GMR Kamalanga Energy Limited

Plant Office:
AT/PO: Kamalanga, PS: Kantabania,
VIA: Meramundali,
DIST: Dhenkanal - 759 121, Odisha
CIN U40101KA2007PLC044809
T +91 6762 663564
W www.gmrgroup.in 03-01/25

Ref: GKEL/MOEF&CC/2024-25/8531
Date: 06.01.2025

To
The Director
Eastern Regional Office
Ministry of Environment, Forests & Climate Change, Govt. of India
A/3, Chandrasekharpur, Bhubaneswar, Odisha - 751023

Sub: Submission of 34th revised Half-Yearly EC Compliance Status Report of 1050 (3x350) MW, TPP at Village Kamalanga, Dhenkanal District, Odisha.
Ref: Env. Clearance vides your letter No. J-13011/64/2007-IA.II (T) dated 5th February 2008

Dear Sir,

With reference to the subject referred above, we are pleased to submit the 34th revised Half Yearly EC Compliance Status Report (April 2023 to September 2024) of our 1050 (3x350) MW Thermal Power Plant at village Kamalanga, Dhenkanal District, Odisha, for your kind perusal please.

Kindly acknowledge receipt of the same.

Thanking You,

Yours Sincerely,
for **GMR Kamalanga Energy Limited**,

Manoj Mishra
Plant Head

Encl. – As above

Copy for kind information to:
1) Director, MoEF&CC, GOI, New Delhi
2) Regional Director, CPCB Zonal Office, Kolkata
3) Member Secretary, SPCB - Odisha, Bhubaneswar
4) Regional Officer, SPCB - Odisha, Hakimpada, Angul

EC Compliance Report

Name of the project : **GMR Kamalanga Energy Limited, Dhenkanal, Odisha**
Clearance Letter No. & Date : ***J_13011/64/2007-IA. II(T) dated 5th Feb 2008 (Phase-I: 3x350MW)***
Period of Compliance Report : **April 2024 to September 2024**

Sl.	CONDITIONS	COMPLIANCE STATUS
1	The total land requirement shall not exceed 1050 Acres for all the activities / facilities of the power project. ***Revised Land requirement of the project is 1158.57 Acres as per the MoEF &CC, New Delhi vide amendment letter dated 11.01.2019.***	Presently 1158.57 Acres of land is in use. Land lease documents list and MoEF&CC letter received on 11.01.2019 enclosed as per annexure- I.
2	It shall be ensured that the project boundary is at least 500 m away from HFL of the river in conformity with the guideline in this regard.	The distance of Brahmani River HFL from the plant boundary is 1.5KM. SGS surface runoff study report page No- 6 enclosed as per annexure- II.
3	The plant heat rate of around 2300 kcal/kwh shall be achieved and the coal consumption shall not exceed 660 tph.	Avg. Heat Rate – 2321.44 kcl/kwh is being achieved. Coal Consumption not exceeding from 660 tph on six monthly basis is being maintained and submitted on six monthly EC compliance report. Copy of compliance for this point from previous six monthly compliances (April-Sept 2022, Oct-March 2023, April-Sep 2023 and Oct-March 2024) are enclosed as per Annexure- III which shows the coal consumption within 660 tph except 680 tph during the period April-September 2024 due to higher ash content in coal.
4	Ash and Sulphur contents in the coal to be used in the project shall not exceed 34% and 0.5 % respectively.	Sulphur content in the coal is being maintained below 0.5%. Copy of coal test report enclosed as per annexure- IV. GKEL Thermal Power Plant is based on Pit head TPP and all parameters are being achieved as per notification S.O. 1561(E) 21st May, 2020.
5	A multi–flue stack of 275 m height with exit velocity of not less than 21 m/s shall be provided with continuous online monitoring system.	The stack height is 275 meters (a copy of the aviation clearance mentioning the stack height is attached in annexure V). The exit velocity of the flue is maintained at more than 21 m/s. The stack monitoring report for November 2024 is enclosed in Annexure VI. A Continuous Emission Monitoring System is installed, and a copy of the RT-DAS server screenshot is enclosed in annexure VII.
6	High efficiency Electrostatic precipitators (ESPs)with efficiency not less than 99.9% shall be installed so as to ensure that particulate emissions do not exceed 50 mg/Nm^3.	The efficiency of the Electrostatic Precipitator is more than 99.9%. A copy of the performance evaluation report is enclosed in annexure VIII. The values of particulate emissions are within the prescribed standards. The stack monitoring report is enclosed in annexure VI.
7	Appropriate mitigation measures shall be adopted to reduce the emissions of SO_2. It shall be ensured that at no point of time the ground level concentration of SO_2 in the impact zone exceeds the prescribed limit. The proponent shall now itself	Appropriate mitigation measures focused on maintaining the SO2 content in the coal are being implemented.

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	also provide space for installation of FGD or other suitable measures, if required at a later stage.	Ambient Air Quality Monitoring, including SO2, is being conducted at seven locations within a 10 km radius. The SO2 GLC at all monitoring locations is found to be within the standard in all seasons. Monitoring reports are submitted on a quarterly basis and through six-monthly EC compliance reports. A copy of the monitoring report for the period FY 2024-25 Q2 is enclosed as per annexure- IX. Space for the installation of FGD is provided in the plant layout. The map is enclosed as per annexure- X.
8	Water requirement shall not exceed 37 cusecs. No ground water shall be extracted for the project at any stage including during construction.	Presently, 20 cusecs of water from the Brahmani River are being used for 3x350 MW operating units. Quarterly (Q-2) report file to CPCB for water consumption is enclosed as per annexure- XI. No ground water extracted for the project at any stage.
9	COC of not less than 5 shall be adopted. ***Specific water consumption shall be 3.5m^3/mw as per the Ministry's Notification dated 07.12.2015***	The avg. COC of last six months is 7.00 and Specific water consumption is <2.5 m3/MW. Quarterly (Q-2) report file to CPCB for water consumption is enclosed as per annexure- XI.
10	Closed circuit cooling system with induced draft cooling towers shall be provided.	Induce Draft Cooling Tower (IDCT) is provided. Copy of layout attached as per annexure- XII.
11	Waste water generated shall be recycled and reused in the plant premises. There shall be no discharge of waste water outside the plant boundary except during monsoon.	Zero Liquid Discharge (ZLD) is maintained. Effluent generated from the plant is treated in the Effluent Treatment Plant (ETP), and sewage is treated in the Sewage Treatment Plant (STP).
12	For controlling fugitive dust, regular sprinkling of water in the coal handling area and other vulnerable areas of the plant shall be ensured.	Dust Extraction (DE) system and Dry Fog Dust Suppression System (DFDS) have been installed to control fugitive emissions. Regular water spraying is being conducted in coal handling and other dust-prone areas of the plant. Photos of the pollution control system are enclosed as per annexure XIII.
13	The project authorities should adhere to the provisions stipulated in the fly ash notification of September, 1999 and as amended in august, 2003 in regard to fly ash utilization. Fly ash shall be collected in dry form. Balance fly ash shall be dispose off in the ash pond through HCSD mode and bottom ash through medium slurry mode.	We adhere to the provisions stipulated in the fly ash notification, and fly ash utilization has achieved 100% over the last five years. Dry fly ash collection facilities and HCSD system are in place. Ash generation & utilization status for the year 2024-25 (H-1) are as follow: - ➢ Total Ash generated = 13,61,452 MT ➢ Total Ash utilisation = 13,61,452 MT ➢ % of utilisation = 100 FY 2023-24 fly ash audit report attached as per annexure- XIV.
14	The ash pond shall be lined with impervious lining to avoid any leaching into ground water. The ash dyke shall be so designed and strengthened to ensure guard against breaching. Adequate safety measures shall also be taken so that pond ash does not become air borne to cause air pollution in the surrounding areas.	Impervious lining and strengthening of the ash dyke have been done and are being maintained. The FY 2023-24 Ash Pond Condition assessment report is attached as per Annexure XV. Presently, both ash ponds are empty, and there is no probability of causing air pollution in the surrounding area due to the ash ponds.

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15	R & R plan for land oustees and homestead oustees shall be prepared in consultation with the state Revenue Authorities prepared before starting work on the project & implemented simultaneously with the start of development/ construction work on the project. A copy of the R&R plan shall also be submitted to this ministry within three months of the issue of this letter.	R&R Plan is not applicable to our project as there are no land oustees from the project area.
16	The District collector / Revenue Divisional commissioner shall be informed regarding R&R and all other benefits to be provided by the project proponent and their effective implementation shall be overseen by the District authorities.	Rehabilitation & periphery development Advisory committee (RPDAC) is overseeing this implementation.
17	Rain water harvesting should be adopted. Central Ground water Authority/Board shall be consulted for finalization of appropriate rain water harvesting technology within a period of three month from the date of clearance.	Rain water harvesting (RWH) system is in operation. Rain water harvesting plan already submitted to CGWA. Copy of the same is enclosed as per annexure- XVI.
18	Regular monitoring of ground water quality including heavy metals shall be undertaken around ash dyke the project area to ascertain the change, if any water quality due to leaching of contaminants from ash disposal area.	Groundwater quality is being monitored around the ash dyke. The report is enclosed as annexure XVII.
19	A greenbelt shall be developed all along the plant and ash pond boundary covering total area of at least 320 acres.	➢ A green belt with indigenous species has already been developed. We have planted approximately 399,103 saplings as of September 2024 (including 1,435 saplings in 2024-25) around the plant and township premises, along the railway line, and the approach road, covering a land area of 382.32 acres. ➢ Survival rate is around 90%. ➢ Under social voluntary project- Sabujima (A Green Initiative), 160 Nos. of fruit bearing trees were planted along with organic farming in the campus of Kamalanga Nodal High School, at Kamalanga Village. ➢ In addition to this, we have also developed avenue plantation and green belt in Dhenkanal area as required by District Administration. ➢ Yearly plantation details enclosed as per annexure- XVIII.
20	First aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.	First aid and sanitation arrangements have been made for drivers and contractor workers.
21	An alternate Goucher land shall be developed in the identified 65 acres of land for use of the villagers for grazing of their cattle's. The District Authorities and the villagers shall be informed of the same for its effective utilization.	65.19 acres of land has already been surrendered to Govt. of Odisha as alternative Goucher land. Land handover letter attached as per annexure- XIX.
22	Leq of noise level should be limited to 75dBA and regular maintenance of equipment be undertaken for people working in the high noise areas, Personal Protection devices should be provided.	Noise level is being maintained. Poster /wall paintings are also displayed for creating awareness. The average max. and min. noise levels at boundary are as follows: - ➢ Day time noise levels- 67.3 dB(A) max. and 46.1 dB(A) min. ➢ Night time noise levels- 64.5 dB(A) max. and 43.7 dB(A) min.

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23	Regular monitoring of the ambient air quality shall be carried out in the impact zone and records maintained. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Quarterly reports shall be submitted to Regional office of this Ministry.	Ambient Air Quality (AAQ) is being monitored regularly by a MoEF&CC accredited laboratory, and records are maintained. Reports are submitted quarterly to MoEF&CC and OSPCB on a monthly basis. The FY 2024-25 Q2 report is enclosed as per annexure IX.
24	The project proponent should advertise in at least two local newspapers widely circulated in the region around the project, one of which should be in the vernacular language of the locality concerned within seven days of issue of this letter, informing that the project has been accorded environmental clearance and copies of clearance letters are available with the SPCB/ Committee and may also be seen website of the MoEF&CC in the http://envfor.nic.in	Grant of EC advertisement in 02 newspaper enclosed as per annexure- XX.
25	A separate environment monitoring cell with suitable qualified staff should be set up for implementation of the stipulated environmental safeguards.	An environment monitoring cell with suitably qualified staff has been in place since 2013. The letter submitted to OSPCB on 31.07.2013 is enclosed as per annexure XXI. Environmental monitoring cell at GKLE is headed by General Manager EHS and this cell contains Manager Environment and three other team members that have background in environmental science and chemistry. Regular Environmental monitoring on AAQ locations and Stack is done through the NABL accredited laboratory and entire monitoring operation and schedule is coordinated by environmental monitoring cell at GKEL.
26	Half yearly report on the status of implementation of the conditions and environmental safeguards should be submitted to this ministry, the Regional officer, CPCB & SPCB	Being Complied. Compliance report is also available on Company URL: https://www.gmrgroup.in/kamalanga/
27	Regional officer of Ministry of environment and forests located at Bhubaneswar will monitor the implementation of the stipulated conditions. A complete set of documents including Environment Management plan and the additional information/clarifications submitted subsequently should be forwarded to Regional office for their use during monitoring.	Submitted, Vide our letter ref: GEL/KTPP/BLR/MOEF/08/ 104 Dated 23rd May 2008. A copy of Environment Management Plan enclosed as per annexure- XXIII.
28	Separate fund should be allocated for implementation of environmental protection measures along with item – wise break. These cost should be included as part of the project cost. The funds earmarked for the environment protection measures should not be diverted for other purposes and year- wise expenditure should be reported to ministry.	Capital investment made towards environmental protection measures until September 2024 is ₹40,186.48 lakhs, and operating expenditure for environmental protection measures in FY 2024-25 (H1) is ₹4,076.91 lakhs. An item-wise breakup is enclosed as per annexure XXIV.
29	Full cooperation should be extended to the scientists/ officers from the Ministry and its Regional office at Bhubaneswar/the CPCB/the SPCB during monitoring of the project.	Agreed. Being extended.

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Annexure-I

No. J-13012/73/2011-IA II (T)
Government of India
Ministry of Environment, Forest and Climate Change

3rd Floor, Vayu Block,
Indira Paryavaran Bhawan, Jor Bagh Road,
Aliganj, New Delhi-110003

Dated: 11.01.2019

To

The Chief Operating Officer
M/s GMR Kamalanga Energy limited
Skip House, 25 / 1, Museum Road,
Bangalore – 560 025

Tel. No: 0672-663605; Fax: 06762-663637; E-mail: Ramesh.pai@gmrgroup.in

Sub: Expansion by addition of 1x350 MW Imported Coal based Thermal Power Plant (Phase-II) at Village Kamalanga, in Odapala Taluk, in Dhenkanal Distt. in Odisha by M/s GMR Kamalanga Energy Ltd.- reg. reconsideration for amendment EC.

