, as FOS values are above the reference value of 1.5 for long term stability.

Table 4 Critical FOS values Along East Side Bund

Dry condition	3.17
Saturated condition	2.79
Seismic condition	1.94

3.3.1.3 Analyses of North Side Bund

Figure 9 presents the section Along North Side Bund and the corresponding model geometry for numerical analysis using Slide2 software tool, respectively. The resulting failure surface and the corresponding FOS value for each of the above conditions are presented in Figures 10(a) to 10(c) and Table 5, respectively.

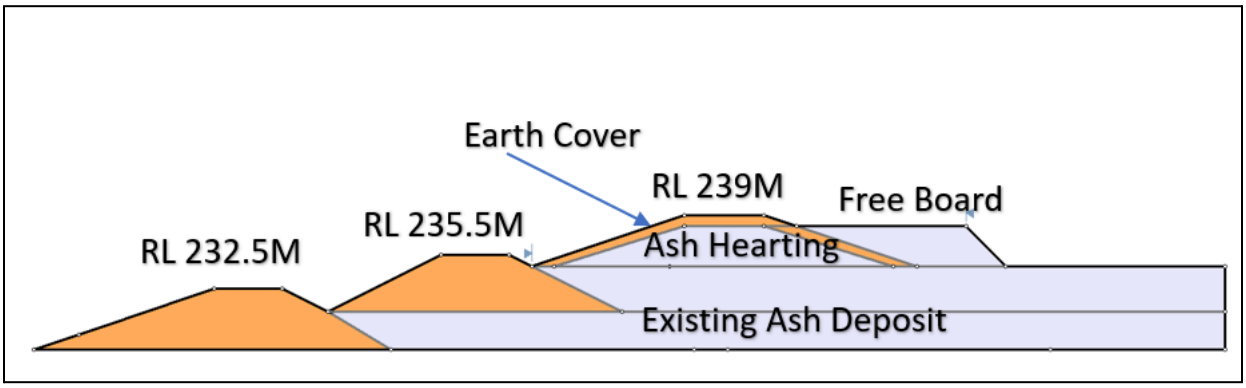


Figure 9: cross-section Along of North Side Bund

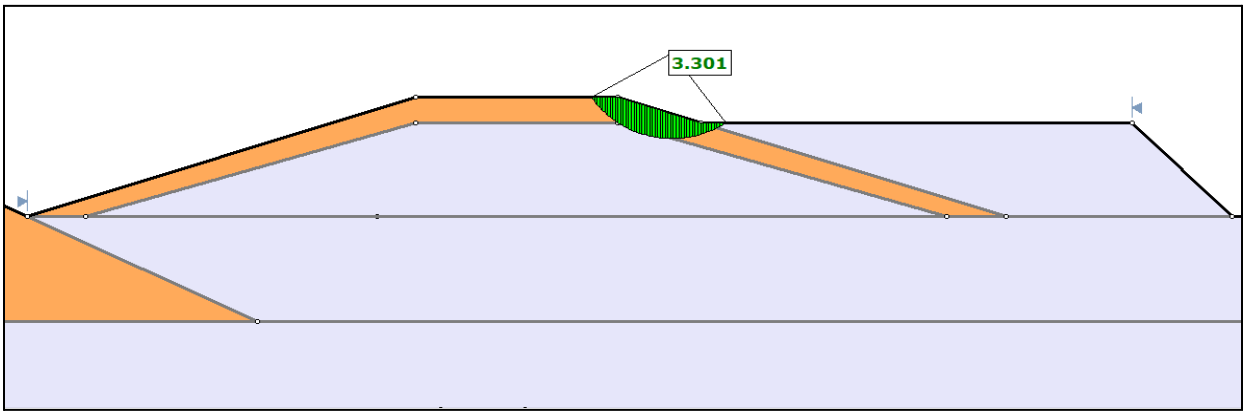


Figure 10(a): Critical slip surface, *North Side Bund* (Dry condition)

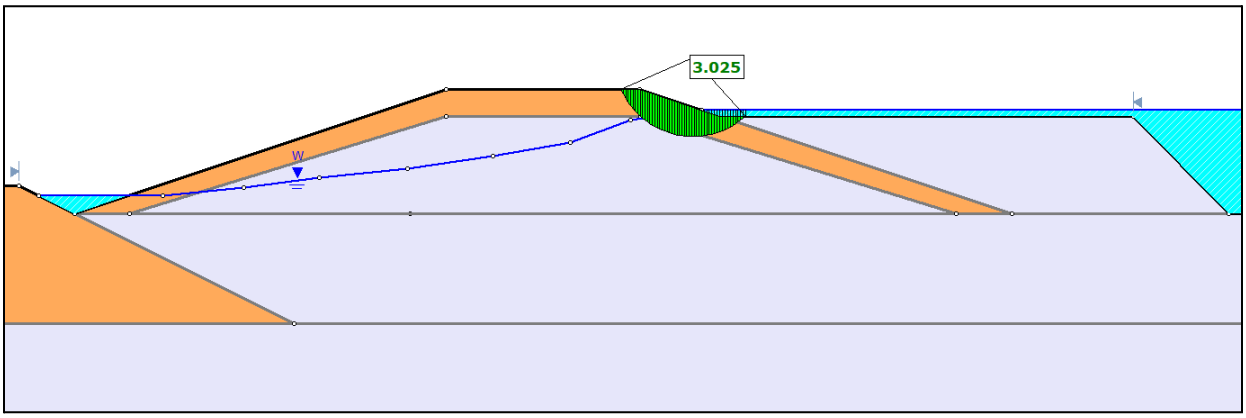


Figure 10(b): Critical slip surface, *North Side Bund* (Saturated condition)

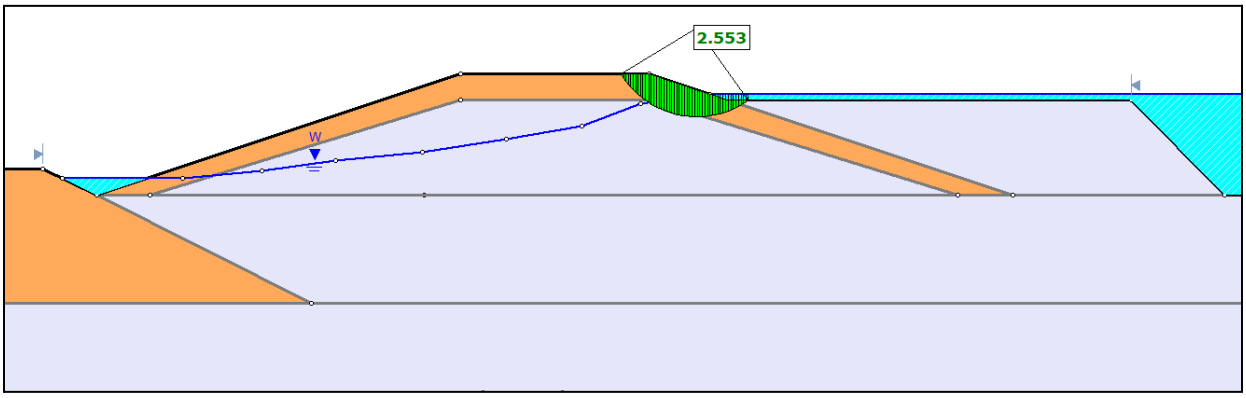


Figure 10(c): Critical slip surface, *North Side Bund*
(Seismic condition)

Figure 10 presents the most critical slip surfaces for the section, for dry condition, saturated steady seepage condition and seismic with saturated steady seepage condition respectively. The FOS values obtained from the numerical modeling runs are provided in Table 5.

From Table 5, it can be seen that this section is found to be stable for all the loading conditions studied, as FOS values are above the reference value of 1.5 for long term stability.

Table 5 Critical FOS values Along North Side Bund

Dry condition	3.30
Saturated condition	3.02
Seismic condition	2.55

3.3.1.4. Analyses of South Side Bund

Figure 11 presents the section Along South Side Bund and the corresponding model geometry for numerical analysis using Slide2 software tool, respectively. The resulting failure surface and the corresponding FOS value for each of the above conditions are presented in Figures 12(a) to 12(c) and Table 6, respectively.

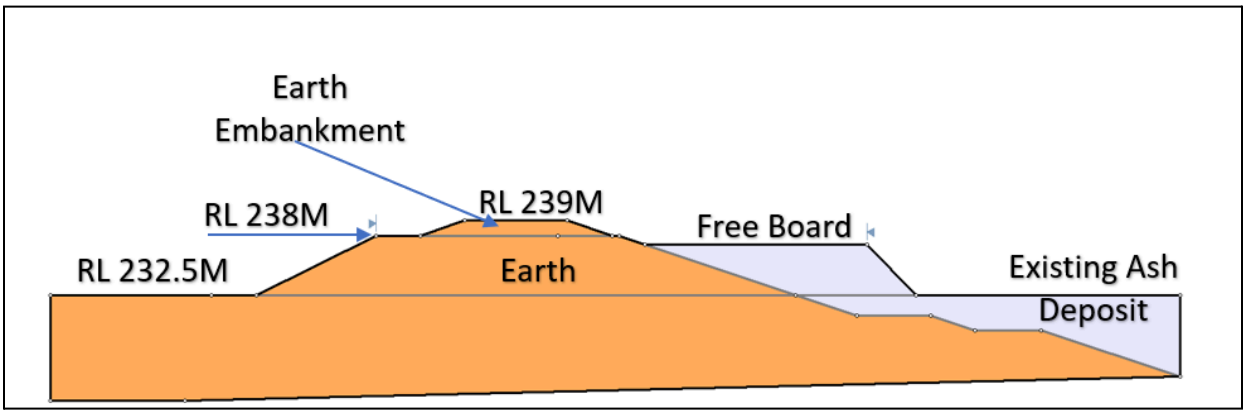


Figure 11 cross-section Along of South Side Bund

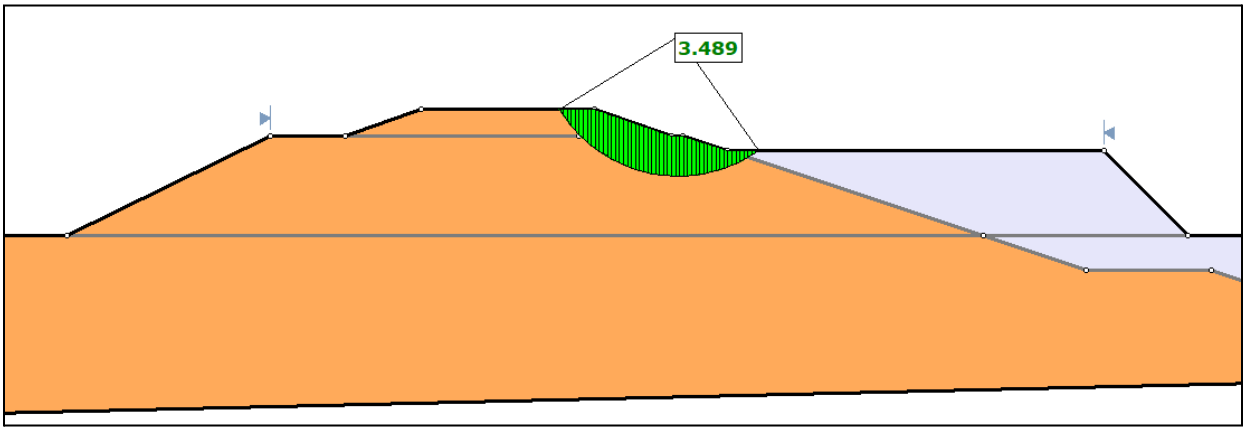


Figure 12(a): Critical slip surface, *South Side Bund* (Dry condition)

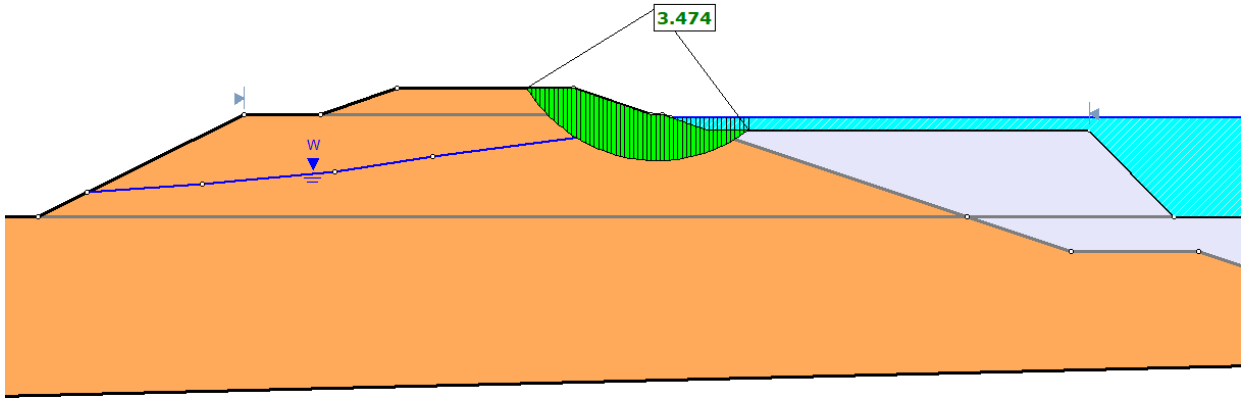


Figure 12(b): Critical slip surface, *South Side Bund* (Saturated condition)

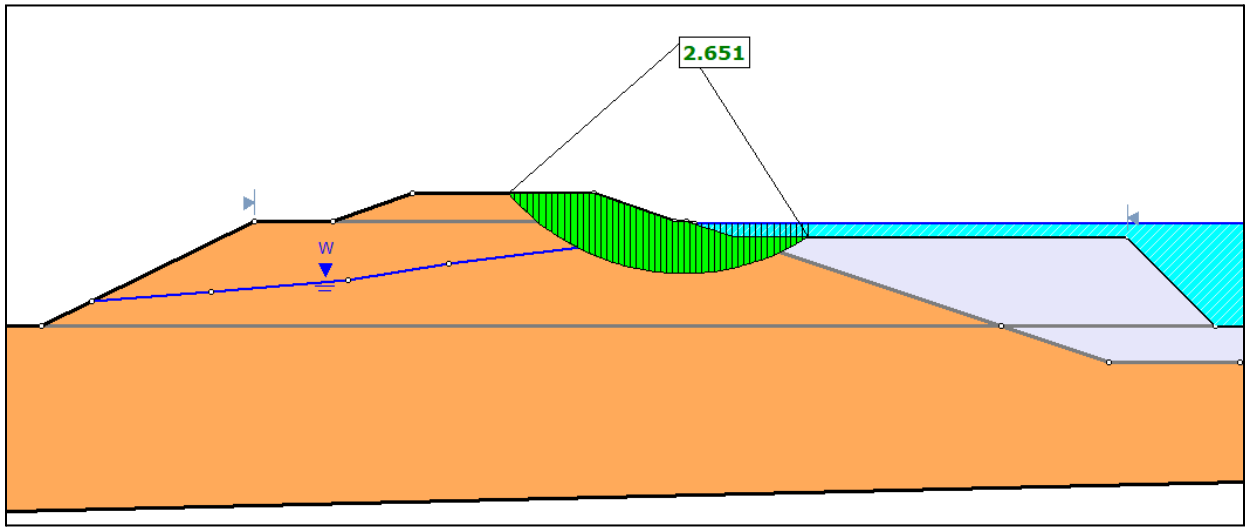


Figure 12(c): Critical slip surface, *South Side Bund*
(Seismic condition)

Figure 12 presents the most critical slip surfaces for the section, for dry condition, saturated steady seepage condition and seismic with saturated steady seepage condition respectively. The FOS values obtained from the numerical modeling runs are provided in Table 6

From Table 6, it can be seen that this section is found to be stable for all the loading conditions studied, as FOS values are above the reference value of 1.5 for long term stability.

Table 6 Critical FOS values Along South Side Bund

Dry condition	3.49
Saturated condition	3.48
Seismic condition	2.65

3.3.1.5. Analyses of West Side Bund of Lagoon 1

Figure 13 presents the section Along West Side Bund of Lagoon 1 and the corresponding model geometry for numerical analysis using Slide2 software tool, respectively. The resulting failure surface and the corresponding FOS value for each of the above conditions are presented in Figures 14(a) to 14(c) and Table 7, respectively.

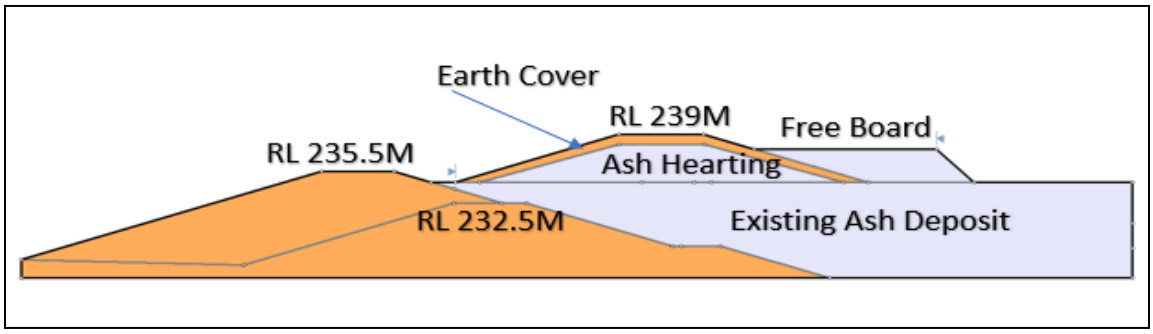


Figure 13: cross-section Along West Side Bund of Lagoon 1

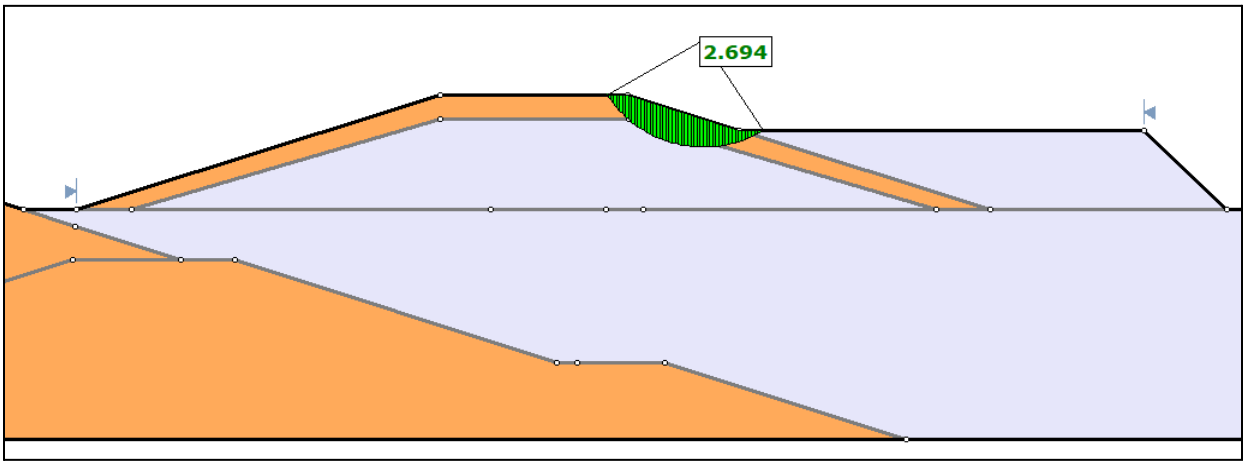


Figure 14(a): Critical slip surface, *West Side Bund of Lagoon 1* (Dry condition)

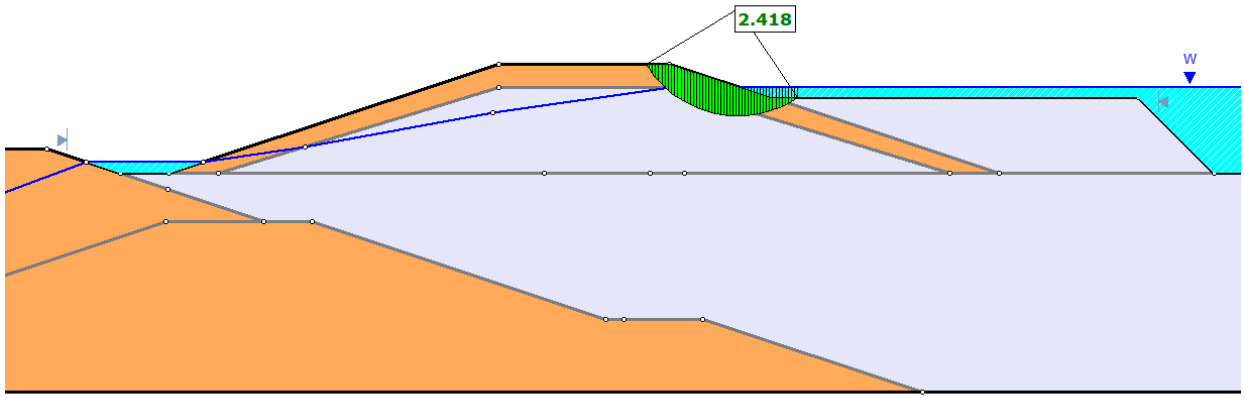


Figure 14(b): Critical slip surface, *West Side Bund of Lagoon 1* (Saturated condition)

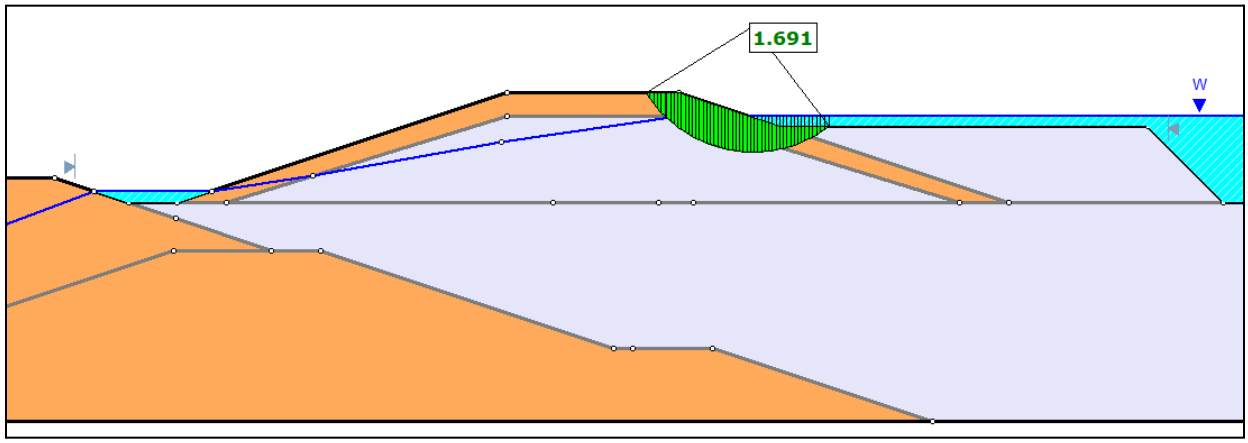


Figure 14(c): Critical slip surface, *West Side Bund of Lagoon 1* (Seismic condition)

Figure 14 presents the most critical slip surfaces for the section, for dry condition, saturated steady seepage condition and seismic with saturated steady seepage condition respectively. The FOS values obtained from the numerical modeling runs are provided in Table 7.

From Table 7, it can be seen that this section is found to be stable for all the loading conditions studied, as FOS values are above the reference value of 1.5 for long term stability.