Sir,

The undersigned is directed to refer to your online application no.IA/OR/THE/75/2011 dated 2.6.2017, Ministry's letter dated 1.9.2017, 12.3.2018, 24.5.2018 & 8.8.2018, Ministry's Regional Office letter dated 19.7.2018 and additional information furnished vide online submissions dated 20.12.2017, 23.3.2018 & 30.8.2018 on the above subject.

2. It has been noted that EC for the above mentioned project has been issued vide Ministry's letter dated5.12.2011 which is valid for five years. However, as per the S.O.2944(E): EIA amendment dated 14.9.2016, the Environmental Clearance is valid for seven years. As the EC dated 5.12.2011 was valid on the date of notification, the validity of the said EC is automatically get extended to seven years, i.e. till 4.12.2018. It has been noted that you have requested for amendment in the EC dated 5.12.2011 for increase in land requirement from 1038.5 acres to 1176.24 acres and extending the validity of EC up to 4.12.2021.

3. It has been noted that the project (Phase-II: 1x350 MW) is still under construction phase. However, the progress and balance of remaining activities has not been submitted. Total area as per EC for both the phases (Phase-I: 3x350 MW and Phase-II: 1x350 MW) was 1038.5 acres. It has also been noted that you have requested for amendment in increasing the land requirement from 1038.5 acres to 1176.24 acres. Unit-1, Unit-2 and Unit-3 of Phase-I have been under operation since 30.4.2013, 12.11.2013 and 25.3.2014 respectively. The incremental 137.74 acres will be used for approach road outside the plant boundary (31.02 acres), Merry Go Round Railway line outside plant boundary (30.79 acres), Realignment of PGCIL transmission

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line inside plant boundary (17.67 acres), Left-out plots inside plant boundary (31.19 acres), Periphery development at outside of plant boundary (7.33 acres), Permissive possession of Govt. land at inside of plant boundary (19.74 acres). There is no forest land involved in the proposed additional land. Plantation will be carried out along side of the approach road.

4. The proposal has been considered by the EAC in its 8th meeting held on 24.7.2017. The EAC on 24.7.2017 recommended for exemption for re-conducting the Public Hearing subject to publishing a notice in the newspapers for seeking public comments regarding increase in land. All the public comments/suggestion received within one month and submit to the Ministry after addressing the public comments for further consideration. It has also been noted that you have submitted the additional information on 20.12.2017. Notice in the newspapers Suryaprava (4thmost circulated Odia language newspaper) and The New Indian Express (English daily) has been published on 26.10.2017 for inviting suggestions/ comments from general public. One-month time was given to receive comments from Public. It has been submitted that no comments/ suggestion were received from the public on the notice.

5. The proposal was re-considered by the Expert Appraisal Committee (Thermal Power) during its 14th Meeting held on 12.1.2018 and recommended for amendment of EC. In acceptance of the recommendations of the EAC (Thermal) in its meeting held on 12.1.2018, the ***Ministry hereby amends the EC dated 5.12.2011*** **for increase in land requirement of the project from 1038.5 acres to 1158.57 acres** (120.07 acres which includes permissive possession of 19.74 acres but excludes PGCIL transmission line of 16.98 acres) subject to following additional conditions:

i. No forest land is involved in the incremental area of 120.07 acres.
ii. Avenue Plantation shall be developed along the Railway line and approach roads.
iii. Revised emission standards and water consumption as per the Ministry's notification dated 07.12.2015 and subsequent amendments notified from time to time shall be complied.
iv. Treated water from the STP located within 50 km distance from the project be reused in the project.
v. An Environmental Officer be declared to look after the matter related to the implementation of various environmental control measures. In case of any non-implementation of such control measures, the Environmental Officer shall be held responsible.
vi. A copy of Forest diversion permission under FC Act, 1980 shall be submitted for which an application has been submitted with State Forest Department.
vii. CER activities will be carried out as per Ministry's OM No. 22-65/2017-IA.II dated 01.05.2018 for implementation of various CER/CSR activities delineated in the Ministry's OM dated 01.05.2018 within the project affected and surrounding areas.

viii. The left out area of 31.19 acres shall be used for greenbelt development. As proposed, the periphery development area of 7.33 acres shall be used for creating infrastructure and other CSR activities for the benefit of communities surrounding the project.

6. All other terms and conditions stipulated in the Environment Clearance dated 5.12.2011 shall remain the same, as applicable.

This issues with the approval of the Competent Authority.

Yours faithfully,

(Dr. S. Kerketta)
Director (IA.I)

Copy to:

1. The Secretary, Ministry of Power, Shram Shakti Bhawan, Rafi Marg, New Delhi 110001.
2. The Chairman, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
3. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
4. The Additional Principal Conservator of Forests (APCCF), Regional Office (EZ), Ministry of Environment, Forests and Climate Change, A/3, Chandesekharpur, Bhubaneswar – 751023.
5. The Secretary (Environment), Environment Department, Government of Odisha, State Silvicultural Garden, Khandagiri, Bhubaneswar, Odisha-751003.
6. The Chairman, Odisha State Pollution Control Board, Paribesh Bhawan, A/118, Nilakantha Nagar, Unit – VIII, Bhubaneswar – 751012, Odisha.
7. The District Collector, Dhenkanal District, Govt. of Odisha, Panjia Sahi, Dhenkanal, Odisha-759001.
8. Guard file/ Monitoring File.
9. Website of the Ministry.

(Dr. S. Kerketta)
Director (IA.I)

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Forest Land

Sl. No	Village	Land	Area in Original Deed In Ac	Allotment No.& Date	Conv.deed no	Date	Area surrendered in Acre	Conveyance deed No.	Date	Net Area in Acre
1	Kamalanga	Forest	70.72	21322/24.11.2012	10501207417	12.12.2012	0.03	10501603057	07.09.2026	70.69
2	Mangalpur	Forest	6.51	21322/24.11.2012	10501207417	12.12.2012	0	-	-	6.51
3	Kamalanga	Forest	0.58	2528/03.02.2014	10501403189	28.06.2024	0	-	-	0.58
4	Mangalpur	Forest	0.22	2528/03.02.2014	10501403189	28.06.2024	0			0.22
	Sub Total (a)		**78.030**				0.03			**78.000**

Govt Land

S. No.	Name of Village	Govt. Land/ Pvt. Land	Area (in acre)	Allotment No. & date	Conveyance deed No.	Date	Area surrendered (in acre)	Conveyance deed No.	Date	Net Area in Acre
1	Mangalpur	Govt.	2.620	3558/14.02.2020	10502002287	15.09.2020	-	-	-	2.620
2	Kamalanga	Govt.	19.340	11648/20.08.2020	10502101570	31.03.2021	-	-	-	19.340
3	Mangalpur	Govt.	4.460	11648/20.08.2020	10502101570	31.03.2021	-	-	-	4.460
4	Senapatiberena	Govt.	0.350	11648/20.08.2020	10502101570	31.03.2021	-	-	-	0.350
5	Kamalanga	Govt.	3.500	220/05.01.2009	5773	24.09.2009	-	-	-	3.500
6	Senapatiberana	Govt.	0.190	220/05.01.2009	5773	24.09.2009	-	-	-	0.190
7	Senapatiberana	Govt.	1.090	8342/23.04.2010	10501003478	22.05.2010	-	-	-	1.090
8	Mangalpur	Govt	6.090	23622 dtd 14.09.2022	10502205989	27.12.2022	-	-	-	6.090
9	Kamalanga	Govt (Gochar)	26.420	523/31.03.2016	10501702122	25.07.2017	-	-	-	26.420
10	Mangalpur	Govt (Gochar)	31.800	529/31.03.2016	10501702131	25.07.2017	0.530	10501801552	10.05.2018	31.270
	Sub-total (b)		**95.860**				**0.530**			**95.330**
10	Kamalanga ##	Pvt.	515.310	2067/04.02.2010	931	09.02.2010	9.430	10501602808	09.08.2016	505.880
11	Kamalanga	Pvt.	22.840	22449/12.12.2012	10501207441	24.12.2012	0.070	10501603059	01.09.2016	22.770
12	Kamalanga	Pvt.	12.020	14417/12.07.2013	10501305240	03.09.2013	0.120	10501603058	01.09.2016	11.900
13	Manglpur	Pvt.	190.125	25658/07.12.2009	5774	24.09.2009	1.220	10501801662	18.05.2018	188.905
14	Manglpur	Pvt.	8.305	6240/09.04.2012	10501202564	20.04.2012	-	-	-	8.305
15	Manglpur	Pvt.	30.790	6100/04.04.2012	10501206749	30.10.2012	-	-	-	30.790
16	Senapatiberana	Pvt.	82.490	16948/22.09.2009	5772	24.09.2009	-	-	-	82.490
17	Bhagabatpur	Pvt.	35.400	16948/22.09.2009	5775	24.09.2009	-	-	-	35.400
18	Mangalpur	Pvt.	31.020	4237/25.02.2014	10501401850	12.03.2014	-	-	-	31.020
19	Mangalpur	Pvt.	4.960	274/03.01.2014	10501400278	15.01.2014	-	-	-	4.960
20	Kamalanga	Pvt.	7.330	18470/14.08.2015	10501503184	12.11.2015	-	-	-	7.330
21	Senapatiberena	Pvt.	1.410	3959/27.02.2016	10501601443	27.04.2016	-	-	-	1.410
22	Senapatiberena	Pvt.	1.830	5669/27.02.2016	10501601444	27.04.2016	-	-	-	1.830
23	Kamalanga##	Pvt.	4.790	5687/08.07.2016	10501602807	09.08.2016	0.250	-	-	4.540
	Sub Total (c)		**948.620**				**11.090**			**937.530**
	Sub Total (a+b+c)		**1,122.510**				**11.650**			**1,110.860**

Direct Purchase by GKEL

Sl. No	Village	Land	Area in Original Sale Deed In Ac	Allotment No.& Date	Conv.deed no	Date	Area surrendered in Acre	Conveyance deed No.	Date	Net Area in Acre
1	Kamalanga	Pvt	0.97	Nil	10501502248	25.06.2015	0	0	0	0.970
2	Banarpal	Pvt	1.34	Nil	10011502249	27.06.2015	0	0	0	1.340
3	Mangalpur	Pvt	8.02	Nil	10501502249	20.07.2015	0	0	0	8.020
4										
	Sub Total (d)		**10.330**				0			**10.330**
	Grand Total (a+b+c+d)		**1,132.840**				-			**1,121.190**

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Balance land to be leased but we are in possession of the land

1 Permissive possession land	33.17
2 Other Govt Land	4.21
	1,158.57

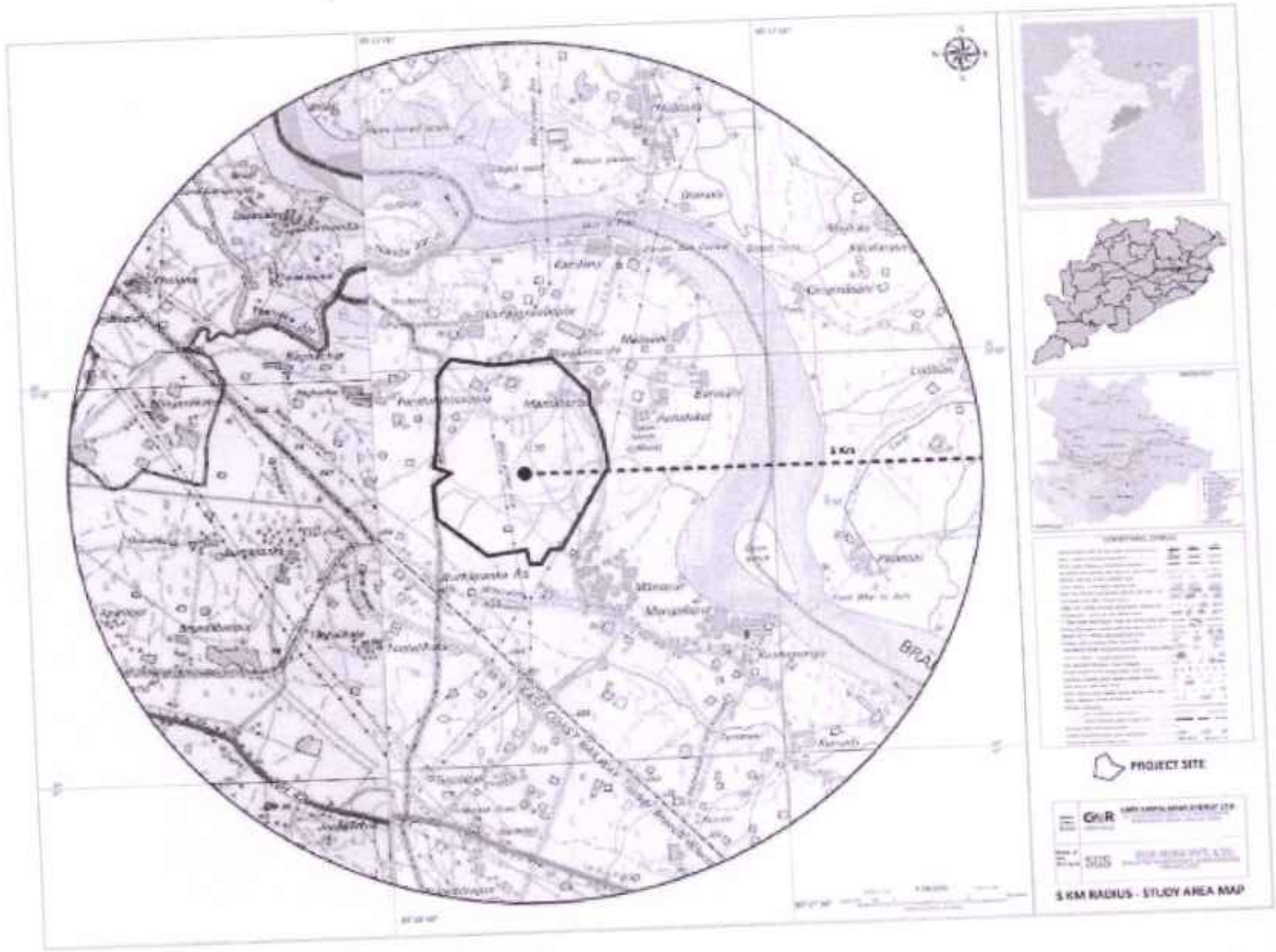

FIGURE 1: THE STUDY AREA MAP

Annexure-II

Annexure-III

GMR Kamalanga Energy Limited

Plant Office:
AT/PO: Kamalanga, PS: Kantabania,
VIA: Meramundali,
DIST: Dhenkanal - 759 121, Odisha
CIN U40101KA2007PLC044809
T +91 6762 663564
W www.gmrgroup.in

Ref: GKEL/MOEF&CC/2022-23/7821
Date: 25.11.2022

To
The Director
Eastern Regional Office
Ministry of Environment, Forests & Climate Change, Govt. of India
A/3, Chandrasekharpur, Bhubaneswar, Odisha - 751023

Sub: Submission of 30th Half-Yearly EC Compliance Status Report of 1050 (3x350) MW, TPP at Village Kamalanga, Dhenkanal District, Odisha.
Ref: Env. Clearance vides your letter No. J-13011/64/2007-IA.II (T) dated 5th February 2008

Dear Sir,

With reference to the subject referred above, we are pleased to submit the 30th Half Yearly EC Compliance Status Report of our 1050 (3x350) MW Thermal Power Plant at village Kamalanga, Dhenkanal District, Odisha, for your kind perusal please.