Table 7: Critical FOS values Along West Side Bund of Lagoon 1

Dry condition	2.69
Saturated condition	2.42
Seismic condition	1.69

3.3.1.6. Analyses of West Side Bund of Lagoon 2

Figure 15 presents the section Along West Side Bund of Lagoon 2 and the corresponding model geometry for numerical analysis using Slide2 software tool, respectively. The resulting failure surface and the corresponding FOS value for each of the above conditions are presented in Figures 16(a) to 16(c) and Table 8, respectively.

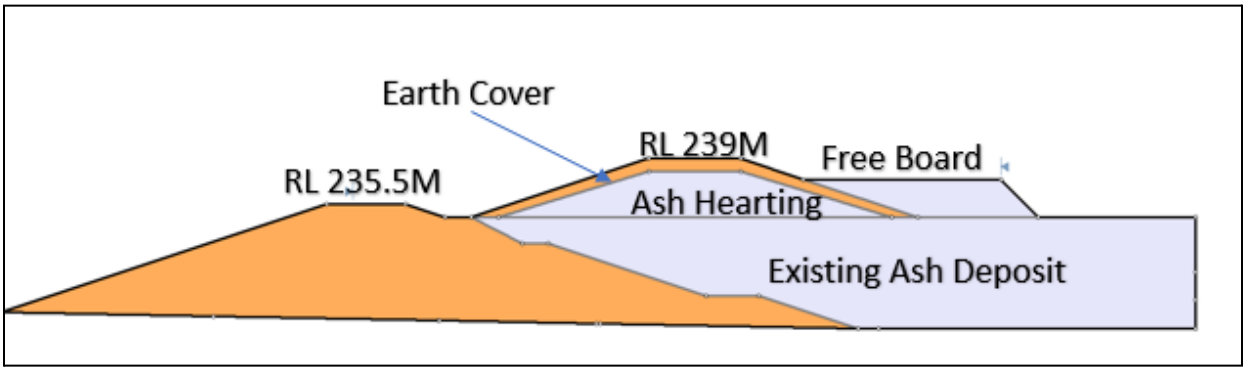


Figure 15: cross-section Along West Side Bund of Lagoon 2

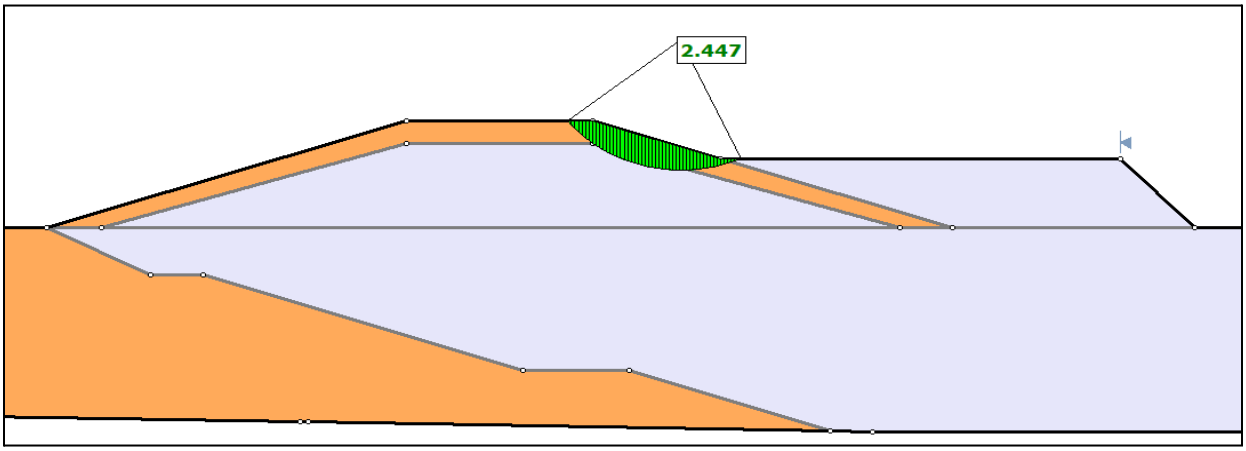


Figure 16(a): Critical slip surface, *West Side Bund of Lagoon 2* (Dry condition)

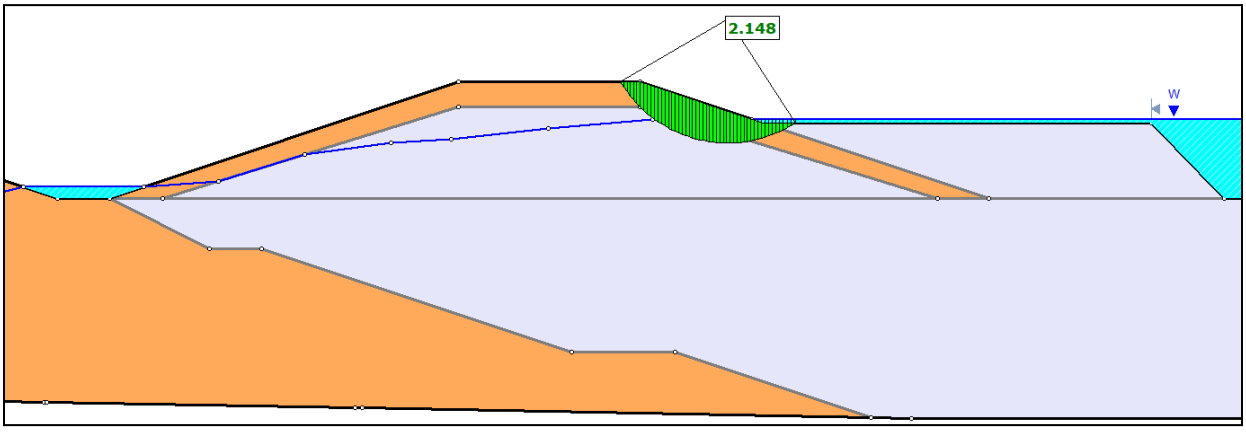


Figure 16(b): Critical slip surface, *West Side Bund of Lagoon 2* (Saturated condition)

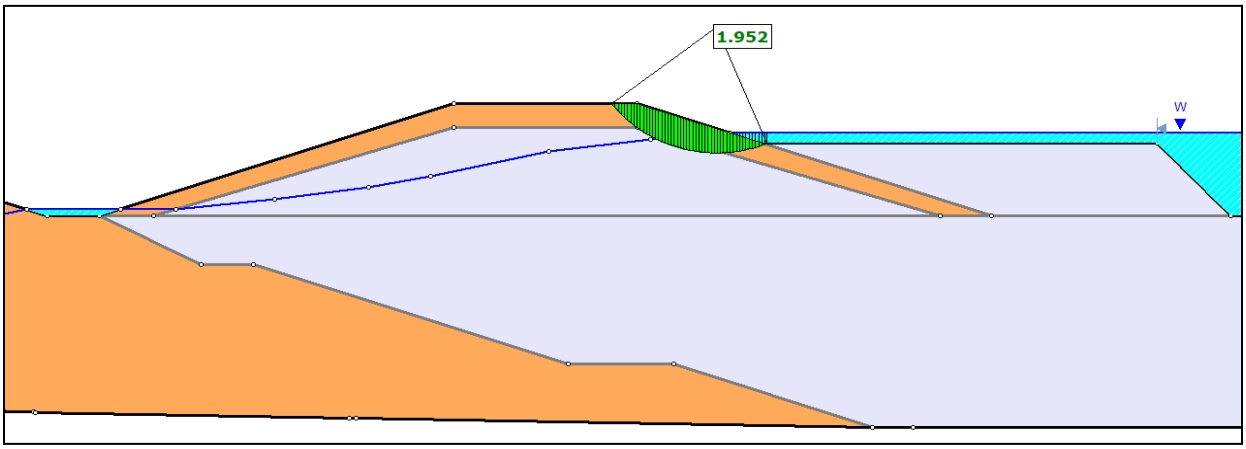


Figure 16(c): Critical slip surface, *West Side Bund of Lagoon 2* (Seismic condition)

Figure 16 presents the most critical slip surfaces for the section, for dry condition, saturated steady seepage condition and seismic with saturated steady seepage condition respectively. The FOS values obtained from the numerical modeling runs are provided in Table 8

From Table 8, it can be seen that this section is found to be stable for all the loading conditions studied, as FOS values are above the reference value of 1.5 for long term stability.

Table 8: Critical FOS values Along West Side Bund of Lagoon 2

Dry condition	2.45
Saturated condition	2.15
Seismic condition	1.95

The analyzed factor of safety values of the proposed sections of the ash dykes as studied is summarized and provided in Table 9 below.

Table 9: Summary of the factor of safety of the existing sections of the ash dyke

Sections	Dry FoS	Saturated/Wet FoS	Seismic FoS
West side bund lagoon 1	2.69	2.42	1.69
West side bund lagoon 2	2.45	2.15	1.95
Divide bund between lagoons 1 & 2	3.83	3.74	2.4
Dyke on the East side bund (hillside)	3.17	2.79	1.94
Dyke between overflow pond and Lagoon #1(north side)	3.30	3.02	2.55
Dyke on south side of Lagoon #2	3.49	3.48	2.65

As can be seen from the analyses, the existing ash dyke sections are found to be safe , at present, in all the stated conditions as the value of FOS is found to be greater than 1.5 for all conditions.

4. Slope Protection as per relevant IS code:9429

It may be noted that earlier the embankment construction and its subsequent raising was done as IS No 9429 (provided in Table 11). However, the physical inspection of the site reveals that the overall ash-dyke configuration has not been changed for the last one year.

The rock toe, toe drains are provided along the entire length of the dyke in all the sides except the east side because of the natural hill. Dowel banks at top of the dyke and slope drains at a spacing of 25 m c/c are already also provided. All the downstream slopes are covered with turfing and upstream slopes are covered with brick lining. According to them regular checks are being carried out of dowel banks, slope drains, rock toe, toe drains, roads etc. In case, if any defect is observed, the management takes necessary actions to ensure stability of slopes. Figures 17, 18 & 19 inserted in the report at various pages show the existing status of embankment around the ash dyke.

Figure 17: Rock Toe and Toe Drain. Rock toe the materials size from 10 to 250 cm; and toe drain width 500 mm and depth 400 mm.

Figure 18: Slope Drain and D/S side slop Cover with Turfing. Rectangular strips of uniform width, not less than about 25 cm x 30 cm in size.

Figure 19: U/S Side Brick lining and Dowel bank. Size - depth 200 mm and wide 100 mm.

4.1. Indicative Field Quality Plan Checklist

As per our discussion, the following checklist was maintained while carrying out soil, ash, rock material, concrete, RCC works and other works items as per the responsibility indicated under (Table 10).

Table 10: Quality assurance Checklist (followed by DB Power according to relevant IS codes indicated against each)

Item No.	Type of Test	Frequency/ Quantum of check	Ref Document	Acceptance Norms and Remarks
Note: All tests shall be carried out by the contractor in the presence of the Owner's authorized representative.				
1.	STRIPPED AND ROLLED SOIL FOUNDATION AREA			
A.	In situ dry density (using core cutter method)	Once for every 100 m length of embankment foundation.	IS:2720 (Part-VIII)	No specified limit. Only for calculation of dry density achieved.
2.	EARTH BORROW AREA			
A	Soil classification	Once for every source	IS: 1498	Soil Types, like, GC, GM, SC, SM, CH or CI type (Done earlier)

Item No.	Type of Test	Frequency/ Quantum of check	Ref Document	Acceptance Norms
3. IN SITU TESTS ON ASH HEARTING LAYERS				
A.	In situ dry density (using core cutter method)	Once for every 1,000 cum of ash work in each layer of filling. At least one test shall be done per day irrespective of the progress.	IS : 2720 (Part-VIII)	No specified limit. Only for calculation of dry density achieved. (Done earlier)
4. IN SITU TESTS ON EARTH COVER LAYERS				
A.	In situ dry density (using core cutter method)	Once for every 2000 cum of earth work in each layer of filling. At least one test shall be done per day irrespective of the progress.	IS : 2720 (Part-29)	No specified limit. Only for calculation of dry density achieved. (Done earlier)

	Type of Test	Frequency/ Quantum of check	Ref Document	Acceptance Norms
5. IN SITU TESS ON SLOPES OF ASH HEARTING AND EARTH COVER				
A.	In situ dry density (using core cutter method)	Once for every 50 meter length of trimmed slope in ash hearting and earth cover.	IS : 2720 (Part-29)	No specified limit. Only for calculation of dry density achieved.
6. DIMENSIONS OF COMPLETED EMBANKMENT SECTION				
A	Top width	Once for every 100 m length of embankment	As per guidelines on design, construction, & O&M of Coal ash ponds released by MoP CEA in Sept 22.	Not less than 6m
B	Outer slope	Once for every 100 m length of embankment		Not steeper than 2.5H: 1V
C	Inner slope	Once for every 100 m length of embankment		Not steeper than 2.5H: 1V

5. Adequate Spillway Capacity

During the field visit, the IITKGP team has found no change in the discharge mechanisms compared to last year's configuration. For discharging, rainwater collected in the lagoons (6 cumec in each lagoon considering 100 mm rainfall intensity),10 and 6 meter-long box culvert spillways are constructed on the north side dyke of lagoon-1. The flood water is being discharged into the discharge channel through wells and spillways. The heading up of water is estimated to be about 0.3 meter in lagoon-2 spillway and 0.4 to 0.5 meter in Lagoon-2 well. The spillway has been constructed by excavating the dyke section and lining it with reinforced concrete of M25 grade, and constructing a box culvert above it. On the downstream side, energy dissipation is provided with concrete steps and a stilling basin at bottom. 1 m high side walls are also provided on both sides of the spillway to prevent splashing of water to the sides.

5.1 Details of the spillway

Plan area for Lagoon #1 at RL 238 m - 164361 Sqm & Lagoon #2 - 202519 Sqm

Area at 238.1 m RL is 210000 Sqm for the Spillway computations

Anticipated Rainfall - 100 mm per day

Surface runoff - 210000*0.1 = 21000 Cum per day

Expected runoff to be passed through spillway in Cum per Sec= 21000/24*60*60

= 0.243 Cum / Sec ~ 0.25 Cum/sec (A)

Minimum capacity of existing spillway

Size of Box opening provided in existing spillway - 4 X2.5mX1.0m

Considering only 100mm depth over sill of spillway & water velocity of 0.5 m/sec Discharge of water through spillway = 4*2.5*0.1*0.5 = 0.5 Cum/sec Whereas actual runoff due to rainfall of 100 mm in 24 hours is only 0.25 Cum/sec.

As discussed above and marked as (A), If we consider a water course of 200 mm, spillway can carry discharge of 1 Cum/sec & in case of floods, we can assume even a water course of 300mm & a discharge of 1.5 Cum/sec can pass safely through the existing spillway.

As per stormy rains were observed many times at site but flow of surface runoff through the existing spillways was not seen. Entire runoff was passing through openings of the decantation well.

Spillway outlet trough is well connected with settling tank existing in the North of Lagoon#1.

Thus existing spillways are very much capable of passing surface runoff safely without any danger to ash dyke embankment.

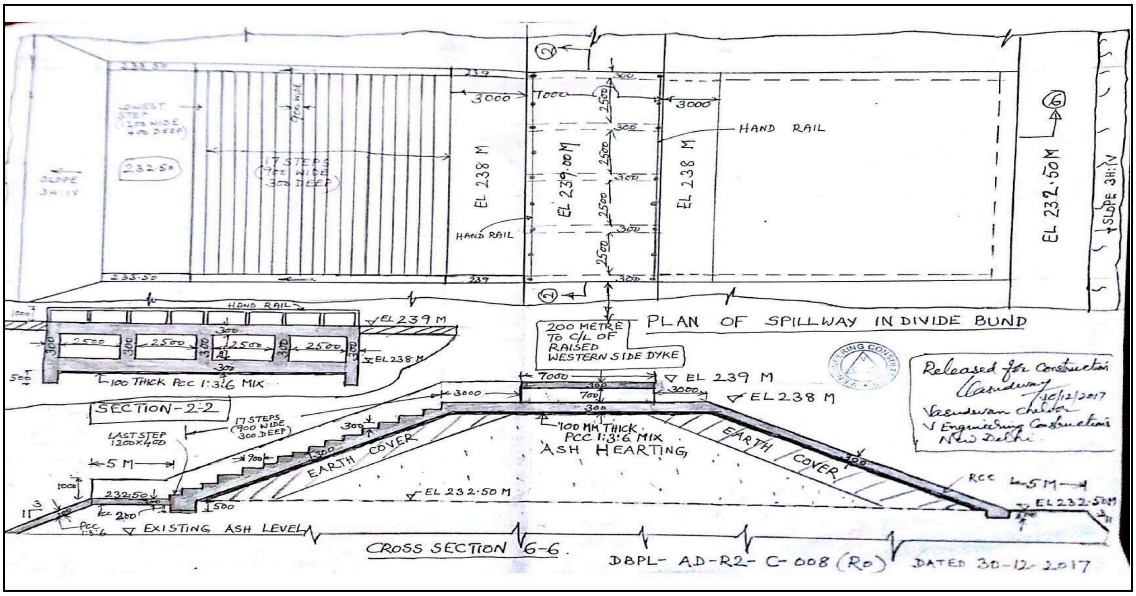


Figure 20: Spillway Construction drawing

Figure 21: Spillway size 10 m x 6 m x1 m

6. Dyke Compaction

During construction of Dyke, proper compaction of the same has been done initially. However, soil compaction is done on a regular basis as and when required. Soil compaction and ash compaction studies are also done regularly internally. However, on the suggestion of the IIT KGP study team, a third party compaction study was conducted by the authority last year. The test results and desired specifications are provided in tables 11 and 12. However, soil and Dyke compaction study is from time to time conducted by the concerned authority. During the field visit, the IITKGP study team has examined these study reports. At present, the ash dyke is completely filled up and covered by turfing and brick lining.

Table 11: The specifications for the Laboratory tests

Sl.No	Relevant IS Codes/Specification	Description
1	**IS: 1892 :2021**	For subsurface investigation of soil for foundation
2	**IS: 2131 :1981**	For Standard Penetration Test
3	**IS: 2132 :1986**	For sampling of Undisturbed and Disturbed Samples
4	**IS: 2720 & their Parts**	For all Laboratory Tests on collected Soil Samples
5	**IS:1498 : 1970**	For Classification & Identification Of Soils
6	**IS: 6403 :1981**	For determination of Ultimate & Safe Bearing Capacity
7	**IS: 8009(Part I) :1976**	For Calculation of Settlement of Foundations
8	**IS: 1904 :2021**	For Permissible Maximum Settlement
9	**IS: 9429 :1999**	For Drainage System For Earth And Rockfill Dams

Table 12: Five samples from the laboratory test results, as received.

Lagoon-1 West Side Bund		Lagoon-1 West Side Bund	
Depth: 0 to 0.63m		Depth: 0.63m to 1.0m	
% Passing on IS Sieve		% Passing on IS Sieve	
Gravel %	40.8	Gravel %	2.9
Sand %	37.1	Sand %	29.8
Silt & Clay %	22.1	Silt & Clay %	67.3
Soil Classification : "GC" Clayey Gravel - SOIL		Soil Classification : "SC" Clayey Sand- FLY ASH	
Atterberg's Limit		Atterberg's Limit	
Liquid Limit (L.L.) %	30	Liquid Limit (L.L.) %	36
Plastic Limit (P.L.) %	22	Plastic Limit (P.L.) %	Non-Plastic
Plasticity Index (P.I.) %	8	Plasticity Index (P.I.) %	Non-Plastic
Other Tests		Other Tests	
Natural Moisture Content %	7.8	Natural Moisture Content %	12.4
Bulk Density gm/cc	1.75	Bulk Density gm/cc	1.16
Dry Density gm/cc	1.62	Dry Density gm/cc	1.03
Cohesion (Kg/cm²)	0.09	Cohesion (Kg/cm²)	0
Angle of Internal Friction (°)	20	Angle of Internal Friction (°)	25
Free Swell Index (%)	10	Free Swell Index (%)	10
Specific Gravity	2.73	Specific Gravity	.36

Lagoon-2 West Side Bund		**Lagoon-2 West Side Bund**	
Depth: 0 to 0.63m		**Depth: 0.63m to 1.0m**	
% Passing on IS Sieve		**% Passing on IS Sieve**	
Gravel %	38.6	Gravel %	3.2
Sand %	43.2	Sand %	31.4

Silt & Clay %	18.2	Silt & Clay %	65.4
Soil Classification : "GC" Clayey Gravel- SOIL		**Soil Classification : "SC" Clayey Sand- FLY ASH**	
Atterberg's Limit		**Atterberg's Limit**	
Liquid Limit (L.L.) %	26	Liquid Limit (L.L.) %	43
Plastic Limit (P.L.) %	21	Plastic Limit (P.L.) %	Non-Plastic
Plasticity Index (P.I.) %	5	Plasticity Index (P.I.) %	Non-Plastic
Other Tests		**Other Tests**	
Natural Moisture Content %	8.1	Natural Moisture Content %	13.2
Bulk Density gm/cc	1.74	Bulk Density gm/cc	1.23
Dry Density gm/cc	1.61	Dry Density gm/cc	1.09
Cohesion (Kg/cm²)	0.07	Cohesion (Kg/cm²)	0
Angle of Internal Friction (°)	21	Angle of Internal Friction (°)	26
Free Swell Index (%)	10	Free Swell Index (%)	10
Specific Gravity	2.74	Specific Gravity	2.38

Lagoon-2 South Side Bund	
Depth: 0 to 1.0 m	
% Passing on IS Sieve	
Gravel %	13.8
Sand %	46.6
Silt & Clay %	39.6
Soil Classification : "SC" Clayey Sand- SOIL	
Atterberg's Limit	

Liquid Limit (L.L.) %	29
Plastic Limit (P.L.) %	21
Plasticity Index (P.I.) %	8
Other Tests	
Natural Moisture Content %	9.5
Bulk Density gm/cc	1.76
Dry Density gm/cc	1.61
Cohesion (Kg/cm²)	0.12
Angle of Internal Friction (°)	18
Free Swell Index (%)	10
Specific Gravity	2.74

Lagoon-1 North Side Bund		**Lagoon-1 North Side Bund**	
Depth: 0 to 0.63m		**Depth: 0.63m to 1.0m**	
% Passing on IS Sieve		**% Passing on IS Sieve**	
Gravel %	30.9	Gravel %	2.8
Sand %	29.4	Sand %	34.4
Silt & Clay %	39.7	Silt & Clay %	62.8
Soil Classification : "GC" Clayey Gravel - SOIL		**Soil Classification : "SC" Clayey Sand- FLY ASH**	
Atterberg's Limit		**Atterberg's Limit**	
Liquid Limit (L.L.) %	29	Liquid Limit (L.L.) %	43
Plastic Limit (P.L.) %	22	Plastic Limit (P.L.) %	Non-Plastic
Plasticity Index (P.I.) %	7	Plasticity Index (P.I.) %	Non-Plastic
Other Tests		**Other Tests**	
Natural Moisture Content %	12.4	Natural Moisture Content %	16.54
Bulk Density gm/cc	1.80	Bulk Density gm/cc	1.34
Dry Density gm/cc	1.60	Dry Density gm/cc	1.15
Cohesion (Kg/cm²)	0.07	Cohesion (Kg/cm²)	0
Angle of Internal Friction (°)	22	Angle of Internal Friction (°)	27
Free Swell Index (%)	10	Free Swell Index (%)	10
Specific Gravity	2.74	Specific Gravity	2.43