Kindly acknowledge receipt of the same.

Thanking You,

Yours Sincerely,
for **GMR Kamalanga Energy Limited,**

Manoj Mishra
Plant Head

Encl. – As above

Copy for kind information to:
1) Director, MoEF&CC, GOI, New Delhi
2) Regional Director, CPCB Zonal Office, Kolkata
3) Member Secretary, SPCB - Odisha, Bhubaneswar
4) Regional Officer, SPCB - Odisha, Hakimpada, Angul

GMR KAMALANGA ENERGY LTD.

Registered Office:
Skip House, 25/1, Museum Road,
Bengaluru - 560 025

EC Compliance Report

Name of the project : **GMR Kamalanga Energy Limited, Dhenkanal, Odisha**
Clearance Letter No. & Date : ***J_13011/64/2007-IA. II(T) dated 5th Feb 2008 (Phase-I: 3x350MW)***
Period of Compliance Report : **April to September 2022**

Sl.	CONDITIONS	COMPLIANCE STATUS
1	The total land requirement shall not exceed 1050 Acres for all the activities / facilities of the power project. ***Revised Land requirement of the project is 1158.57 Acres as per the MoEF &CC, New Delhi vide amendment letter dated 11.01.2019.***	Presently 1158.57 Acres of land is in use.
2	It shall be ensured that the project boundary is at least 500 m away from HFL of the river in conformity with the guideline in this regard.	Complied. The distance of Brahmani River from the plant boundary is > 1.5KM.
3	The plant heat rate of around 2300 kcal/kwh shall be achieved and the coal consumption shall not exceed 660 tph.	Avg. Heat Rate – 2331.12 kcl/kwh Avg. Coal Consumption – 560.17 tph
4	Ash and Sulphur contents in the coal to be used in the project shall not exceed 34% and 0.5 % respectively.	Ash and Sulphur content of fired coal are as below during compliance period ➢ Ash content – 44.17 % ➢ Sulphur content- 0.46 %
5	A multi–flue stack of 275 m height with exit velocity of not less than 21 m/s shall be provided with continuous online monitoring system.	Complied Velocity is being maintained as specified.
6	High efficiency Electrostatic precipitators (ESPs)with efficiency not less than 99.9% shall be installed so as to ensure that particulate emissions do not exceed 50 mg/Nm^3.	Complied, The values of particulate emissions are found within the prescribed standard.
7	Appropriate mitigation measures shall be adopted to reduce the emissions of SO_2. It shall be ensured that at no point of time the ground level concentration of SO_2 in the impact zone exceeds the prescribed limit. The proponent shall now itself also provide space for installation of FGD or other suitable measures, if required at a later stage.	➢ Being complied, ➢ GLC of SO_2 in impact zone was found within the prescribed limit. Monitoring report is being submitted quarterly ➢ Space provided for FGD
8	Water requirement shall not exceed 37 cusecs. No ground water shall be extracted for the project at any stage including during construction.	Complied. Water from river Brahmani is being used for operational activity, as per the approval.
9	COC of not less than 5 shall be adopted. ***Specific water consumption shall be 3.5m^3/mw as per the Ministry's Notification dated 07.12.2015***	Complied The avg. COC of last six months is 6.85 and Specific water consumption is 2.18 m^3/MW.
10	Closed circuit cooling system with induced draft cooling towers shall be provided.	Complied
11	Waste water generated shall be recycled and reused in the plant premises. There shall be no discharge of waste water outside the plant boundary except during monsoon.	Complied.
12	For controlling fugitive dust, regular sprinkling of water in the coal handling area and other vulnerable areas of the plant shall be ensured.	Being complied. Regular water spraying being done in coal handling and other dust vulnerable areas of the plant.

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13	The project authorities should adhere to the provisions stipulated in the fly ash notification of September, 1999 and as amended in august, 2003 in regard to fly ash utilization. Fly ash shall be collected in dry form. Balance fly ash shall be dispose off in the ash pond through HCSD mode and bottom ash through medium slurry mode.	Noted & Being complied. Dry fly ash collection facilities and HCSD system are in place. Ash generation & utilization status for the year 2022-23 (H-1) are as follow: - ➢ Total Ash generated = 1086586 MT ➢ Total Ash utilisation = 1259122 MT (Including Pond Ash of 172536 MT) ➢ % of utilisation = 115.88 *Annual return submitted vide letter no.7617 dated 25.04.2022 for the year 2021-22*
14	The ash pond shall be lined with impervious lining to avoid any leaching into ground water. The ash dyke shall be so designed and strengthened to ensure guard against breaching. Adequate safety measures shall also be taken so that pond ash does not become air borne to cause air pollution in the surrounding areas.	Complied.
15	R & R plan for land oustees and homestead oustees shall be prepared in consultation with the state Revenue Authorities prepared before starting work on the project & implemented simultaneously with the start of development/ construction work on the project. A copy of the R&R plan shall also be submitted to this ministry within three months of the issue of this letter.	R&R Plan is not applicable to our project as there are no land oustees from the project area.
16	The District collector / Revenue Divisional commissioner shall be informed regarding R&R and all other benefits to be provided by the project proponent and their effective implementation shall be overseen by the District authorities.	Being Complied. Rehabilitation & periphery development Advisory committee (RPDAC) is overseeing this implementation.
17	Rain water harvesting should be adopted. Central Ground water Authority/Board shall be consulted for finalization of appropriate rain water harvesting technology within a period of three month from the date of clearance.	Rain water harvesting (RWH) system is in operation. Rain water harvesting plan already submitted to CGWA.
18	Regular monitoring of ground water quality including heavy metals shall be undertaken around ash dyke the project area to ascertain the change, if any water quality due to leaching of contaminants from ash disposal area.	Complied.
19	A greenbelt shall be developed all along the plant and ash pond boundary covering total area of at least 320 acres.	➢ Green belt with Indigenous species is being developed in phase wise. We have planted around 3,93,816 saplings till September 2022 (including 1466 saplings in 2022-23) in around plant & township premises, avenue plantation along the Railway line & approach Road to cover land area of 358.303 Acres. ➢ Survival rate is around 90%. ➢ Under social voluntary project- Sabujima (A Green Initiative), 160 Nos. of fruit bearing trees were planted along with organic farming in the campus of Kamalanga Nodal High School, at Kamalanga Village. ➢ In addition to this, we have also developed avenue plantation and green belt in Dhenkanal area as required by District Administration.
20	First aid and sanitation arrangements shall be made for the	Complied.

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	drivers and other contract workers during construction phase.	
21	An alternate Goucher land shall be developed in the identified 65 acres of land for use of the villagers for grazing of their cattle's. The District Authorities and the villagers shall be informed of the same for its effective utilization.	Complied, 65.19 acres of land has already been surrendered to Govt. of Odisha as alternative Goucher land.
22	Leq of noise level should be limited to 75dBA and regular maintenance of equipment be undertaken for people working in the high noise areas, Personal Protection devices should be provided.	Noise level is being maintained. Poster /wall paintings are also displayed for creating awareness. The average max. and min. noise levels at boundary are as follows: - ➢ Day time noise levels- 68.3 dB(A) max. and 48.5 dB(A) min. ➢ Night time noise levels- 67.2 dB(A) max. and 46.7 Db(A) min.
23	Regular monitoring of the ambient air quality shall be carried out in the impact zone and records maintained. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Quarterly reports shall be submitted to Regional office of this Ministry.	AAQ is being monitored regularly by MoEF&CC accredited laboratory and records maintained. Copies of the reports are being submitted quarterly.
24	The project proponent should advertise in at least two local newspapers widely circulated in the region around the project, one of which should be in the vernacular language of the locality concerned within seven days of issue of this letter, informing that the project has been accorded environmental clearance and copies of clearance letters are available with the SPCB/ Committee and may also be seen website of the MoEF&CC in the http://envfor.nic.in	Complied.
25	A separate environment monitoring cell with suitable qualified staff should be set up for implementation of the stipulated environmental safeguards.	Complied.
26	Half yearly report on the status of implementation of the conditions and environmental safeguards should be submitted to this ministry, the Regional officer, CPCB & SPCB	Being Complied. Compliance report is also available on Company URL: https://www.gmrgroup.in/kamalanga/
27	Regional officer of Ministry of environment and forests located at Bhubaneswar will monitor the implementation of the stipulated conditions. A complete set of documents including Environment Management plan and the additional information/clarifications submitted subsequently should be forwarded to Regional office for their use during monitoring.	Submitted Vide our letter ref: GEL/KTPP/BLR/MOEF/08/ 104 Dated 23rd May 2008.
28	Separate fund should be allocated for implementation of environmental protection measures along with item – wise break. These cost should be included as part of the project cost. The funds earmarked for the environment protection measures should not be diverted for other purposes and year- wise expenditure should be reported to ministry.	➢ Capital investment till September 2022 (Rs. in Lakhs) = 108.74/- ➢ Recurring Investment till September 2022 (Rs. in Lakhs) = 4435.93/-
29	Full cooperation should be extended to the scientists/ officers from the Ministry and its Regional office at Bhubaneswar/the CPCB/the SPCB during monitoring of the project.	Agreed. Being extended.

Monitoring report of Environmental Parameters like Stack Emission, AAQ, Effluent quality & Drinking water analysis report is enclosed as Annexure-I

Date: 25.11.2022

Manoj Mishra
Plant Head

GMR KAMALANGA ENERGY LTD.

GMR Kamalanga Energy Limited

Plant Office:
AT/PO: Kamalanga, PS: Kantabania,
VIA: Meramundali,
DIST: Dhenkanal - 759 121, Odisha
CIN U40101KA2007PLC044809
T +91 6762 663564
W www.gmrgroup.in

Ref: GKEL/MOEF&CC/2023-24/7991
Date: 26.05.2023

To
The Director
Eastern Regional Office
Ministry of Environment, Forests & Climate Change, Govt. of India
A/3, Chandrasekharpur, Bhubaneswar, Odisha - 751023

Sub: Submission of 31st Half-Yearly EC Compliance Status Report of 1050 (3x350) MW, TPP at Village Kamalanga, Dhenkanal District, Odisha.
Ref: Env. Clearance vides your letter No. J-13011/64/2007-IA.II (T) dated 5th February 2008

Dear Sir,

With reference to the subject referred above, we are pleased to submit the 31st Half Yearly EC Compliance Status Report of our 1050 (3x350) MW Thermal Power Plant at village Kamalanga, Dhenkanal District, Odisha, for your kind perusal please.

Kindly acknowledge receipt of the same.

Thanking You,

Yours Sincerely,
for **GMR Kamalanga Energy Limited,**

Manoj Mishra
Plant Head

Encl. – As above

Copy for kind information to:
1) Director, MoEF&CC, GOI, New Delhi
2) Regional Director, CPCB Zonal Office, Kolkata
3) Member Secretary, SPCB - Odisha, Bhubaneswar
4) Regional Officer, SPCB - Odisha, Hakimpada, Angul

GMR KAMALANGA ENERGY LTD.

Registered Office:
Skip House, 25/1, Museum Road,
Bengaluru - 560 025

EC Compliance Report

Name of the project : **GMR Kamalanga Energy Limited, Dhenkanal, Odisha**
Clearance Letter No. & Date : ***J_13011/64/2007-IA. II(T) dated 5th Feb 2008 (Phase-I: 3x350MW)***
Period of Compliance Report : **October 2022 to March 2023**

Sl.	CONDITIONS	COMPLIANCE STATUS
1	The total land requirement shall not exceed 1050 Acres for all the activities / facilities of the power project. ***Revised Land requirement of the project is 1158.57 Acres as per the MoEF &CC, New Delhi vide amendment letter dated 11.01.2019.***	Presently 1158.57 Acres of land is in use.
2	It shall be ensured that the project boundary is at least 500 m away from HFL of the river in conformity with the guideline in this regard.	Complied. The distance of Brahmani River from the plant boundary is > 1.5KM.
3	The plant heat rate of around 2300 kcal/kwh shall be achieved and the coal consumption shall not exceed 660 tph.	Avg. Heat Rate – 2327.04 kcl/kwh Avg. Coal Consumption – 445.01 tph
4	Ash and Sulphur contents in the coal to be used in the project shall not exceed 34% and 0.5 % respectively.	Ash and Sulphur content of fired coal are as below during compliance period ➢ Ash content – 44.17 % ➢ Sulphur content- 0.45 %
5	A multi–flue stack of 275 m height with exit velocity of not less than 21 m/s shall be provided with continuous online monitoring system.	Complied Velocity is being maintained as specified.
6	High efficiency Electrostatic precipitators (ESPs)with efficiency not less than 99.9% shall be installed so as to ensure that particulate emissions do not exceed 50 mg/Nm^3.	Complied, The values of particulate emissions are found within the prescribed standard.
7	Appropriate mitigation measures shall be adopted to reduce the emissions of SO_2. It shall be ensured that at no point of time the ground level concentration of SO_2 in the impact zone exceeds the prescribed limit. The proponent shall now itself also provide space for installation of FGD or other suitable measures, if required at a later stage.	➢ Being complied, ➢ GLC of SO_2 in impact zone was found within the prescribed limit. Monitoring report is being submitted quarterly ➢ Space provided for FGD
8	Water requirement shall not exceed 37 cusecs. No ground water shall be extracted for the project at any stage including during construction.	Complied. Water from river Brahmani is being used for operational activity, as per the approval.
9	COC of not less than 5 shall be adopted. ***Specific water consumption shall be 3.5m^3/mw as per the Ministry's Notification dated 07.12.2015***	Complied The avg. COC of last six months is 6.78 and Specific water consumption is 2.07 m^3/MW.
10	Closed circuit cooling system with induced draft cooling towers shall be provided.	Complied
11	Waste water generated shall be recycled and reused in the plant premises. There shall be no discharge of waste water outside the plant boundary except during monsoon.	Complied.
12	For controlling fugitive dust, regular sprinkling of water in the coal handling area and other vulnerable areas of the plant shall be ensured.	Being complied. Regular water spraying being done in coal handling and other dust vulnerable areas of the plant.

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13	The project authorities should adhere to the provisions stipulated in the fly ash notification of September, 1999 and as amended in august, 2003 in regard to fly ash utilization. Fly ash shall be collected in dry form. Balance fly ash shall be dispose off in the ash pond through HCSD mode and bottom ash through medium slurry mode.	Noted & Being complied. Dry fly ash collection facilities and HCSD system are in place. Ash generation & utilization status for the year 2022-23 (H-2) are as follow: - ➢ Total Ash generated = 1132694 MT ➢ Total Ash utilisation = 1257096 MT (Including Pond Ash of 124402 MT) ➢ % of utilisation = 110.98 *Annual return submitted vide letter no.7957 dated 18.04.2023 for the year 2022-23*
14	The ash pond shall be lined with impervious lining to avoid any leaching into ground water. The ash dyke shall be so designed and strengthened to ensure guard against breaching. Adequate safety measures shall also be taken so that pond ash does not become air borne to cause air pollution in the surrounding areas.	Complied.
15	R & R plan for land oustees and homestead oustees shall be prepared in consultation with the state Revenue Authorities prepared before starting work on the project & implemented simultaneously with the start of development/ construction work on the project. A copy of the R&R plan shall also be submitted to this ministry within three months of the issue of this letter.	R&R Plan is not applicable to our project as there are no land oustees from the project area.
16	The District collector / Revenue Divisional commissioner shall be informed regarding R&R and all other benefits to be provided by the project proponent and their effective implementation shall be overseen by the District authorities.	Being Complied. Rehabilitation & periphery development Advisory committee (RPDAC) is overseeing this implementation.
17	Rain water harvesting should be adopted. Central Ground water Authority/Board shall be consulted for finalization of appropriate rain water harvesting technology within a period of three month from the date of clearance.	Rain water harvesting (RWH) system is in operation. Rain water harvesting plan already submitted to CGWA.
18	Regular monitoring of ground water quality including heavy metals shall be undertaken around ash dyke the project area to ascertain the change, if any water quality due to leaching of contaminants from ash disposal area.	Complied.
19	A greenbelt shall be developed all along the plant and ash pond boundary covering total area of at least 320 acres.	➢ Green belt with Indigenous species already developed. We have planted around 3,95,308 saplings till March 2023 (including 2958 saplings in 2022-23) in around plant & township premises, avenue plantation along the Railway line & approach Road to cover land area of 358.303 Acres. ➢ Survival rate is around 90%. ➢ Under social voluntary project- Sabujima (A Green Initiative), 160 Nos. of fruit bearing trees were planted along with organic farming in the campus of Kamalanga Nodal High School, at Kamalanga Village. ➢ In addition to this, we have also developed avenue plantation and green belt in Dhenkanal area as required by District Administration.
20	First aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.	Complied.

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21	An alternate Goucher land shall be developed in the identified 65 acres of land for use of the villagers for grazing of their cattle's. The District Authorities and the villagers shall be informed of the same for its effective utilization.	Complied, 65.19 acres of land has already been surrendered to Govt. of Odisha as alternative Goucher land.
22	Leq of noise level should be limited to 75dBA and regular maintenance of equipment be undertaken for people working in the high noise areas, Personal Protection devices should be provided.	Noise level is being maintained. Poster /wall paintings are also displayed for creating awareness. The average max. and min. noise levels at boundary are as follows: - ➢ Day time noise levels- 67.5 dB(A) max. and 47.3 dB(A) min. ➢ Night time noise levels- 63.7 dB(A) max. and 45.2 Db(A) min.
23	Regular monitoring of the ambient air quality shall be carried out in the impact zone and records maintained. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Quarterly reports shall be submitted to Regional office of this Ministry.	AAQ is being monitored regularly by MoEF&CC accredited laboratory and records maintained. Copies of the reports are being submitted quarterly.
24	The project proponent should advertise in at least two local newspapers widely circulated in the region around the project, one of which should be in the vernacular language of the locality concerned within seven days of issue of this letter, informing that the project has been accorded environmental clearance and copies of clearance letters are available with the SPCB/ Committee and may also be seen website of the MoEF&CC in the http://envfor.nic.in	Complied.
25	A separate environment monitoring cell with suitable qualified staff should be set up for implementation of the stipulated environmental safeguards.	Complied.
26	Half yearly report on the status of implementation of the conditions and environmental safeguards should be submitted to this ministry, the Regional officer, CPCB & SPCB	Being Complied. Compliance report is also available on Company URL: https://www.gmrgroup.in/kamalanga/
27	Regional officer of Ministry of environment and forests located at Bhubaneswar will monitor the implementation of the stipulated conditions. A complete set of documents including Environment Management plan and the additional information/clarifications submitted subsequently should be forwarded to Regional office for their use during monitoring.	Submitted Vide our letter ref: GEL/KTPP/BLR/MOEF/08/ 104 Dated 23rd May 2008.
28	Separate fund should be allocated for implementation of environmental protection measures along with item – wise break. These cost should be included as part of the project cost. The funds earmarked for the environment protection measures should not be diverted for other purposes and year- wise expenditure should be reported to ministry.	➢ Capital investment till March 2023 (Rs. in Lakhs) = 39618.57 ➢ Recurring Investment in FY 2022-23 (Rs. in Lakhs) = 8023.75
29	Full cooperation should be extended to the scientists/ officers from the Ministry and its Regional office at Bhubaneswar/the CPCB/the SPCB during monitoring of the project.	Agreed. Being extended.

Monitoring report of Environmental Parameters like Stack Emission, AAQ, Effluent quality & Drinking water analysis report is enclosed as Annexure-I.

Manoj Mishra
Plant Head

Date: 26.05.2023

GMR KAMALANGA ENERGY LTD.

GMR Kamalanga Energy Limited

Plant Office:
AT/PO: Kamalanga, PS: Kantabania,
VIA: Meramundali,
DIST: Dhenkanal - 759 121, Odisha
CIN U40101KA2007PLC044809
T +91 6762 663564
W www.gmrgroup.in

Ref: GKEL/MOEF&CC/2023-24/8135
Date: 28.11.2023

To
The Director
Eastern Regional Office
Ministry of Environment, Forests & Climate Change, Govt. of India
A/3, Chandrasekharpur, Bhubaneswar, Odisha - 751023

Sub: **Submission of 32nd Half-Yearly EC Compliance Status Report of 1050 (3x350) MW, TPP at Village Kamalanga, Dhenkanal District, Odisha.**
Ref: Env. Clearance vides your letter No. J-13011/64/2007-IA.II (T) dated 5th February 2008

Dear Sir,

With reference to the subject referred above, we are pleased to submit the 32nd Half Yearly EC Compliance Status Report of our 1050 (3x350) MW Thermal Power Plant at village Kamalanga, Dhenkanal District, Odisha, for your kind perusal please.

Kindly acknowledge receipt of the same.

Thanking You,

Yours Sincerely,
for **GMR Kamalanga Energy Limited,**

Manoj Mishra
Plant Head

Encl. – As above

Copy for kind information to:
1) Director, MoEF&CC, GOI, New Delhi
2) Regional Director, CPCB Zonal Office, Kolkata
3) Member Secretary, SPCB - Odisha, Bhubaneswar
4) Regional Officer, SPCB - Odisha, Hakimpada, Angul

GMR KAMALANGA ENERGY LTD.

Registered Office:
Skip House, 25/1, Museum Road,
Bengaluru - 560 025

EC Compliance Report

Name of the project : **GMR Kamalanga Energy Limited, Dhenkanal, Odisha**
Clearance Letter No. & Date : ***J_13011/64/2007-IA. II(T) dated 5th Feb 2008 (Phase-I: 3x350MW)***
Period of Compliance Report : **April 2023 to September 2023**

Sl.	CONDITIONS	COMPLIANCE STATUS
1	The total land requirement shall not exceed 1050 Acres for all the activities / facilities of the power project. ***Revised Land requirement of the project is 1158.57 Acres as per the MoEF &CC, New Delhi vide amendment letter dated 11.01.2019.***	Presently 1158.57 Acres of land is in use.
2	It shall be ensured that the project boundary is at least 500 m away from HFL of the river in conformity with the guideline in this regard.	Complied. The distance of Brahmani River from the plant boundary is > 1.5KM.
3	The plant heat rate of around 2300 kcal/kwh shall be achieved and the coal consumption shall not exceed 660 tph.	Avg. Heat Rate – 2327.03 kcl/kwh Avg. Coal Consumption – 579.21 tph
4	Ash and Sulphur contents in the coal to be used in the project shall not exceed 34% and 0.5 % respectively.	Ash and Sulphur content of fired coal are as below during compliance period ➢ Ash content – 45.43 % ➢ Sulphur content- 0.46 %
5	A multi–flue stack of 275 m height with exit velocity of not less than 21 m/s shall be provided with continuous online monitoring system.	Complied Velocity is being maintained as specified.
6	High efficiency Electrostatic precipitators (ESPs)with efficiency not less than 99.9% shall be installed so as to ensure that particulate emissions do not exceed 50 mg/Nm^3.	Complied, The values of particulate emissions are found within the prescribed standard.
7	Appropriate mitigation measures shall be adopted to reduce the emissions of SO_2. It shall be ensured that at no point of time the ground level concentration of SO_2 in the impact zone exceeds the prescribed limit. The proponent shall now itself also provide space for installation of FGD or other suitable measures, if required at a later stage.	➢ Being complied, ➢ GLC of SO_2 in impact zone was found within the prescribed limit. Monitoring report is being submitted quarterly ➢ Space provided for FGD
8	Water requirement shall not exceed 37 cusecs. No ground water shall be extracted for the project at any stage including during construction.	Complied. Water from river Brahmani is being used for operational activity, as per the approval.
9	COC of not less than 5 shall be adopted. ***Specific water consumption shall be 3.5m^3/mw as per the Ministry's Notification dated 07.12.2015***	Complied The avg. COC of last six months is 6.74 and Specific water consumption is 2.19 m^3/MW.
10	Closed circuit cooling system with induced draft cooling towers shall be provided.	Complied
11	Waste water generated shall be recycled and reused in the plant premises. There shall be no discharge of waste water outside the plant boundary except during monsoon.	Complied.
12	For controlling fugitive dust, regular sprinkling of water in the coal handling area and other vulnerable areas of the plant shall be ensured.	Being complied. Regular water spraying being done in coal handling and other dust vulnerable areas of the plant.

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13	The project authorities should adhere to the provisions stipulated in the fly ash notification of September, 1999 and as amended in august, 2003 in regard to fly ash utilization. Fly ash shall be collected in dry form. Balance fly ash shall be dispose off in the ash pond through HCSD mode and bottom ash through medium slurry mode.	Noted & Being complied. Dry fly ash collection facilities and HCSD system are in place. Ash generation & utilization status for the year 2023-24 (H-1) are as follow: - ➢ Total Ash generated = 1208621 MT ➢ Total Ash utilisation = 1208621 MT ➢ % of utilisation = 100 *Annual return submitted vide letter no.7957 dated 18.04.2023 for the year 2022-23*
14	The ash pond shall be lined with impervious lining to avoid any leaching into ground water. The ash dyke shall be so designed and strengthened to ensure guard against breaching. Adequate safety measures shall also be taken so that pond ash does not become air borne to cause air pollution in the surrounding areas.	Complied.
15	R & R plan for land oustees and homestead oustees shall be prepared in consultation with the state Revenue Authorities prepared before starting work on the project & implemented simultaneously with the start of development/ construction work on the project. A copy of the R&R plan shall also be submitted to this ministry within three months of the issue of this letter.	R&R Plan is not applicable to our project as there are no land oustees from the project area.
16	The District collector / Revenue Divisional commissioner shall be informed regarding R&R and all other benefits to be provided by the project proponent and their effective implementation shall be overseen by the District authorities.	Being Complied. Rehabilitation & periphery development Advisory committee (RPDAC) is overseeing this implementation.
17	Rain water harvesting should be adopted. Central Ground water Authority/Board shall be consulted for finalization of appropriate rain water harvesting technology within a period of three month from the date of clearance.	Rain water harvesting (RWH) system is in operation. Rain water harvesting plan already submitted to CGWA.
18	Regular monitoring of ground water quality including heavy metals shall be undertaken around ash dyke the project area to ascertain the change, if any water quality due to leaching of contaminants from ash disposal area.	Complied.
19	A greenbelt shall be developed all along the plant and ash pond boundary covering total area of at least 320 acres.	➢ Green belt with Indigenous species already developed. We have planted around 3,97,298 saplings till September 2023 (including 1990 saplings in 2023-24) in around plant & township premises, avenue plantation along the Railway line & approach Road to cover land area of 358.303 Acres. ➢ Survival rate is around 90%. ➢ Under social voluntary project- Sabujima (A Green Initiative), 160 Nos. of fruit bearing trees were planted along with organic farming in the campus of Kamalanga Nodal High School, at Kamalanga Village. ➢ In addition to this, we have also developed avenue plantation and green belt in Dhenkanal area as required by District Administration.
20	First aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.	Complied.

GMR KAMALANGA ENERGY LTD.