Divide Bund		Divide Bund	
Depth: 0 to 0.63m		**Depth: 0.63m to 1.0m**	
% Passing on IS Sieve		**% Passing on IS Sieve**	
Gravel %	32.6	Gravel %	2.3
Sand %	27.2	Sand %	37.6
Silt & Clay %	40.2	Silt & Clay %	60.1
Soil Classification : "GC" Clayey Gravel - SOIL		**Soil Classification : "SC" Clayey Sand- FLY ASH**	
Atterberg's Limit		**Atterberg's Limit**	
Liquid Limit (L.L.) %	29	Liquid Limit (L.L.) %	43
Plastic Limit (P.L.) %	21	Plastic Limit (P.L.) %	Non-Plastic
Plasticity Index (P.I.) %	8	Plasticity Index (P.I.) %	Non-Plastic
Other Tests		**Other Tests**	
Natural Moisture Content %	8.7	Natural Moisture Content %	12.4
Bulk Density gm/cc	1.75	Bulk Density gm/cc	1.25
Dry Density gm/cc	1.61	Dry Density gm/cc	1.11
Cohesion (Kg/cm²)	0.10	Cohesion (Kg/cm²)	0
Angle of Internal Friction (°)	21	Angle of Internal Friction (°)	27
Free Swell Index (%)	10	Free Swell Index (%)	10
Specific Gravity	2.73	Specific Gravity	2.41

7. Downstream Erosion Protection IS 9429 : 1999

The downstream erosion protection steps as mentioned below are implemented for the stability of downstream slopes and safety of the dyke (following all the guidelines on design, construction and O&M released by MoP, Central Electricity Authority in September 2022, as reported to the study team by the mine authority).

a. Rock toe has been laid along the dyke in 3 sides except East side (size: 10 to 250 cm & more)

   Toe drain (size:width 50cm depth 40cm) existing along the dyke and working well

b. Slope drains width 30cm x 20cm depth have been laid at an spacing of 25m c/c & all are maintained & working well (Total number of slope drains: 80 nos)

c. Dowel bank (dimensions wide 10 cm x depth 20 cm) at the top of dyke exist which is intact & maintained,

d. On the downstream slope of the embankment suitable turfing using turf sods is provided to protect the slopes against erosion. Size of turfing sods is 25 cm x 30 cm and thickness is in the range of 5-8 cm which is sufficient to cover the grass roots.

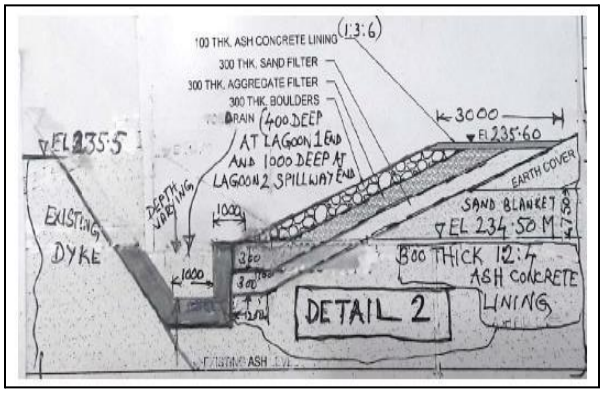


Figure 22(a): Rock Toe & discharge Construction drawing.

Figure 22(b):Toe drain Size-wide 500 mm & depth 400 mm

Figure 22(c) Turfing

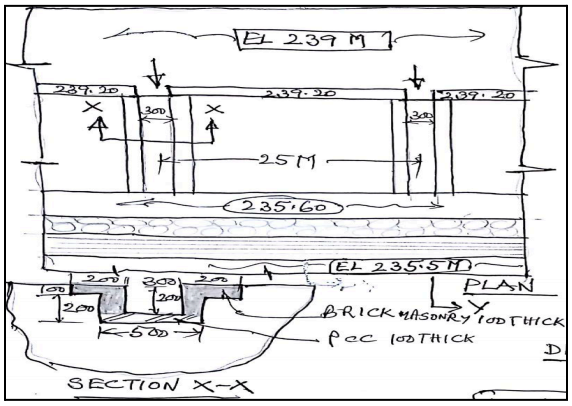


Figure 22(d) Slope drain construction drawing

Figure 22(e) Slope drain.Size - Wide 300mm & Depth 200mm

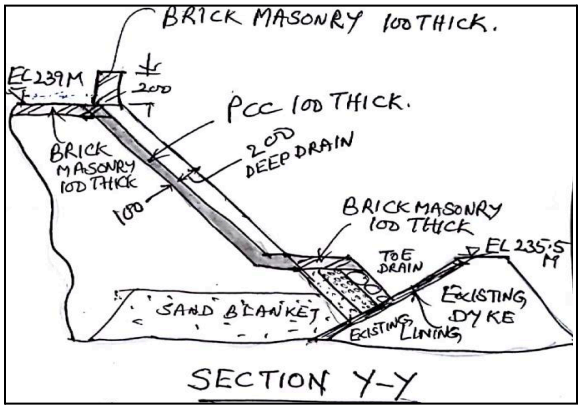


Figure 22(f) Dowel bank construction drawing

Figure 22(g) Dowel bank. Size-wide 100mm & depth 200mm

8. Checklist for Annual Safety Audit

All the details of the checklist of annual safety audits conducted by the mine authority using third parties (other than IITKGP) is provided in Table 13.

Table 13: Provides the details of the checklist on the annual safety audit conducted by us using third party help other than the IIT KGP study team.

Description	**Observations**	**Actions taken**
Condition of Approach Road and Roads over Dyke	Found to be in good condition, ash-loaded vehicles can move safely over the roads	No immediate actions required, remains adequate for operation
Condition of Dowel Banks	Identified damages / broken parts at a few locations.	Immediate repairs executed by the authority
Condition of Slope Drains	Observed to be in good and clean condition	No immediate actions however, periodic maintenance is suggested
Condition of Toe Drains	Floral growth on the drain is observed at various locations.	Regular uprooting of small grasses from toe drains is suggested
Condition of U/S & D/S Slopes	Found to be in good and clean condition	Regular maintenance is suggested
Condition of Slope Protective Measures	Rain cuts observed at a few locations.	Prompt remedial actions to be taken; is suggested
Condition of Rock Toe	Overall intact, with some top caps of brickwork damaged; timely repairs executed	Timely maintenance and repair works, are suggested
Condition of Civil Structures (Decantation Wells, etc.)	All structures intact, concrete deemed sound without any adverse observations	No immediate actions required, structures deemed fit and functional
Condition of Discharge Water Carrying Drains	Drains found clean, with water flowing without obstruction	No immediate actions
Visual Quality of Water in Drains carrying Decanted Water	Clear and visually acceptable	No immediate actions required, however, continuous checking is suggested to maintain the discharge water quality
Seepage through Downstream Slopes	Water seepage in small quantity found at downstream side slope of lagoon 2	Remedial action is taken. Authority is suggested to pay extra attention to prevent further

		leakage from the bund.
Signs of Piping in the Embankment	No signs of piping identified	No immediate actions required
Signs of Settlement of Embankment	No signs of settlement noted	No immediate actions required
Longitudinal Cracks over Top of Embankment	No longitudinal cracks observed	No immediate actions required
Adequate Margin during Evacuation of Pond Ash	Sufficient margin observed during pond ash evacuation	No immediate actions required
Vegetation Removal over Embankment & Drains	Regular removal of vegetation implemented	No immediate actions required
Visual Quality of Seepage Water through Rock Toe	Water through rock toe appears very clear	No immediate actions required
Sufficient Freeboard in the Ash Pond	Adequate freeboard maintained	No immediate actions required

Figure 23: Rain cuts filling work

Figure 24: Slope drain repairing work

Figure 25: Rock toe drain cleaning work

Figure 26: Vegetation cleaning work

9. Checklist for Fly Ash Generation (as per reports submitted by the authority to CPCB, see Annexure for details)

Table14 Provides the details of the checklist on the annual FlyAsh Generation studies which are conducted by us using third party help other than the IIT KGP study team.

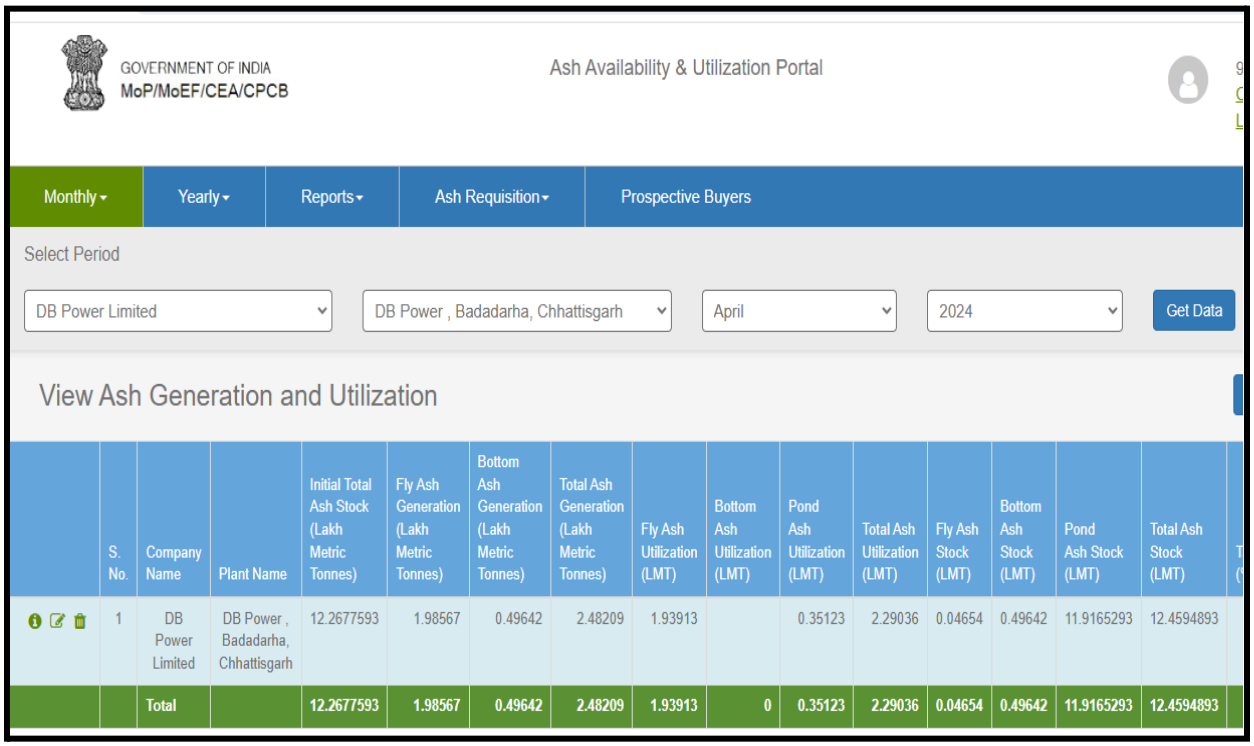
Table 14 Checklist for fly ash generation and utilization

FY	Plant Capacity	Coal Consumption	Ash Generation		
			Fly Ash	Bottom Ash	Total
	MW	LMT	LMT	LMT	LMT
2023-2024	1200	**63.11**	**22.44**	**5.61**	**28.05**
2024-2025 (Till Dec 2024)	1200	**45.27**	**15.86**	**3.96**	**19.82**

ASH UTILIZATION DETAILS												
FY	(SILO) Fly Ash Utilization						Pond Ash Utilization				Total (A+B)	Percentage of Ash Utilization
	Cement	Mine filling	Making of fly ash based /Bricks/blocks/tiles etc	Construction of Highways and Roads including flyovers	Reclamation of low-lying area	Total (A)	Mine filling	Construction of Highways and Roads including flyovers	Reclamation of low-lying area	Total (B)		
	LMT	LMT	LMT	LMT	LMT	LMT	LMT	LMT	LMT	LMT	LMT	in %
2023-2024	0.08	18.47	0.21	0	3.03	21.79	5.87		0.43	6.3	28.09	100.14
2024-2025 (Till Dec 2024)	0.09	13.22	0.21	0.96	1.2	15.68	5.91	1.03	0.33	7.27	22.95	115.79

Fly-ash utilization reports are regularly submitted to the online portals. The above data are the results of compilation of these reports (April 2024, and December 2024). Some snapshots of these online reports are provided below.