21	An alternate Goucher land shall be developed in the identified 65 acres of land for use of the villagers for grazing of their cattle's. The District Authorities and the villagers shall be informed of the same for its effective utilization.	Complied, 65.19 acres of land has already been surrendered to Govt. of Odisha as alternative Goucher land.
22	Leq of noise level should be limited to 75dBA and regular maintenance of equipment be undertaken for people working in the high noise areas, Personal Protection devices should be provided.	Noise level is being maintained. Poster /wall paintings are also displayed for creating awareness. The average max. and min. noise levels at boundary are as follows: - ➢ Day time noise levels- 68.3 dB(A) max. and 46.1 dB(A) min. ➢ Night time noise levels- 64.2 dB(A) max. and 45.7 Db(A) min.
23	Regular monitoring of the ambient air quality shall be carried out in the impact zone and records maintained. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Quarterly reports shall be submitted to Regional office of this Ministry.	AAQ is being monitored regularly by MoEF&CC accredited laboratory and records maintained. Copies of the reports are being submitted quarterly.
24	The project proponent should advertise in at least two local newspapers widely circulated in the region around the project, one of which should be in the vernacular language of the locality concerned within seven days of issue of this letter, informing that the project has been accorded environmental clearance and copies of clearance letters are available with the SPCB/ Committee and may also be seen website of the MoEF&CC in the http://envfor.nic.in	Complied.
25	A separate environment monitoring cell with suitable qualified staff should be set up for implementation of the stipulated environmental safeguards.	Complied.
26	Half yearly report on the status of implementation of the conditions and environmental safeguards should be submitted to this ministry, the Regional officer, CPCB & SPCB	Being Complied. Compliance report is also available on Company URL: https://www.gmrgroup.in/kamalanga/
27	Regional officer of Ministry of environment and forests located at Bhubaneswar will monitor the implementation of the stipulated conditions. A complete set of documents including Environment Management plan and the additional information/clarifications submitted subsequently should be forwarded to Regional office for their use during monitoring.	Submitted Vide our letter ref: GEL/KTPP/BLR/MOEF/08/ 104 Dated 23rd May 2008.
28	Separate fund should be allocated for implementation of environmental protection measures along with item – wise break. These cost should be included as part of the project cost. The funds earmarked for the environment protection measures should not be diverted for other purposes and year- wise expenditure should be reported to ministry.	➢ Capital investment till September 2023 (Rs. in Lakhs) = 40041.66 ➢ Recurring Investment till September 2023 (Rs. in Lakhs) = 4539.94
29	Full cooperation should be extended to the scientists/ officers from the Ministry and its Regional office at Bhubaneswar/the CPCB/the SPCB during monitoring of the project.	Agreed. Being extended.

Monitoring report of Environmental Parameters like Stack Emission, AAQ, Effluent quality & Drinking water analysis report is enclosed as **Annexure-I.**

Date: 28.11.2023

GMR KAMALANGA ENERGY LTD.

Manoj Mishra
Plant Head

GMR KAMALANGA ENERGY LTD.

GMR Kamalanga Energy Limited

GMR

Plant Office:
AT/PO: Kamalanga, PS: Kantabania,
VIA: Meramundali,
DIST: Dhenkanal - 759 121, Odisha
CIN U40101KA2007PLC044809
T +91 6762 663564
W www.gmrgroup.in 31-04/24

Ref: GKEL/MOEF&CC/2024-25/8312
Date: 24.05.2024

To
The Director
Eastern Regional Office
Ministry of Environment, Forests & Climate Change, Govt. of India
A/3, Chandrasekharpur, Bhubaneswar, Odisha - 751023

Sub: **Submission of 33rd Half-Yearly EC Compliance Status Report of 1050 (3x350) MW, TPP at Village Kamalanga, Dhenkanal District, Odisha.**
Ref: Env. Clearance vides your letter No. J-13011/64/2007-IA.II (T) dated 5th February 2008

Dear Sir,

With reference to the subject referred above, we are pleased to submit the 33rd Half Yearly EC Compliance Status Report of our 1050 (3x350) MW Thermal Power Plant at village Kamalanga, Dhenkanal District, Odisha, for your kind perusal please.

Kindly acknowledge receipt of the same.

Thanking You,

Yours Sincerely,
for **GMR Kamalanga Energy Limited**,

Manoj Mishra
Plant Head

GMR KAMALANGA ENERGY LTD.

Encl. – As above

Copy for kind information to:
1) Director, MoEF&CC, GOI, New Delhi
2) Regional Director, CPCB Zonal Office, Kolkata
3) Member Secretary, SPCB - Odisha, Bhubaneswar
4) Regional Officer, SPCB - Odisha, Hakimpada, Angul

Registered Office:
Skip House, 25/1, Museum Road,
Bengaluru - 560 025

EC Compliance Report

Name of the project : **GMR Kamalanga Energy Limited, Dhenkanal, Odisha**
Clearance Letter No. & Date : ***J_13011/64/2007-IA. II(T) dated 5th Feb 2008 (Phase-I: 3x350MW)***
Period of Compliance Report : **October 2023 to March 2024**

Sl.	CONDITIONS	COMPLIANCE STATUS
1	The total land requirement shall not exceed 1050 Acres for all the activities / facilities of the power project. ***Revised Land requirement of the project is 1158.57 Acres as per the MoEF &CC, New Delhi vide amendment letter dated 11.01.2019.***	Presently 1158.57 Acres of land is in use.
2	It shall be ensured that the project boundary is at least 500 m away from HFL of the river in conformity with the guideline in this regard.	Complied. The distance of Brahmani River from the plant boundary is > 1.5KM.
3	The plant heat rate of around 2300 kcal/kwh shall be achieved and the coal consumption shall not exceed 660 tph.	Avg. Heat Rate – 2308.93 kcl/kwh Avg. Coal Consumption – 654.26 tph
4	Ash and Sulphur contents in the coal to be used in the project shall not exceed 34% and 0.5 % respectively.	Ash and Sulphur content of fired coal are as below during compliance period ➢ Ash content – 44.52 % ➢ Sulphur content- 0.45 %
5	A multi–flue stack of 275 m height with exit velocity of not less than 21 m/s shall be provided with continuous online monitoring system.	Complied Velocity is being maintained as specified.
6	High efficiency Electrostatic precipitators (ESPs)with efficiency not less than 99.9% shall be installed so as to ensure that particulate emissions do not exceed 50 mg/Nm^3.	Complied, The values of particulate emissions are found within the prescribed standard. Stack monitoring report enclosed as per Annexure- I.
7	Appropriate mitigation measures shall be adopted to reduce the emissions of SO_2. It shall be ensured that at no point of time the ground level concentration of SO_2 in the impact zone exceeds the prescribed limit. The proponent shall now itself also provide space for installation of FGD or other suitable measures, if required at a later stage.	➢ Being complied, ➢ GLC of SO_2 in impact zone was found within the prescribed limit. Monitoring report is being submitted quarterly. ➢ Space provided for FGD
8	Water requirement shall not exceed 37 cusecs. No ground water shall be extracted for the project at any stage including during construction.	Complied. Water from river Brahmani is being used for operational activity, as per the approval.
9	COC of not less than 5 shall be adopted. ***Specific water consumption shall be 3.5m^3/mw as per the Ministry's Notification dated 07.12.2015***	Complied The avg. COC of last six months is 7.00 and Specific water consumption is 2.10 m^3/MW.
10	Closed circuit cooling system with induced draft cooling towers shall be provided.	Complied
11	Waste water generated shall be recycled and reused in the plant premises. There shall be no discharge of waste water outside the plant boundary except during monsoon.	Complied.
12	For controlling fugitive dust, regular sprinkling of water in the coal handling area and other vulnerable areas of the plant shall be ensured.	Being complied. Regular water spraying being done in coal handling and other dust vulnerable areas of the plant.

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13	The project authorities should adhere to the provisions stipulated in the fly ash notification of September, 1999 and as amended in august, 2003 in regard to fly ash utilization. Fly ash shall be collected in dry form. Balance fly ash shall be dispose off in the ash pond through HCSD mode and bottom ash through medium slurry mode.	Noted & Being complied. Dry fly ash collection facilities and HCSD system are in place. Ash generation & utilization status for the year 2023-24 (H-2) are as follow: - ➢ Total Ash generated = 12,81,526 MT ➢ Total Ash utilisation = 12,81,526 MT ➢ % of utilisation = 100
14	The ash pond shall be lined with impervious lining to avoid any leaching into ground water. The ash dyke shall be so designed and strengthened to ensure guard against breaching. Adequate safety measures shall also be taken so that pond ash does not become air borne to cause air pollution in the surrounding areas.	Complied.
15	R & R plan for land oustees and homestead oustees shall be prepared in consultation with the state Revenue Authorities prepared before starting work on the project & implemented simultaneously with the start of development/ construction work on the project. A copy of the R&R plan shall also be submitted to this ministry within three months of the issue of this letter.	R&R Plan is not applicable to our project as there are no land oustees from the project area.
16	The District collector / Revenue Divisional commissioner shall be informed regarding R&R and all other benefits to be provided by the project proponent and their effective implementation shall be overseen by the District authorities.	Being Complied. Rehabilitation & periphery development Advisory committee (RPDAC) is overseeing this implementation.
17	Rain water harvesting should be adopted. Central Ground water Authority/Board shall be consulted for finalization of appropriate rain water harvesting technology within a period of three month from the date of clearance.	Rain water harvesting (RWH) system is in operation. Rain water harvesting plan already submitted to CGWA.
18	Regular monitoring of ground water quality including heavy metals shall be undertaken around ash dyke the project area to ascertain the change, if any water quality due to leaching of contaminants from ash disposal area.	Complied.
19	A greenbelt shall be developed all along the plant and ash pond boundary covering total area of at least 320 acres.	➢ Green belt with Indigenous species already developed. We have planted around 3,97,668 saplings till March 2023 (including 2360 saplings in 2023-24) in around plant & township premises, avenue plantation along the Railway line & approach Road to cover land area of 358.303 Acres. ➢ Survival rate is around 90%. ➢ Under social voluntary project- Sabujima (A Green Initiative), 160 Nos. of fruit bearing trees were planted along with organic farming in the campus of Kamalanga Nodal High School, at Kamalanga Village. ➢ In addition to this, we have also developed avenue plantation and green belt in Dhenkanal area as required by District Administration.
20	First aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.	Complied.

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21	An alternate Goucher land shall be developed in the identified 65 acres of land for use of the villagers for grazing of their cattle's. The District Authorities and the villagers shall be informed of the same for its effective utilization.	Complied, 65.19 acres of land has already been surrendered to Govt. of Odisha as alternative Goucher land.
22	Leq of noise level should be limited to 75dBA and regular maintenance of equipment be undertaken for people working in the high noise areas, Personal Protection devices should be provided.	Noise level is being maintained. Poster /wall paintings are also displayed for creating awareness. The average max. and min. noise levels at boundary are as follows: - ➢ Day time noise levels- 67.4 dB(A) max. and 45.7 dB(A) min. ➢ Night time noise levels- 65.1 dB(A) max. and 43.5 Db(A) min.
23	Regular monitoring of the ambient air quality shall be carried out in the impact zone and records maintained. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Quarterly reports shall be submitted to Regional office of this Ministry.	AAQ is being monitored regularly by MoEF&CC accredited laboratory and records maintained. Copies of the reports are being submitted quarterly.
24	The project proponent should advertise in at least two local newspapers widely circulated in the region around the project, one of which should be in the vernacular language of the locality concerned within seven days of issue of this letter, informing that the project has been accorded environmental clearance and copies of clearance letters are available with the SPCB/ Committee and may also be seen website of the MoEF&CC in the http://envfor.nic.in	Complied.
25	A separate environment monitoring cell with suitable qualified staff should be set up for implementation of the stipulated environmental safeguards.	Complied.
26	Half yearly report on the status of implementation of the conditions and environmental safeguards should be submitted to this ministry, the Regional officer, CPCB & SPCB	Being Complied. Compliance report is also available on Company URL: https://www.gmrgroup.in/kamalanga/
27	Regional officer of Ministry of environment and forests located at Bhubaneswar will monitor the implementation of the stipulated conditions. A complete set of documents including Environment Management plan and the additional information/clarifications submitted subsequently should be forwarded to Regional office for their use during monitoring.	Submitted Vide our letter ref: GEL/KTPP/BLR/MOEF/08/ 104 Dated 23rd May 2008.
28	Separate fund should be allocated for implementation of environmental protection measures along with item – wise break. These cost should be included as part of the project cost. The funds earmarked for the environment protection measures should not be diverted for other purposes and year- wise expenditure should be reported to ministry.	➢ Operating expenditure for environmental protection measures in FY 2023-24- (Rs. in Lakhs) = 7211.06
29	Full cooperation should be extended to the scientists/ officers from the Ministry and its Regional office at Bhubaneswar/the CPCB/the SPCB during monitoring of the project.	Agreed. Being extended.

Monitoring report of Environmental Parameters like Stack Emission, AAQ, Effluent quality & Drinking water analysis report is enclosed as **Annexure-I.**

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Annexure-IV

QUALITEK LABS LIMITED

D2/18, Mancheswar Industrial Estate, Bhubaneswar – 751010, Odisha, India
Website: www.qualiteklab.com
E-mail id: customerservices.bbsr@qualiteklab.com; Phone: 0674-2952347

TEST REPORT

ULR No. : NA	Format No.: QLB/MSP/QA/012/F001/00
Test Report No: QLB/TR/MN/2024/0702/009 P2	Report issue date: 10/07/2024
Sample Submitted/Drawn: Submitted	

Customer Detail:

Name: GMR Kamalanga Energy Limited

Address: KamalangaKantabania, Dhenkanal, Odisha, India-759121

Sample Details:

Sample Name/type #:	Coal	**Item code#:**	NA
Sample qty. received:	200 gm	**Sample registration no.:**	QLB/MN/2024/0702/009
Batch no/lot no#:	Feeder Coal U#2	**Sample conditions:**	Good
Mfg. license no.#:	NA	**Packing description:**	Intact
Mfg. date/Exp. date#:	NA	**Sample receipt date:**	02/07/2024
f (WO no.)#:	NA	**Sample registration date:**	02/07/2024

Sampling Details:

Sampling done by:	NA	**Sampling plan/method:**	NA
Date & time of sampling:	NA	**Sample item:**	NA
Location of sampling:	NA	**Quantity sampled:**	NA
Environmental conditions during sampling:	NA	**Any deviation occurred during sampling:**	NA

Analysis Details:

Analysis start date: 02/07/2024 **Analysis end date:** 06/07/2024

Sr. No	Test Parameters	Unit of measurement (UOM)	Test Method	Specification	Test Result
	Discipline: Chemical				
	Group : Solid Fuels				
1	Mercury	ppm	QLB/STP/MN/020	NA	16
2	Ultimate Analysis Sulphur	%	ASTM D 5373	NA	0.42
3	Ultimate Analysis Oxygen	%	ASTM D 5373	NA	14.15
	Ultimate Analysis Hydrogen	%	ASTM D 5373	NA	2.73
5	Ultimate Analysis Carbon	%	ASTM D 5373	NA	35.07
6	Ultimate Analysis Nitrogen	%	ASTM D 5373	NA	1.17

Symbol/s:# Information provided by customer for which the laboratory has no control,**Test subcontracted.

Remarks : 1. NA: Not applicable 2.The results apply to the sample as received

----------**End of Test Report**----------

Reviewed by
Name : Mrs. Smruti Rekha Parida
Designation : Jr. Executive-QA

Authorized by
Name : Mr. Pabitra Kumar Panda
Designation : Asst Manager-Minerals
Discipline : Chemical

GMR KAMALANGA ENERGY LTD.

Disclaimer :

1. The test result relates only to the samples tested and applicable parameters, endorsement of product is neither inferred nor implied.
2. The report shall not be reproduced except in full without approval of the laboratory & cannot be used as an evidence in the court of law and should not be used any advertising media without special permission in writing.
3. The sample is analyzed at Qualitek Labs Limited, Bhubaneswar and the testing has been performed to the best of our ability and our responsibility. This certificate reflects our findings at the time and place of testing.
4. If the report is misplaced by any means shall be returned to the mentioned address of Qualitek Labs Limited.

Annexure-V

(13)

स्पीड पोस्ट
SPEED POST

भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA

File No. AAI/ER/NOC(257/10)/ 057-060.

Date: 10.01.2011

NOC FOR HEIGHT CLEARENCE ONLY

To
N.D.Rathi
M/s GMR Kamalanga Energy Ltd.
HIG – 28, Gangadhar Meher Marg
Bhubaneswar – 751013 (Odisha)

Sub: Issue of NOC

1. Please refer to your application No.**GKEL/BBSR/AAI/10-11/508** dated **06.10.2010** on the subject mentioned above.

2. This office has no objection to the construction of the proposed **Two Chimney** by **M/s GMR Kamalanga Energy Ltd.** here in after referred to as the applicant(s) at location, **Vill – Kamalanga, Block – Odapada, Tahsil – Dhenkanal Sadar, Dist – Dhenkanal, Odisha (Chimney No.1 Lat 20° 52′ 07″ Long 85° 16′ 06″, Chimney No.2 Lat 20° 52′ 07″ Long 85° 16′ 11″)** to height [**Chimney No.1, 277.39M** (in figures) **Two Hundred and Seventy Seven decimal Three Nine Meters**(in words) Above Ground Level, **Chimney No.2, 279.39** (in figures) **Two Hundred and Seventy Nine decimal Three Nine Meters** (in words) Above Ground Level]. So that the top of the proposed structure when erected shall not exceed **347.39M (Three Hundred and Forty Seven decimal Three Nine Meters)** Above Mean Sea Level **for both the proposed chimneys**.

3. This No Objection Certificate is being issued on the express understanding that site elevation reduced level (height of Above Mean Sea Level) of **70M for Chimney No.1 and 68M for Chimney No.2** of the relative location of the proposed building/structure & its distances and bearings from the ARP/Runway ends as tendered by the applicant(s) are correct. If however, at any stage it is established that the said data as tendered by the said applicant is actually different from the actual data which could adversely affect aircraft operations, the structure or part(s) there of in respect of which this NOC is being issued will have to be demolished at his own cost or as may be directed by the Airports Authority Of India. The applicant(s) is/are therefore advised in his/their own interest to verify the elevation and other data furnished for the site, before embarking on the proposed construction.

4. The issue of this NOC is further subject to the provisions of section 9-A of the Indian Aircraft Act 1934 and those of any notifications issued there under from time to time and under which the applicant may be called upon by the Airports Authority Of India to demolish in whole or in part the structure now being authorized vide this NOC.

5. No Radio /TV Antenna lighting arresters, staircase, Mumtee Overhead water tank and attachments or fixtures of any kind shall project above the height indicated in para 2.

6. The use of oil fired or electric fired furnace is obligatory within 08Km from the Airport.

7. This certificate is valid for a period of **seven years** from the date of issue. If the building/structure/chimneys not constructed & completed within the above mentioned period of **seven years** the applicant(s) required to obtain a fresh No Objection Certificate from the Chairman, Airports Authority Of India and/or the General manager (Aerodrome)E.R. The date of completion of building/structure/chimney should be intimated to the Chairman/or the General Manager (Aerodrome)Eastern Region.

8. No light or a combination of lights which by reason of its intensity, configuration or colour may cause confusion with the aeronautical ground lights of the near by Airport shall be installed at the site at any time during or after the construction of the **Chimney**.

***** Day Marking & Night lighting with secondary power supply should be provided as per ICAO standard.**

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GMR

Annexure-VI

Visiontek Consultancy Services Pvt. Ltd.

(Committed For Better Environment)

ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017 Certified

Ref: **Envlab/24-25/TR-13425** *Date:* **02.12.2024**

SOURCE EMISSION MONITORING REPORT NOVEMBER-2024

1. Name of Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Sampling Location : **ST-1 :** Stack attached to ESP Outlet of UNIT-1
   : **ST-2 :** Stack attached to ESP Outlet of UNIT-2
   : **ST-3 :** Stack attached to ESP Outlet of UNIT-3
3. Date of Sampiing : 18.11.2024
4. Date of Analysis : 19.11.2024.2024 to 25.11.2024
5. Sample Collected by : VCSPL Representative in presence of GMR representative

Sl. No.	Parameters	Unit of Measurement	Standard as per MoEF& CC & CPCB	Analysis Results		
				ST-1	ST-2	ST-3
Sampling Date				18.11.2024	18.11.2024	18.11.2024
1.	Stack Temperature	^0C	--	127	120	125
2.	Velocity	m/sec	--	20.14	23.10	22.21
3.	Volume of Flue gas	m^3/hour	-	1670188.62	1904188.53	1830823.69
4.	Particulate Matter as PM	mg/Nm^3	50.0	36.4	32.8	41.2
5.	Sulphur Dioxide as SO_2	mg/Nm^3	600.0	1386	1465	1372
6.	Oxides of Nitrogen as NOx	mg/Nm^3	450.0	398	432	418
7.	Carbon Monoxide as CO	mg/Nm^3	--	**8.4**	**9.3**	**9.5**
8.	Carbon Dioxide as CO_2	%	--	**10.2**	**10.9**	**11.3**
9.	Oxygen as O_2	%	--	**7.4**	**5.2**	**6.3**
10.	Mercury as Hg	mg/Nm^3	**0.03**	**0.0162**	**0.0153**	**0.0165**

Note: The value of SO2, NOx are corrected @6% O2 level in flue gas emission.

Reviewed By VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR

VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR *Approved by*

GMR KAMALANGA ENERGY LTD. GMR

OSPCB

https://ospcb-rtdas.com/#/landing/industryReports/realTimeReport

Dashboard | Live Status | Regulator Reports | Industry Reports | Star Rating | Calibration | Work Flow | GMR_Kamalanga

Real Time Report / Trends

Reports

M/s. GMR Kamalanga Energy Ltd.(Including Township over 45 Ac.)

Meramandali , Odisha POWER PLANT Refresh

Data Last Received On	Configuration Updated On	Calibration at	CEMS	EQMS	AAQMS	Total Stations
05, January, 2025	25, July, 2019	01, January, 2018	3	1	4	8

Live Readings

Help

Emission | Effluent | Ambient

Stack_2_Boiler2

Stack_2_Boiler2

0.0164 mg/Nm3
Stack_2_Boiler2 - **Hg**
15 MinsAvg: 0.02 mg/Nm3
Limit: 0 - 0.03 mg/Nm3 Range: 0 - 50

347.0693 mg/Nm3
Stack_2_Boiler2 - **NOx**
15 MinsAvg: 324.27 mg/Nm3
Limit: 0 - 450.0 mg/Nm3 Range: 0 - 1000

43.375 mg/Nm3
Stack_2_Boiler2 - **PM**
15 MinsAvg: 42.83 mg/Nm3
Limit: 0 - 50.0 mg/Nm3 Range: 0 - 1000

1172.8978 mg/Nm3
Stack_2_Boiler2 - **SO2**
15 MinsAvg: 1158.90 mg/Nm3
Limit: 0 - 600.0 mg/Nm3 Range: 0 - 1000

Type here to search What will be ITC Hote... ENG 14:52 05-01-2025

GMR KAMALANGA ENERGY LTD.

Annexure-VII

Annexure-VIII

PERFORMANCE EVALUATION STUDY FOR POLLUTION CONTROL EQUIPMENTS

Of

GMR KAMALANGA ENERGY LIMITED

(3 x 350 MW THERMAL POWER PLANT)

AT/PO - KAMALANGA, DIST. – DHENKANAL

ODISHA – 759121

Conducted by :-

Visiontek Consultancy Services Pvt. Ltd.

(Committed for Better Environment)

Plot No.-M-22&23, ChandakaIndustrialEstate, Patia, Bhubaneswar, Khurda,
Odisha-751024,India, Tel.:0674-3511721
E-mail: visiontek@vcspl.org,visiontekin@gmail.com
Visitus at:www.vcspl.org

GMR KAMALANGA ENERGY LTD.

Boiler – I (ESP)

S. No.	Sampling Location	Date of Sampling	Time	Flue gas temp ^0C	Velocity of Flue gas in M/sec	Particulate matter in mg/Nm^3	Area of cross section of Duct in m^2	Gas flow in Nm^3/sec	Pass efficiency in %	Unit Efficiency in %
1	ESP outlet Pass A	25.05.2022	14:00 to 14:30	124	26.7	42	12.6	336.42	99.94	99.93
2	ESP Inlet Pass A	25.05.2022	14:00 to 14:30	124	27.46	66780	12.25	336.42		
3	ESP Outlet Pass B	25.05.2022	14:30 to 15:00	124	28.2	44	12.6	355.32	99.93	
4	ESP Inlet Pass B	25.05.2022	14:30 to 15:00	124	29.01	65296	12.25	355.32		

Boiler – II (ESP)

S. No.	Sampling Location	Date of Sampling	Time	Flue gas temp ^0C	Velocity of Flue gas in M/sec	Particulate matter in mg/Nm^3	Area of cross section of Duct in m^2	Gas flow in Nm^3/sec	Pass efficiency in %	Unit Efficiency in %
1	ESP outlet Pass A	25.5.2022	15:30 to 16:00	131	22.3	49	12.6	280.98	99.92	99.92
2	ESP Inlet Pass A	25.5.2022	15:30 to 16:00	131	22.94	62590	12.25	280.98		
3	ESP Outlet Pass B	25.5.2022	16:00 to 16:30	131	26.4	48	12.6	332.64	99.93	
4	ESP Inlet Pass B	25.5.2022	16:00 to 16:30	131	27.15	65925	12.25	332.64		

GMR KAMALANGA ENERGY LTD.

Boiler – III (ESP)

S. No.	Sampling Location	Date of Sampling	Time	Flue gas temp ^0C	Velocity of Flue gas in M/sec	Particulate matter in mg/Nm^3	Area of cross section of Duct in m^2	Gas flow in Nm^3/sec	Pass efficiency in %	Unit Efficiency in %
1	ESP outlet Pass A	25.5.2022	17:00 to 17:30	135	26.55	41	12.6	334.53	99.94	99.94
2	ESP Inlet Pass A	25.5.2022	17:00 to 17:30	135	27.31	68439	12.25	334.53		
3	ESP Outlet Pass B	25.5.2022	17:30 to 18:00	135	27.24	39	12.6	343.224	99.94	
4	ESP Inlet Pass B	25.5.2022	17:30 to 18:00	135	28.02	67211	12.25	343.224		

GMR KAMALANGA ENERGY LTD.

Annexure- IX

GMR Kamalanga Energy Limited

Plant Office.
AT/PO: Kamalanga, PS: Kantabania,
VIA: Meramundali,
DIST: Dhenkanal - 759 121, Odisha
CIN U40101KA2007PLC044809
T +91 6762 663564
W www.gmrgroup.in

14-09/24

Ref. No. GKEL/MoEF&CC/2024-25/8467
Dated – 21.10.2024

To
The Director
Ministry of Environment Forest & Climate Change, Govt. of India,
Regional Office, A/3, Chandrasekharpur,
Bhubaneswar – 751023, Odisha.

Sub: Quarterly AAQ Monitoring Report (Q - 2) 2024-25.
Ref: EC vide letter no J-13011/64/2007-IA II (T) dated 05.02.2008.

Dear Sir,

In compliance to the EC condition regarding the above subject, we are submitting herewith the ambient air quality report of impact zone (both core & buffer zone) for Q – 2, FY 2024-25.

Kindly acknowledge receipt of the same.

Thanking you,

Yours sincerely,
for **GMR Kamalanga Energy Limited,**

Manoj Mishra
Plant Head

Encl. – As above

Registered Office:
Skip House, 25/1, Museum Road,
Bengaluru - 560 025

Visiontek Consultancy Services Pvt. Ltd.