Submitted to online portal month of April 2024 & December 2024



GOVERNMENT OF INDIA
MoP/MoEF/CEA/CPCB

Ash Availability & Utilization Portal

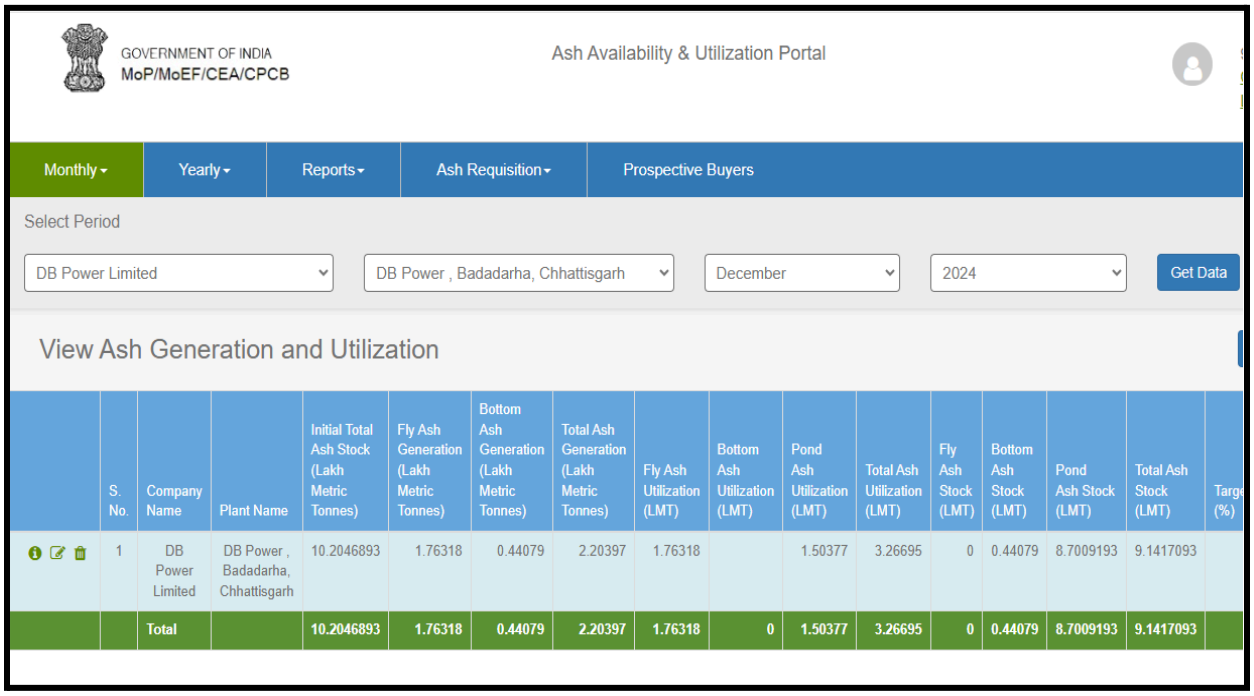
Monthly | Yearly | Reports | Ash Requisition | Prospective Buyers

Select Period

DB Power Limited | DB Power , Badadarha, Chhattisgarh | April | 2024 | Get Data

View Ash Generation and Utilization

	S. No.	Company Name	Plant Name	Initial Total Ash Stock (Lakh Metric Tonnes)	Fly Ash Generation (Lakh Metric Tonnes)	Bottom Ash Generation (Lakh Metric Tonnes)	Total Ash Generation (Lakh Metric Tonnes)	Fly Ash Utilization (LMT)	Bottom Ash Utilization (LMT)	Pond Ash Utilization (LMT)	Total Ash Utilization (LMT)	Fly Ash Stock (LMT)	Bottom Ash Stock (LMT)	Pond Ash Stock (LMT)	Total Ash Stock (LMT)
	1	DB Power Limited	DB Power , Badadarha, Chhattisgarh	12.2677593	1.98567	0.49642	2.48209	1.93913		0.35123	2.29036	0.04654	0.49642	11.9165293	12.4594893
		Total		**12.2677593**	**1.98567**	**0.49642**	**2.48209**	**1.93913**	**0**	**0.35123**	**2.29036**	**0.04654**	**0.49642**	**11.9165293**	**12.4594893**



GOVERNMENT OF INDIA
MoP/MoEF/CEA/CPCB

Ash Availability & Utilization Portal

Monthly | Yearly | Reports | Ash Requisition | Prospective Buyers

Select Period

DB Power Limited | DB Power , Badadarha, Chhattisgarh | December | 2024 | Get Data

View Ash Generation and Utilization

	S. No.	Company Name	Plant Name	Initial Total Ash Stock (Lakh Metric Tonnes)	Fly Ash Generation (Lakh Metric Tonnes)	Bottom Ash Generation (Lakh Metric Tonnes)	Total Ash Generation (Lakh Metric Tonnes)	Fly Ash Utilization (LMT)	Bottom Ash Utilization (LMT)	Pond Ash Utilization (LMT)	Total Ash Utilization (LMT)	Fly Ash Stock (LMT)	Bottom Ash Stock (LMT)	Pond Ash Stock (LMT)	Total Ash Stock (LMT)
	1	DB Power Limited	DB Power , Badadarha, Chhattisgarh	10.2046893	1.76318	0.44079	2.20397	1.76318		1.50377	3.26695	0	0.44079	8.7009193	9.1417093
		Total		**10.2046893**	**1.76318**	**0.44079**	**2.20397**	**1.76318**	**0**	**1.50377**	**3.26695**	**0**	**0.44079**	**8.7009193**	**9.1417093**

10. Inspection Reports on Mandatory overall safety maintenance of the ash pond prepared internally

The compulsory ash pond checklist for the inspection conducted internally by the authority is reported here, which is based on the SOP at DBPL. These reports are indicative of continuous and stringent efforts on the part of management to maintain the safety of the pond.

Table 15 The inspection report for overall safety of ash pond

Inspection report of ash dyke				
Name of the Project: **DB POWER LTD** Name of ash dyke and lagoon: **ASH DYKE LAGOON-1 & 2** Phase of ash dyke: (starter phase or raising phase number)- **1st Raising & 2nd Raising of ash dyke** (Each phase of the dyke was inspected separately and observations recorded). Date of inspection: 23.12.2024 Time of inspection: 12:30 PM **Top level of ash dyke phase inspected**: **235.500 & 239.00** Water level: Lagoon 1- 235.500 & Lagoon-2 – 238.00 **Name of authorized inspecting office**r: Anil prajapati , Lekhram patel & Bijendra singh				
			Observation	**Compliance report**
1	Condition of approach road to the top of dyke	Good/tolerable/bad	**Good**	
2	Whether ash is visible above water level anywhere within the lagoon?	Yes/no	**Yes**	
3	Whether fugitive ash is flying anywhere?	Yes/no	**No**	
4	Visual quality of ash pond effluent overflowing from decant towers	Good/bad	**Good**	
5	Is there any damage on the upstream slope?	Yes/no	**NA**	
	If yes, description of erosion			
6	Quality of effluent discharging from spillway	Good/bad	**NA**	
7	Whether uniform deposition of ash is being achieved within the lagoon?	Yes/no	**No**	
8	Whether there is any erosion/damage below the ash pipeline running over the dyke? If yes, chainage at which point damage is present.	Yes/no	No	

9	Whether there is any leakage in the ash pipeline running over the dyke?If yes, at what chainage?	Yes/no	**No**	
10	Whether the slurry discharge jet is damaging the dyke slope lining? If yes, at what chainage?	Yes/no	**No**	
11	Condition of downstream slope protection If bad, description and location of damage.	Good/bad	**Good**	
12	Condition of dyke top If bad, description and location of damage	Good/bad	**Good**	
13	Are there any cracks on the dyke top, upstream slope or downstream slope? If yes, description and location of cracks	Yes/no	**No**	
14	If cracks are present, are they widening or lengthening?	Yes/no	**NO**	
15	Is there any foundation heaving noticed near the toe of the starter dyke? If yes, description and location of heave	**Yes/no.**	**No**	
16	Is there any vegetation growth on the dyke top or on the slopes, other than turfing?	Yes/no	**Yes**	
17	Is there any seepage, boils, wetness, bulging etc. noticed on the downstream slope above rock toe? If yes, description and location	Yes/no	**No**	
18	Is there any seepage, boils, wetness, bulging etc. noticed on the foundation near the downstream toe of dyke? If yes, description and location	Yes/no	**Yes , small qty in toe drain .This is a healthy sign .**	
19	If there is seepage or boils on the dyke slopes or on foundation, whether the seepage water is clear or muddy in color.	Clear/muddy	**Clear**	
	If muddy, whether immediate first aid by covering with inverted filter has been planned.	Yes/no	**NA**	

20	Is there any caving in or sinking signs on the slopes or on foundation near the dyke toe? If yes, description and location	Yes/no	**No**	
21	Are there any rain cuts on the downstream slope?	Yes/no	**No**	
22	Condition of dowel bank and slope drains If bad, description and location of damage	Good/tolerable / bad	**Tolerable**	
23	Condition of rock toe and capping over rock toe If bad, description and location of damage	Good/bad	**Good**	
24	Condition of toe drain lining If bad, description and location of damage	Good/bad	**Good**	
25	Whether water is flowing freely in toe drain and slope drains If no, description of problem and location	Yes/no	**Yes**	
26	Is there any vegetation growth in the toe drain and slope drains	Yes/no	**No**	
27	Is there any silt deposition in the toe drain or slope drains	Yes/no	**No**	
28	Is there any rat holes, burrough holes or hoof marks on the dyke slope or very near to dyke toe	Yes/no	**No**	
29	Are there any manmade excavations near the dyke toe on the foundation? If yes, description and location.	Yes/no	**No**	
30	Is there any construction material stored/deposited on the dyke top	Yes/no	**No**	
31	Is there any seepage or gap outside the embedded pipe lining?	Yes/no	**No**	
	If yes, whether the colour of seeping water is clear or muddy. If muddy, immediate first aid by covering with inverted filter to be provided	Clear/muddy		

32	Is there any water logging on the foundation around the dyke? If yes, details of location, depth of water etc.	Yes/no.	**No**	

11. Details of actions taken on deficiencies noted

As per the discussions with the DBPL authority, the details of the action taken reports for some of the major observation points are provided below.

Table 16 Details of action taken for deficiencies

Sl.No.	**Inspection Area**	Observation	**Action Taken on Issues Identified**
I	**Condition of Access Roads**	Ash-loaded vehicles caused considerable damage to the access roads prior to the last monsoon.	Full repair work has been carried out using Wet Mix Macadam (WMM) at the dyke's top.
II	**Vegetation on D/S Slopes**	Significant vegetation growth was noted across the entire downstream slopes.	Complete removal of vegetation from the downstream slopes has been successfully completed
III	**Ash Slurry Pipe Integrity**	On 17th September 2024, a leakage in the ash slurry pipeline was found near the security post no-1 on the North-west side bund of lagoon 1.	The leak was immediately repaired after a pipeline shutdown. No damage occurred to the embankment or slopes. Welding consumables used: IS Code-ER 4221X.
IV	**Condition of Dowel Bank**	Multiple points of damage were identified on the dowel bank.	Ongoing repairs are being performed to address the damaged dowel bank areas
V	**Vegetation in Toe Drains**	Vegetation growth was observed in the toe drains, particularly during the monsoon season.	Regular cleaning and maintenance of the toe drains are now in place to avoid blockages
VI	**Vegetation in Slope Drains**	Vegetation build-up was found in the slope drains during the rainy period, hindering water flow	Slope drains are being cleared periodically to maintain proper functionality.
VII	**Condition of Spillway**	Vegetation growth was observed on the steps of the spillway during rainy conditions, affecting its efficiency.	Periodic cleaning of the spillway is being carried out to ensure its proper operation during rains.
VIII	**U/S Side of Ash Dyke**	Erosion and surface instability were observed on the u/s side of the ash dyke.	Brick pitching has been installed on the u/s side of the ash dyke to improve stability and prevent further erosion.
IX	**D/S Side of Ash Dyke**	Erosion and insufficient vegetation cover were noted on the d/s side of the ash dyke.	Turfing has been completed on the d/s side to strengthen the soil and prevent erosion.