(Committed For Better Environment)

Certified for : ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Accredited by : NABET-A Grade, MOEF & CC/CPCB & SPCB-A Grade

- Infrastructure Enginering
- Water Resource Management
- Environmental & Social Study
- Surface & Sub-Surface Investigation
- Quality Control & Project Management
- Renewable Energy
- Agricultural Development
- Information Technology
- Public Health Engineering
- Mine Planning & Design
- Mineral/Sub-Soil Exploration
- Waste Management Services

Laboratory Services
Environment Lab
Food Lab
Material Lab
Soil Lab
Mineral Lab
&
Microbiology Lab

Ref: Envlab/24-25/TR- 08477 *Date:*05.08.2024

AMBIENT AIR QUALITY MONITORING REPORT FOR July-2024 (CORE ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer,VOC Sampler
3. Sampling Location : **AAQMS-1: Near Rain Water pump House Pit**
4. Sample Collected By : VCSPL Representative in presence of Client's Representative

Date	PARAMETERS											
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
01.07.2024	53.8	28.1	14.7	26.3	9.6	0.55	22.5	BDL	BDL	BDL	BDL	BDL
04.07.2024	50.7	27.2	15.5	25.9	10.6	0.68	21.5	BDL	BDL	BDL	BDL	BDL
08.07.2024	49.7	26.6	14.0	24.9	10.5	0.59	23.2	BDL	BDL	BDL	BDL	BDL
11.07.2024	54.5	29.4	15.7	26.1	10.4	0.53	BDL	BDL	BDL	BDL	BDL	BDL
15.07.2024	51.8	28.4	14.2	25.6	10.5	0.62	24.4	BDL	BDL	BDL	BDL	BDL
18.07.2024	50.4	27.3	14.8	23.8	9.6	0.52	BDL	BDL	BDL	BDL	BDL	BDL
22.07.20.24	50.7	27.3	14.7	22.1	10.2	0.62	23.2	BDL	BDL	BDL	BDL	BDL
25.07.2024	50.5	26.2	15.5	21.4	10.8	0.67	23.1	BDL	BDL	BDL	BDL	BDL
Monthly Average	51.5	27.6	14.9	24.5	10.3	0.59	23.0	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard	100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part 2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling , 3rd Edn.By James P. Lodge Method-411	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling , 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NO_X< 6 $\mu g/m^3$, O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$, Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

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Mineral Lab
&
Microbiology Lab

Ref: Envlab/24-25/TR- 08478 *Date:* 05.08.2024

AMBIENT AIR QUALITY MONITORING REPORT FOR JULY-2024 (CORE ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer, VOC Sample
3. Sampling Location : **AAQMS-2: Near Security Watch Tower - 3**
4. Sample Collected By : VCSPL Representative in presence of Client's Representative

Date	PARAMETERS											
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
01.07.2024	51.2	29.8	14.2	24.8	10.2	0.54	BDL	BDL	BDL	BDL	BDL	BDL
04.07.2024	51.5	31.2	14.6	22.5	9.8	0.55	22.3	BDL	BDL	BDL	BDL	BDL
08.07.2024	52.2	32.8	14.4	22.5	9.9	0.64	22.5	BDL	BDL	BDL	BDL	BDL
11.07.2024	51.5	28.5	14.6	22.3	10.6	0.55	22.6	BDL	BDL	BDL	BDL	BDL
15.07.2024	49.9	29.0	15.2	23.4	10.4	0.62	BDL	BDL	BDL	BDL	BDL	BDL
18.07.2024	51.1	28.6	15.3	24.9	10.3	0.67	23.8	BDL	BDL	BDL	BDL	BDL
22.07.20.24	53.2	28.1	16.4	21.7	10.5	0.6	23.7	BDL	BDL	BDL	BDL	BDL
25.07.2024	50.5	25.2	14.6	23.1	10.6	0.52	25.5	BDL	BDL	BDL	BDL	BDL
Monthly Average	51.4	29.1	14.9	23.2	10.3	0.58	23.4	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard	100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling - 3rd Edn.By James P. Lodge (Method-411)	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling - 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NO_X< 6 $\mu g/m^3$, O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$, Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

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Soil Lab
Mineral Lab
&
Microbiology Lab

Ref: Envlab/24-25/TR- 08479 *Date:* 05.08.2024

AMBIENT AIR QUALITY MONITORING REPORT FOR July -2024 (CORE ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer,VOC Sampler
3. Sampling Location : **AAQMS-3: Near Budhapanka Material Gate(Security Watch Tower No.1)**
4. Sample Collected By : VCSPL Representative in presence of Client's Representative

Date	PARAMETERS											
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
01.07.2024	54.4	29.5	16.8	24.6	9.8	0.64	23.4	BDL	BDL	BDL	BDL	BDL
04.07.2024	53.4	28.3	15.9	24.6	10.1	0.68	23.2	BDL	BDL	BDL	BDL	BDL
08.07.2024	54.0	30.7	15.5	24.3	9.6	0.65	22.2	BDL	BDL	BDL	BDL	BDL
11.07.2024	53.4	28.8	15.6	25.5	10.4	0.57	BDL	BDL	BDL	BDL	BDL	BDL
15.07.2024	53.2	28.5	17.3	24.9	10.4	0.61	24.4	BDL	BDL	BDL	BDL	BDL
18.07.2024	53.7	28.5	16.4	24.8	10.6	0.65	BDL	BDL	BDL	BDL	BDL	BDL
22.07.20.24	51.6	28.1	16.1	23.1	10.1	0.55	23.8	BDL	BDL	BDL	BDL	BDL
25.07.2024	50.9	28.8	15.8	25.3	9.8	0.53	BDL	BDL	BDL	BDL	BDL	BDL
Monthly Average	53.1	28.9	16.2	24.6	10.1	0.61	23.4	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard	100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling - 3rd Edn.By James P. Lodge (Method-411)	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling - 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NO_x< 6 $\mu g/m^3$, O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$, Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

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Soil Lab
Mineral Lab
&
Microbiology Lab

Ref: Envlab/24-25/TR- 08480 *Date:* 05.08.2024

AMBIENT AIR QUALITY MONITORING REPORT FOR JULY -2024 (BUFFER ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer,VOC Sampler
3. Sample Collected By : VCSPL Representative in presence of Client's Representative

Location Name	Date	PARAMETERS											
		PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
AAQMS1: Kamalanga (Township)	22.07.2024	53.5	28.9	15.5	26.8	7.8	0.52	21.5	BDL	BDL	BDL	BDL	BDL
AAQMS-2: Mangalpur	23.07.2024	53.5	29.6	16.2	17.2	8.6	0.62	24.5	BDL	BDL	BDL	BDL	BDL
AAQMS3: Budhapanka	24.07.2024	52.2	28.5	14.8	26.1	9.5	0.54	22.8	BDL	BDL	BDL	BDL	BDL
AAQMS4: Bhogamunda	25.07.2024	50.8	26.3	12.4	24.2	8.6	0.49	23.5	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard		100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD		Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling , 3rd Edn.By James P. Lodge (Method-411)	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling , 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NO_X< 6 $\mu g/m^3$, O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$, Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

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Soil Lab
Mineral Lab
&
Microbiology Lab

Ref: **Envlab/23-24/TR- 08975** *Date:* **02.09.2024**

AMBIENT AIR QUALITY MONITORING REPORT FOR AUGUST-2024 (CORE ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer,VOC Sampler
3. Sampling Location : **AAQMS-1: Near Rain Water pump House Pit**
4. Sample Collected By : VCSPL Representative in presence of Client's Representative

Date	PARAMETERS											
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
01.08.2024	49.2	27.6	14.2	25.8	9.4	0.53	22.6	BDL	BDL	BDL	BDL	BDL
05.08.2024	50.2	26.8	15.2	25.6	10.2	0.63	22.1	BDL	BDL	BDL	BDL	BDL
08.08.2024	49.2	26.2	14.2	25.2	10.2	0.55	22.8	BDL	BDL	BDL	BDL	BDL
12.08.2024	54.3	29.3	15.1	25.5	10.3	0.52	BDL	BDL	BDL	BDL	BDL	BDL
16.08.2024	52.1	28.7	14.5	25.8	10.2	0.65	23.8	BDL	BDL	BDL	BDL	BDL
19.08.2024	49.9	26.8	14.2	23.2	9.2	0.55	BDL	BDL	BDL	BDL	BDL	BDL
22.08.2024	50.2	26.8	14.4	21.8	10.1	0.58	23.2	BDL	BDL	BDL	BDL	BDL
26.08.2024	50.2	25.8	15.1	21.1	10.4	0.55	22.8	BDL	BDL	BDL	BDL	BDL
29.08.2024	52.2	28.4	14.2	25.7	10.2	0.58	21.5	BDL	BDL	BDL	BDL	BDL
Monthly Average	50.8	27.4	14.6	24.4	10.0	0.57	22.7	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard	100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method S 5182 (Part 2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling , 3rd Edn.By James P. Lodge (Method-411	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling , 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NOx< 6 $\mu g/m^3$, O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$, Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

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Microbiology Lab

Ref: Envlab/23-24/TR- 08976 *Date:* 02.09.2024

AMBIENT AIR QUALITY MONITORING REPORT FOR AUGUST-2024 (CORE ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer, VOC Sample
3. Sampling Location : **AAQMS-2: Near Security Watch Tower - 3**
4. Sample Collected By : VCSPL Representative in presence of Client's Representative

Date	PARAMETERS											
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
01.08.2024	51.5	30.2	13.8	24.4	9.8	0.55	BDL	BDL	BDL	BDL	BDL	BDL
05.08.2024	50.5	30.3	14.2	22.1	9.2	0.56	21.8	BDL	BDL	BDL	BDL	BDL
08.08.2024	51.2	31.8	14.1	22.2	9.5	0.62	22.6	BDL	BDL	BDL	BDL	BDL
12.08.2024	51.1	28.1	14.2	21.8	10.2	0.58	21.8	BDL	BDL	BDL	BDL	BDL
16.08.2024	49.5	28.7	15.3	23.5	10.2	0.65	BDL	BDL	BDL	BDL	BDL	BDL
19.08.2024	50.8	28.5	14.8	24.4	10.1	0.66	22.7	BDL	BDL	BDL	BDL	BDL
22.08.2024	52.2	27.2	16.2	21.5	10.6	0.61	22.5	BDL	BDL	BDL	BDL	BDL
26.08.2024	50.1	24.8	14.1	22.6	9.8	0.55	25.2	BDL	BDL	BDL	BDL	BDL
29.08.2024	50.3	25.2	13.8	24.3	9.3	0.54	22.5	BDL	BDL	BDL	BDL	BDL
Monthly Average	50.8	28.3	14.5	23.0	9.9	0.59	22.7	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard	100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling - 3rd Edn.By James P. Lodge (Method-411)	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling - 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NOx< 6 $\mu g/m^3$, O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$, Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

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Ref: **Envlab/23-24/TR- 08977** *Date:* **02.09.2024**

AMBIENT AIR QUALITY MONITORING REPORT FOR AUGUST -2024 (CORE ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer,VOC Sampler
3. Sampling Location : **AAQMS-3: Near Budhapanka Material Gate(Security Watch Tower No.1)**
4. Sample Collected By : VCSPL Representative in presence of Client's Representative

Date	PARAMETERS											
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
01.08.2024	53.8	28.8	16.2	24.1	9.5	0.62	23.2	BDL	BDL	BDL	BDL	BDL
05.08.2024	53.2	28.2	15.2	24.5	9.8	0.65	22.5	BDL	BDL	BDL	BDL	BDL
08.08.2024	53.8	30.5	15.2	24.1	9.8	0.64	21.8	BDL	BDL	BDL	BDL	BDL
12.08.2024	53.1	28.5	15.5	25.3	10.2	0.55	BDL	BDL	BDL	BDL	BDL	BDL
16.08.2024	52.8	28.1	16.8	24.5	10.3	0.62	24.6	BDL	BDL	BDL	BDL	BDL
19.08.2024	53.2	28.1	16.2	24.4	10.2	0.63	BDL	BDL	BDL	BDL	BDL	BDL
22.08.2024	51.5	27.8	15.8	22.8	9.9	0.58	23.5	BDL	BDL	BDL	BDL	BDL
26.08.2024	50.2	28.1	15.5	25.1	9.6	0.55	BDL	BDL	BDL	BDL	BDL	BDL
29.08.2024	50.1	27.8	15.1	24.8	9.3	0.57	22.5	BDL	BDL	BDL	BDL	BDL
Monthly Average	52.4	28.4	15.7	24.4	9.8	0.60	23.1	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard	100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling , 3rd Edn.By James P. Lodge (Method-411)	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling , 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NOx< 6 $\mu g/m^3$,O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$,Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR

Reviewed by

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Approved by

Plot No.- M-22 & 23, Chandaka Industrial Estate, Patia, Bhubaneswar, Khurda, Odisha-751024, India Tel.: 0674-3511721
E-mail: visiontek@visiontek.org, visiontekin@gmail.com
Visit us at: www.visiontek.org

Visiontek Consultancy Services Pvt. Ltd.

(Committed For Better Environment)

Certified for : ISO 9001:2015, ISO 14001:2015, ISO 45001:2018

Accredited by : NABET-A Grade, MOEF & CC/CPCB & SPCB-A Grade

- Infrastructure Engineering
- Water Resource Management
- Environmental & Social Study
- Surface & Sub-Surface Investigation
- Quality Control & Project Management
- Renewable Energy
- Agricultural Development
- Information Technology
- Public Health Engineering
- Mine Planning & Design
- Mineral/Sub-Soil Exploration
- Waste Management Services

Laboratory Services
Environment Lab
Food Lab
Material Lab
Soil Lab
Mineral Lab
&
Microbiology Lab

Ref: Envlab/23-24/TR- 08978 *Date:* 02.09.2024

AMBIENT AIR QUALITY MONITORING REPORT FOR AUGUST -2024 (BUFFER ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer,VOC Sampler
3. Sample Collected By : VCSPL Representative in presence of Client's Representative

Location Name	Date	PARAMETERS											
		PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
AAQMS1: Kamalanga (Township)	19.08.2024	52.7	28.1	15.2	26.5	7.5	0.55	21.2	BDL	BDL	BDL	BDL	BDL
AAQMS-2: Mangalpur	20.08.2024	53.2	29.3	15.8	16.8	8.3	0.63	24.3	BDL	BDL	BDL	BDL	BDL
AAQMS3: Budhapanka	21.08.2024	51.8	28.2	14.4	25.8	9.2	0.55	22.5	BDL	BDL	BDL	BDL	BDL
AAQMS4: Bhogamunda	22.08.2024	50.4	26.1	12.2	24.1	8.6	0.53	23.2	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard		100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD		Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemicnl Method Air Sampling, 3rd Edn.By James P. Lodge (Method-411)	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling, 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NO_X< 6 $\mu g/m^3$, O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$, Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR

Reviewed by

VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR

Approved by

Plot No.- M-22 & 23, Chandaka Industrial Estate, Patia, Bhubaneswar, Khurda, Odisha-751024, India Tel.: 0674-3511721
E-mail: visiontek@visiontek.org, visiontekin@gmail.com
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Ref: **Envlab/23-24/TR- 10233** *Date:***30.09.2024**

AMBIENT AIR QUALITY MONITORING REPORT FOR SEPTEMBER-2024 (CORE ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer,VOC Sampler
3. Sampling Location : **AAQMS-1: Near Rain Water pump House Pit**
4. Sample Collected By : VCSPL Representative in presence of Client's Representative