Figure 27(a) Road repairing work

Figure 27(a) Road repairing work (other action)

Figure 27(b) Vegetation clearance

Figure 27(C) Ash slurry pipes before repairing work.

Figure 27(c) Ash slurry pipes after repairing work.

Figure 27(d) Dowel bank repairing work

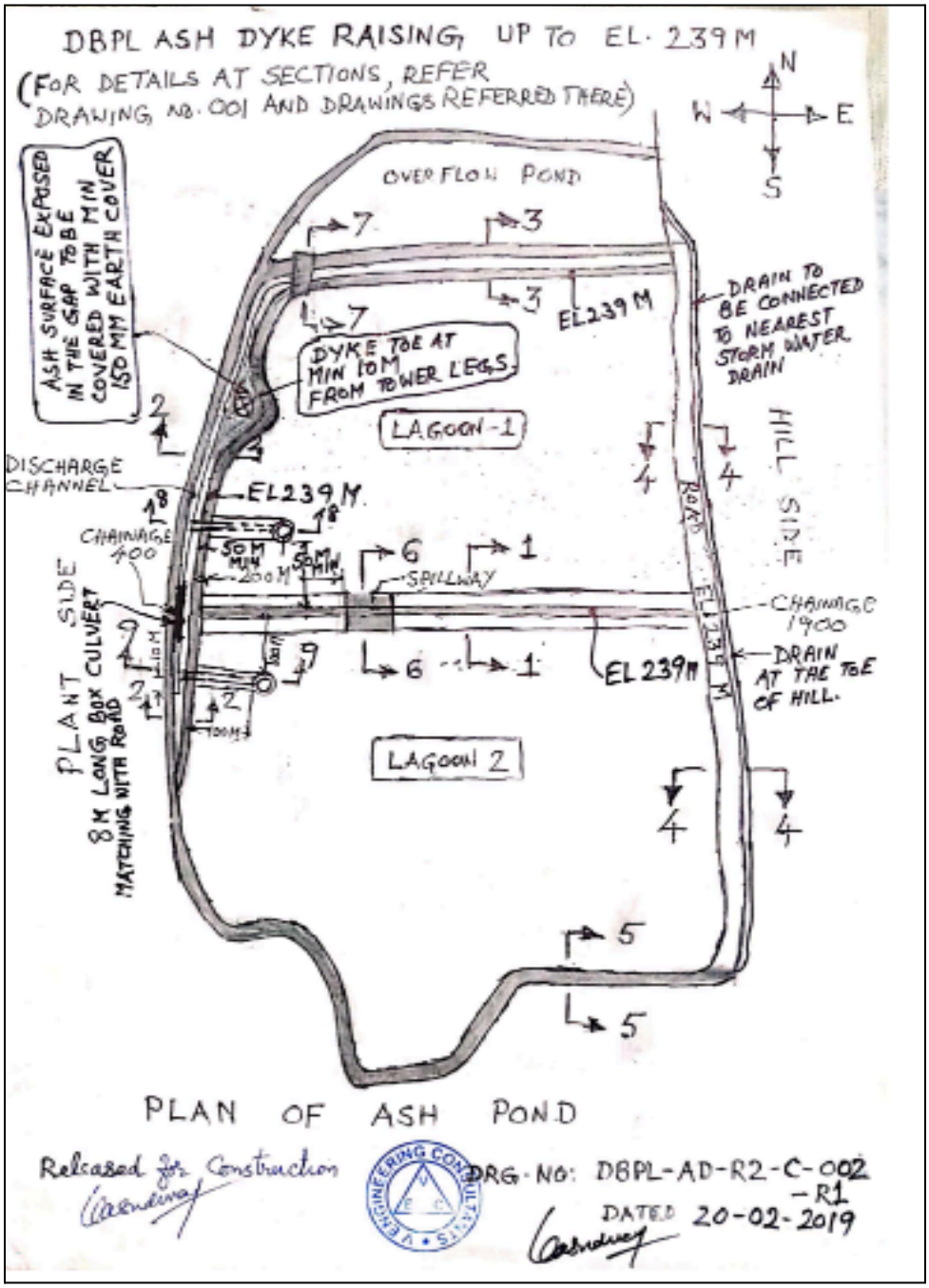
Figure 27(e) Cleaning of Toe drain.

Figure 27(f) Rock Toe filter.

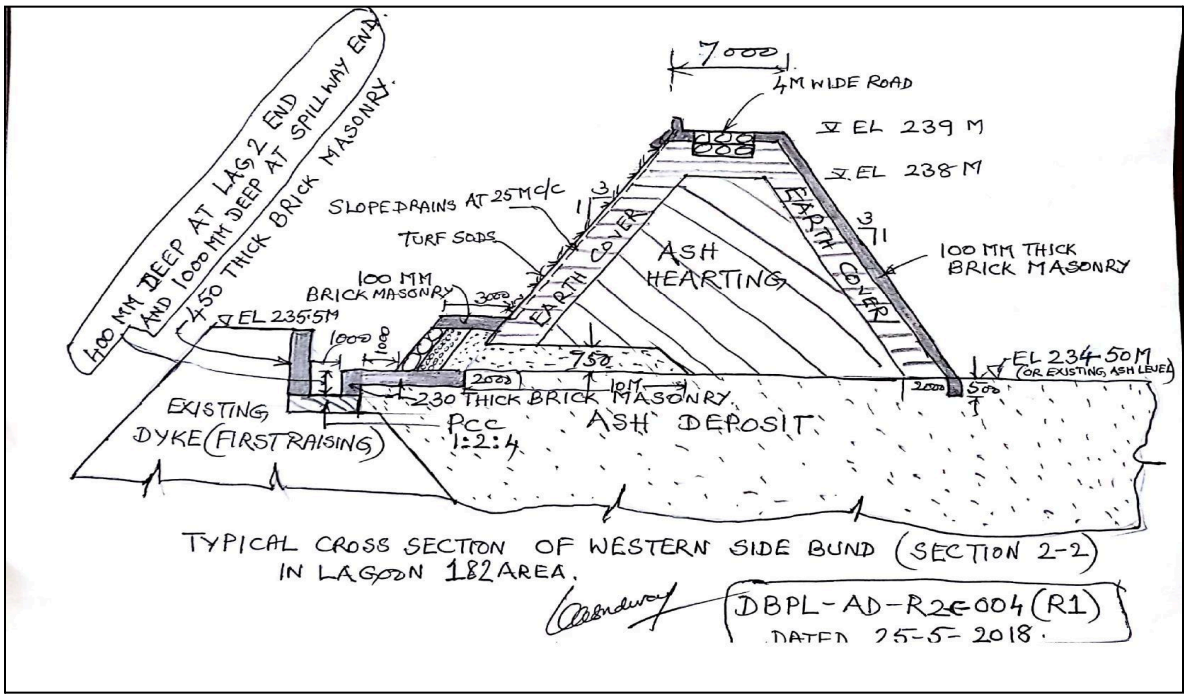
Figure 27(g): Cleaning of slope drains

Figure 27(h): Cleaning of the spillway

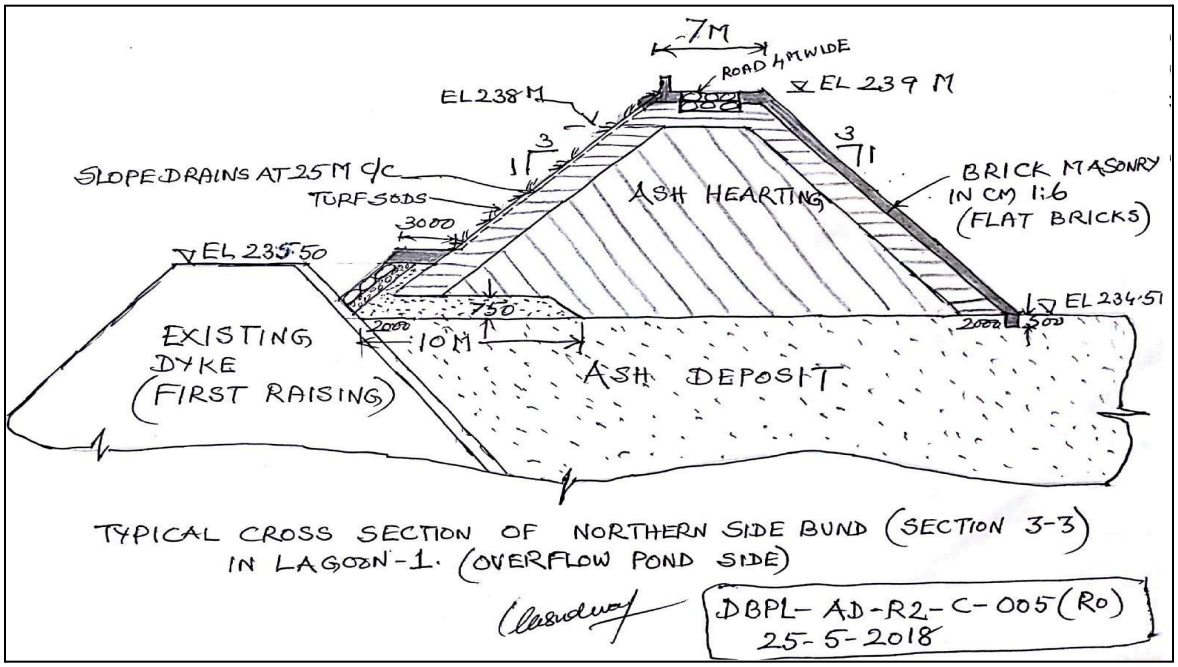
Annexure – I Ash dyke plan



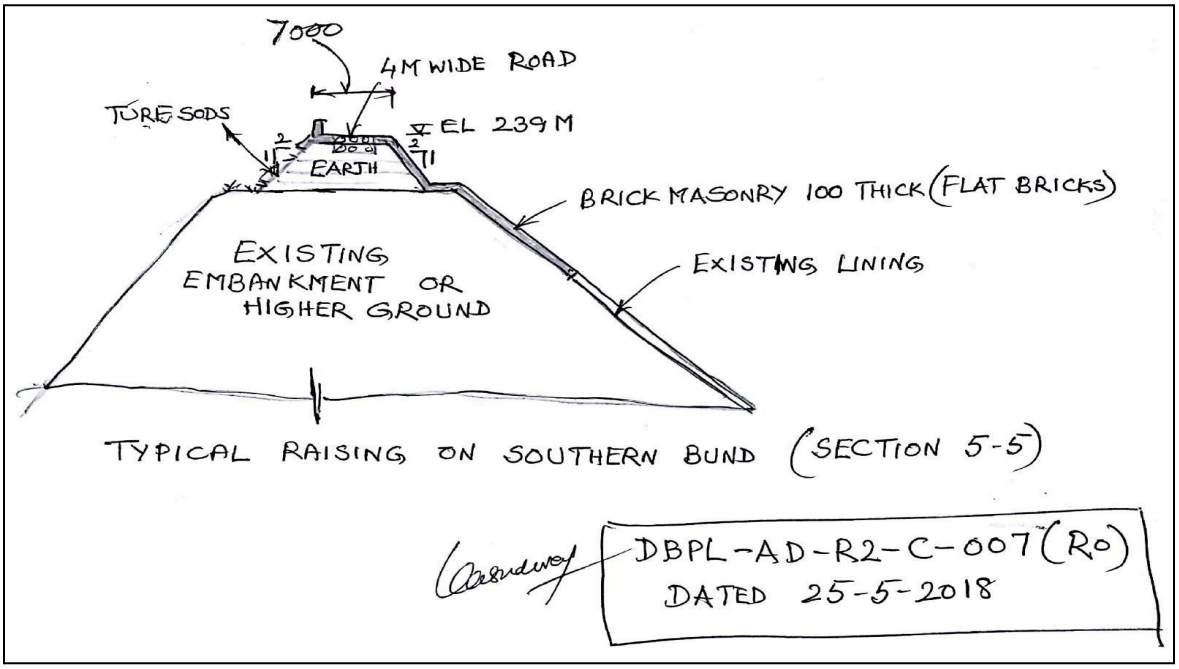
Annexure – II Section of west side bund lagoon 1 & 2



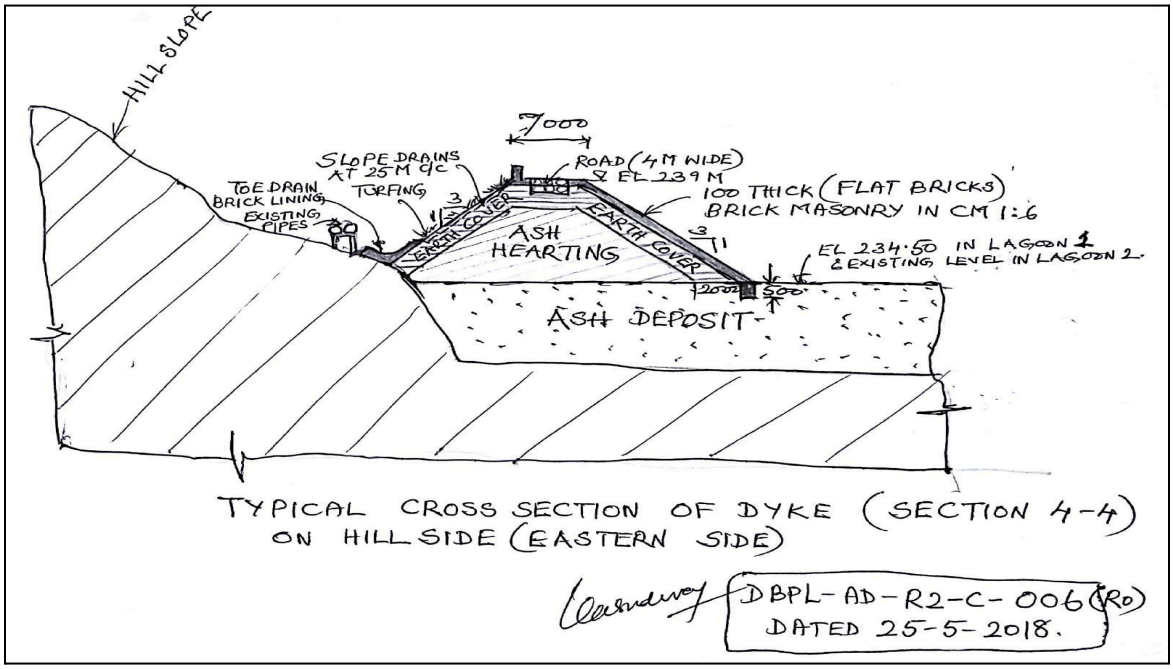
Annexure – III Section of North side bund lagoon 1



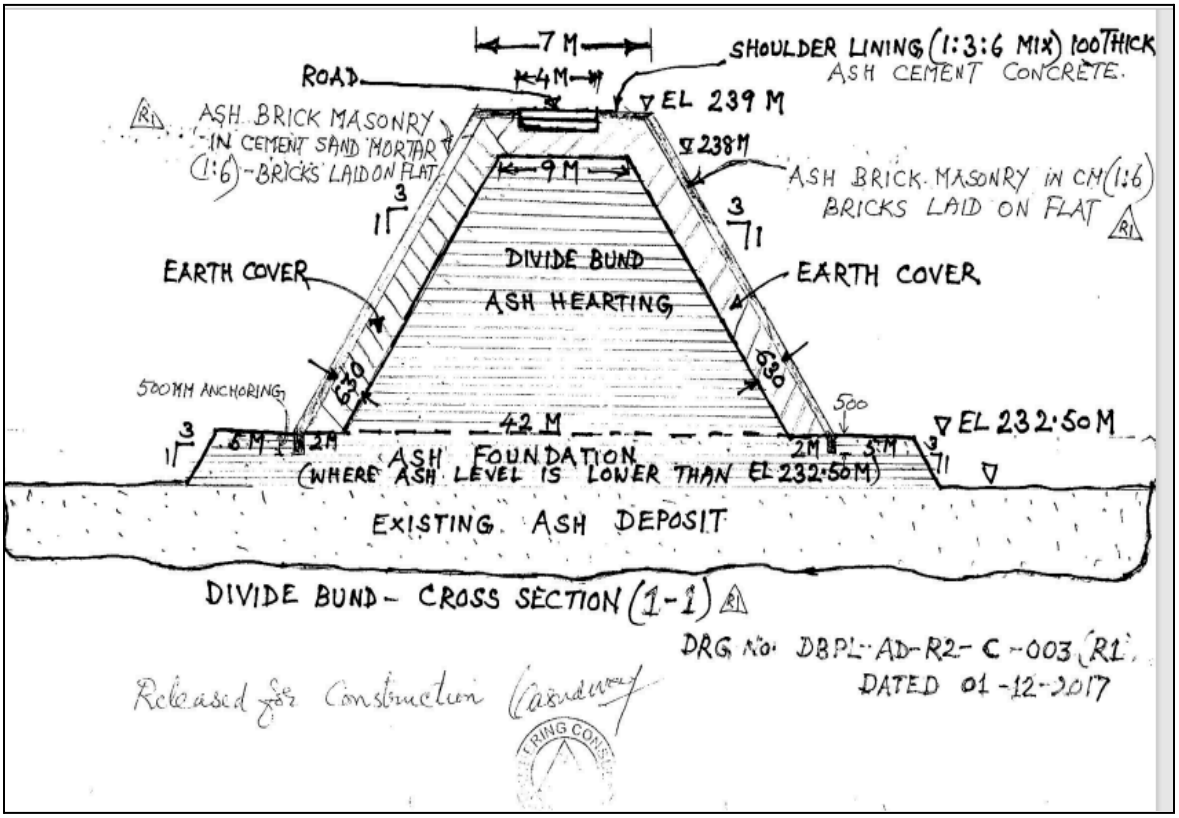
Annexure – IV Section of south side bund lagoon 2



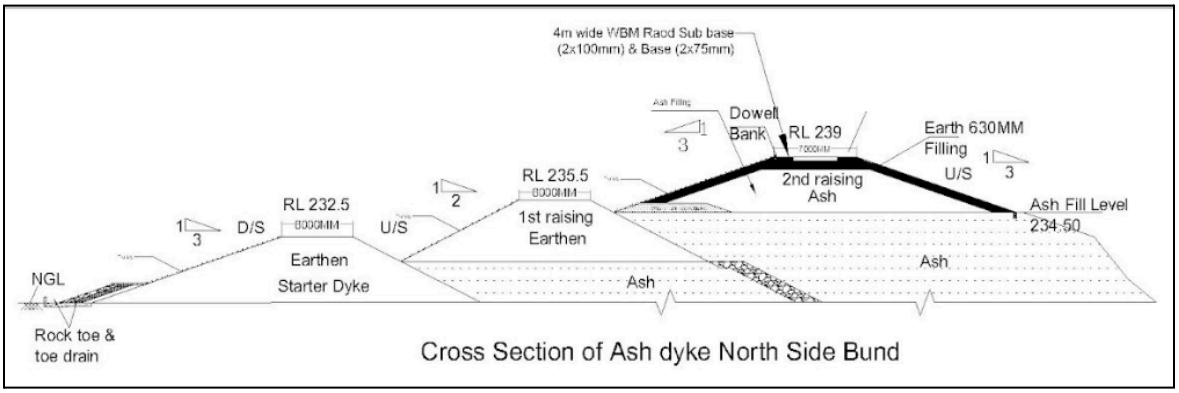
Annexure – V Section of East side bund



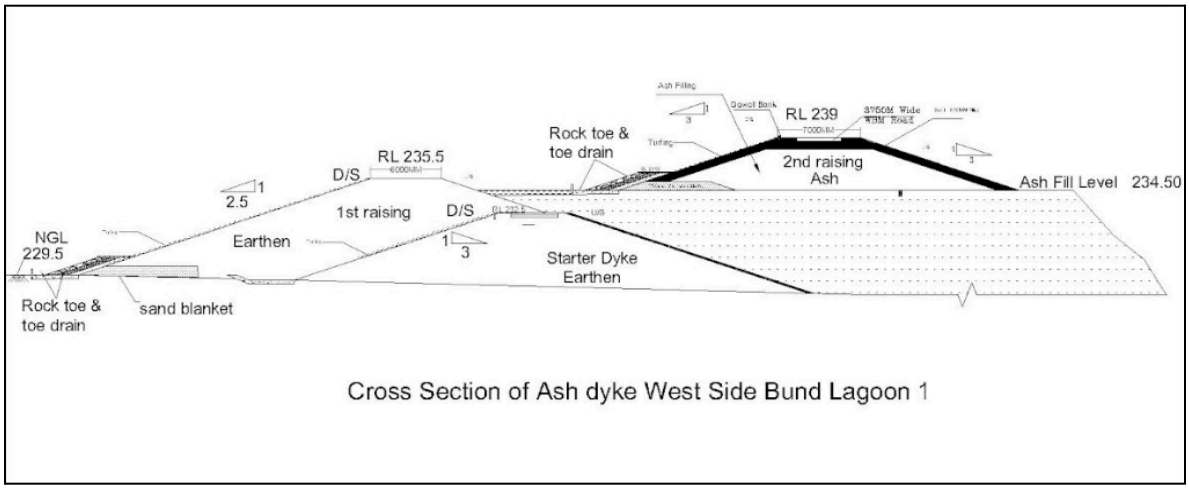
Annexure – VI Section of Divide bund



Annexure – VII Cross Section of North side bund

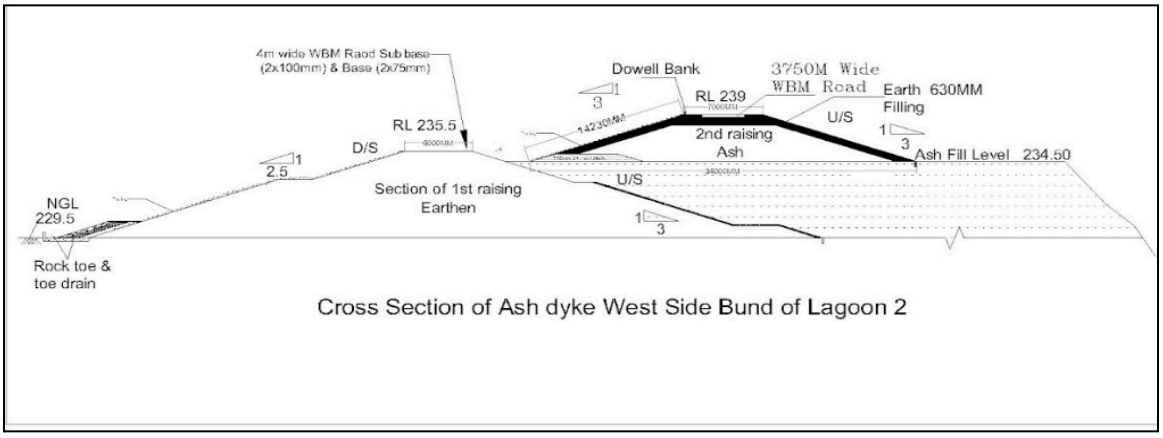


Annexure – VIII Cross Section of West side bund lagoon 1



Cross Section of Ash dyke West Side Bund Lagoon 1

Annexure – IX Cross Section of West side bund lagoon 2



Cross Section of Ash dyke West Side Bund of Lagoon 2