Date	PARAMETERS											
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
02.09.2024	48.2	26.4	13.8	25.6	9.2	0.54	22.5	BDL	BDL	BDL	BDL	BDL
05.09.2024	49.3	25.8	15.3	25.7	9.8	0.62	21.3	BDL	BDL	BDL	BDL	BDL
09.09.2024	48.3	25.4	13.8	24.8	10.3	0.58	23.2	BDL	BDL	BDL	BDL	BDL
12.09.2024	54.2	29.1	14.8	25.2	10.1	0.54	BDL	BDL	BDL	BDL	BDL	BDL
16.09.2024	51.8	28.5	14.7	25.9	9.8	0.62	21.2	BDL	BDL	BDL	BDL	BDL
19.09.2024	49.5	26.4	13.8	22.8	9.3	0.58	BDL	BDL	BDL	BDL	BDL	BDL
23.09.2024	49.8	26.4	14.2	21.6	9.9	0.55	21.2	BDL	BDL	BDL	BDL	BDL
26.09.2024	49.9	25.6	15.2	21.3	10.2	0.57	23.2	BDL	BDL	BDL	BDL	BDL
30.09.2024	52.1	28.3	14.5	25.9	9.9	0.57	22.2	BDL	BDL	BDL	BDL	BDL
Monthly Average	50.3	26.9	14.5	24.3	9.8	0.57	22.1	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard	100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part 2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling , 3rd Edn.By James P. Lodge Method-411	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling , 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values:SO_2< 4 $\mu g/m^3$, NO_X< 6 $\mu g/m^3$,O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$,Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR Reviewed by

VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR Approved By

Plot No.- M-22 & 23, Chandaka Industrial Estate, Patia, Bhubaneswar, Khordha, Odisha-751024, India Tel.: 0674-3511721
E-mail: visiontek@visiontek.org, visiontekin@gmail.com
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Ref: **Envlab/23-24/TR- 10234** *Date:* **30.09.2024**

AMBIENT AIR QUALITY MONITORING REPORT FOR SEPTEMBER-2024 (CORE ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer, VOC Sample
3. Sampling Location : **AAQMS-2: Near Security Watch Tower - 3**
4. Sample Collected By : VCSPL Representative in presence of Client's Representative

Date	PARAMETERS											
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
02.09.2024	50.5	29.4	13.2	23.8	9.5	0.58	BDL	BDL	BDL	BDL	BDL	BDL
05.09.2024	50.2	29.9	13.7	20.7	9.4	0.59	22.2	BDL	BDL	BDL	BDL	BDL
09.09.2024	50.8	31.5	13.8	21.8	9.6	0.66	21.2	BDL	BDL	BDL	BDL	BDL
12.09.2024	50.2	27.0	13.9	21.5	10.5	0.62	23.2	BDL	BDL	BDL	BDL	BDL
16.09.2024	48.4	27.6	14.8	23.1	9.8	0.63	BDL	BDL	BDL	BDL	BDL	BDL
19.09.2024	50.4	28.1	13.8	23.6	10.2	0.68	22.8	BDL	BDL	BDL	BDL	BDL
23.09.2024	51.2	26.2	15.1	20.4	10.1	0.55	21.8	BDL	BDL	BDL	BDL	BDL
26.09.2024	49.9	24.6	13.8	22.3	9.5	0.58	25.4	BDL	BDL	BDL	BDL	BDL
30.09.2024	50.2	25.3	13.5	24.1	9.2	0.57	23.2	BDL	BDL	BDL	BDL	BDL
Monthly Average	50.2	27.7	14.0	22.4	9.8	0.61	22.8	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard	100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob & Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling , 3rd Edn.By James P. Lodge (Method-411)	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling , 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NOx< 6 $\mu g/m^3$, O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$, Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR *Reviewed by*

VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR *Approved by*

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Ref: Envlab/23-24/TR- 10235 *Date:* 30.09.2024

AMBIENT AIR QUALITY MONITORING REPORT FOR SEPTEMBER -2024 (CORE ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer,VOC Sampler
3. Sampling Location : **AAQMS-3: Near Budhapanka Material Gate(Security Watch Tower No.1)**
4. Sample Collected By : VCSPL Representative in presence of Client's Representative

Date	PARAMETERS											
	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
02.09.2024	52.8	27.7	16.5	24.4	9.6	0.65	22.8	BDL	BDL	BDL	BDL	BDL
05.09.2024	53.4	28.3	15.1	24.5	9.2	0.62	21.8	BDL	BDL	BDL	BDL	BDL
09.09.2024	52.7	29.4	15.5	24.5	9.2	0.61	22.5	BDL	BDL	BDL	BDL	BDL
12.09.2024	53.2	28.7	14.8	24.5	10.1	0.58	BDL	BDL	BDL	BDL	BDL	BDL
16.09.2024	50.8	26.5	16.2	23.8	9.8	0.68	23.8	BDL	BDL	BDL	BDL	BDL
19.09.2024	52.2	27.2	15.8	24.3	10.5	0.66	BDL	BDL	BDL	BDL	BDL	BDL
23.09.2024	50.5	26.8	15.1	22.2	9.5	0.57	22.8	BDL	BDL	BDL	BDL	BDL
26.09.2024	49.1	27.0	15.2	24.8	9.4	0.58	BDL	BDL	BDL	BDL	BDL	BDL
30.09.2024	50.2	27.6	15.2	25.1	9.5	0.58	21.6	BDL	BDL	BDL	BDL	BDL
Monthly Average	51.7	27.7	15.5	24.2	9.6	0.61	22.7	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard	100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD	Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Gaeke Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling 3rd Edn.By James P. Lodge Method-411	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling , 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NOx< 6 $\mu g/m^3$, O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$, Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

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Ref: Envlab/23-24/TR- 10236 *Date:* 30.09.2024

AMBIENT AIR QUALITY MONITORING REPORT FOR SEPTEMBER -2024 (BUFFER ZONE)

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Monitoring Instruments : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer,VOC Sampler
3. Sample Collected By : VCSPL Representative in presence of Client's Representative

Location Name	Date	PARAMETERS											
		PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	O_3 ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	Ni (ng/m^3)	As (ng/m^3)	C_6H_6 ($\mu g/m^3$)	BaP (ng/m^3)
AAQMS1: Kamalanga (Township)	10.09.2024	51.6	27.0	15.4	26.6	7.8	0.62	21.4	BDL	BDL	BDL	BDL	BDL
AAQMS-2: Mangalpur	11.09.2024	52.1	28.2	15.4	16.2	8.1	0.61	24.5	BDL	BDL	BDL	BDL	BDL
AAQMS3: Budhapanka	12.09.2024	51.5	27.8	14.2	25.4	9.3	0.58	22.3	BDL	BDL	BDL	BDL	BDL
AAQMS4: Bhogamunda	13.09.2024	50.2	26.2	12.5	24.3	8.4	0.52	23.6	BDL	BDL	BDL	BDL	BDL
CPCB, New Delhi AAQ Standard		100	60	80	80	100	4	400	1	20	6	5	1
TEST METHOD		Gravimetric IS 5182: Part 23	Gravimetric EPA 1998	Improved West & Geake Method IS 5182 (Part-2) RA2017	Modified Jacob &Hochheiser Method IS 5182 (Part-6) RA2017	Chemical Method Air Sampling , 3rd Edn.By James P. Lodge (Method-411)	Non Dispersive Infrared Method IS 5182 (Part-10):1999	Indo Phenol Blue Method Air Sampling , 3rd Edn.By James P. Lodge (Method-401)	AAS Method IS 5182(Part -22):2004			Gas Chromatography IS 5182 (Part-11):2006	Solvent Extraction IS 5182 (Part-12):2004

BDL Values: SO_2< 4 $\mu g/m^3$, NOx< 6 $\mu g/m^3$,O_3<5 $\mu g/m^3$, NH_3<20 $\mu g/m^3$,Ni<0.01 ng/m^3, As < 0.001 ng/m^3, C_6H_6<0.001 $\mu g/m^3$, BaP<0.002 ng/m^3, Pb<0.001 $\mu g/m^3$, CO-<0.1 mg/m^3

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VISIONTEK CONSULTANCY SERVICES PVT. LTD. BBSR *Approved by*

Plot No.- M-22 & 23, Chandaka Industrial Estate, Patia, Bhubaneswar, Khordha, Odisha-751024, India Tel.: 0674-3511721
E-mail: visiontek@visiontek.org, visiontekin@gmail.com
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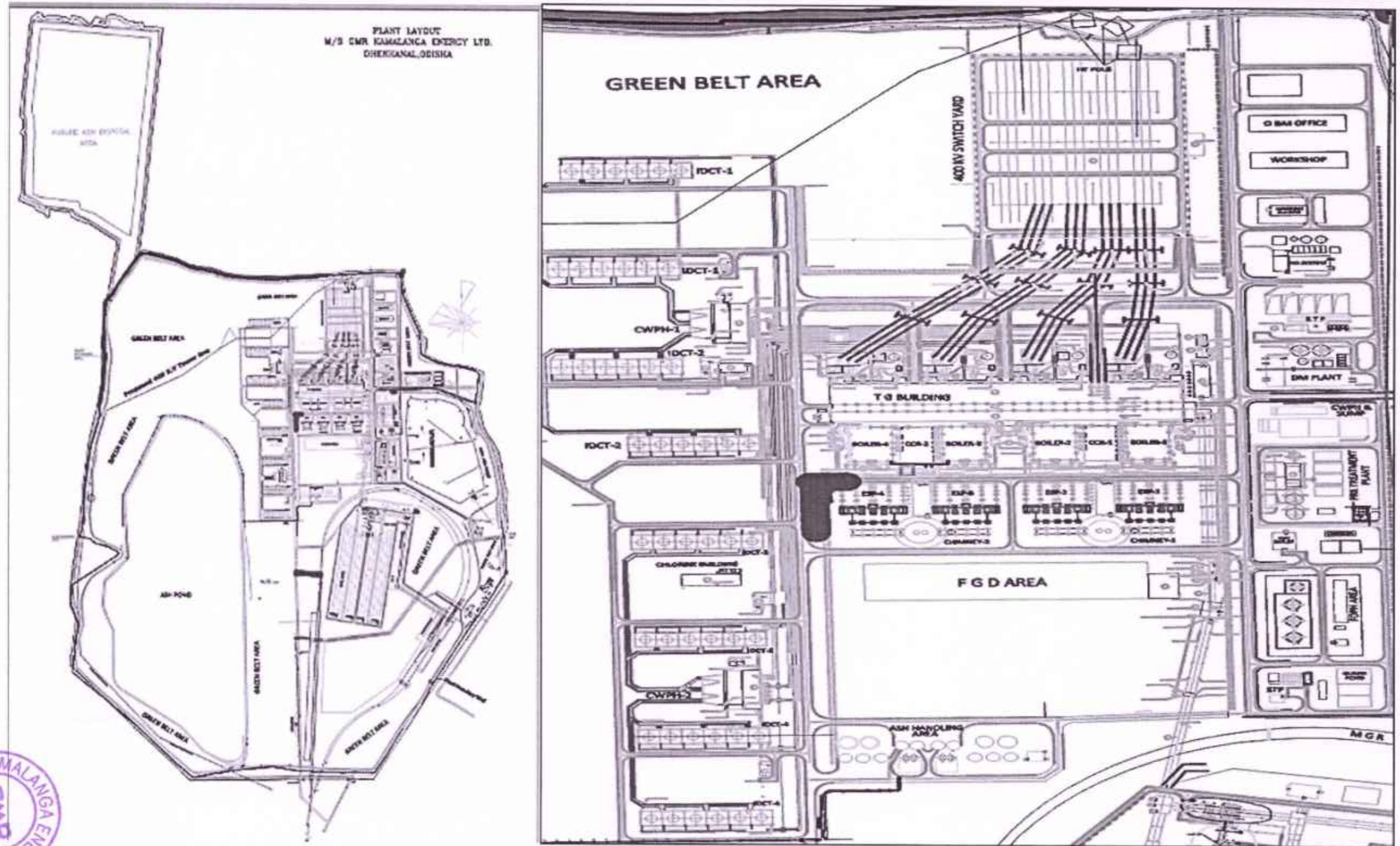
PROJECT LAYOUT

GMR



GMR KAMALANGA ENERGY LTD.

Annexure X

Annexure-X

GMR Kamalanga Energy Limited

GMR

Plant Office:
AT/PO: Kamalanga, PS: Kantabania,
VIA: Meramundali,
DIST: Dhenkanal - 759 121, Odisha
CIN U40101KA2007PLC044809
T +91 6762 663564
W www.gmrgroup.in

15-09/24

Ref. No. GKEL/CPCB/2024-25/8468
Dated – 21.10.2024

To
The Divisional Head – IPC II
Central Pollution Control Board
Parivesh Bhawan, East Arjun Nagar
New Delhi - 110032

Sub: Submission of Compliance status by TPPs with respect to Specific water consumption limit - reg.
Ref: Your office letter no B-33014/7/2019/IPC-II/TPP/ Email dated 8th July 2019

Dear Sir,

With reference to the above cited subject, we are submitting here with the quarterly specific water consumption report for Q – 2, FY 2024-25 of our 3x350 MW coal based Thermal Power Plant.

Kindly acknowledge receipt of the same.

Thanking you,

Yours sincerely,
for **GMR Kamalanga Energy Limited,**

Manoj Mishra
Plant Head

Encl. – As above

Copy for kind information to :-

1. The Member Secretary, State Pollution Control Board, Odisha, Bhubaneswar.
2. The Regional Officer, State Pollution Control Board, Odisha, Angul.

GMR KAMALANGA ENERGY LTD.

Registered Office:
Skip House, 25/1, Museum Road,
Bengaluru - 560 025

Format for quaterly reporting of water consumption data and compliance with respect to the limit notice vide notification dated 07.12.2015 of coal/lignite based thermal power plant.

Name of the Power Plant	: GMR Kamalanga Energy Ltd., Dhenkanal , Odisha.
Capacity	: Total - 1050 MW (3x350 MW each)
Applicable SWC Standard	: 3.5 M3/MWh

Zero waste water discharge condition mandatory OR not : Yes & Complied

Q - 2 FY 2024-25	Date	Station Generation (MU)	Water Consumption (M3)	Specific Water Consumption (Daily Avg. in m3/mwh)	Remarks
July	01-07-2024	24.539	53283	2.17	
	02-07-2024	23.339	47365	2.03	
	03-07-2024	24.500	50577	2.06	
	04-07-2024	23.255	46392	1.99	
	05-07-2024	24.743	41744	1.69	
	06-07-2024	16.697	38311	2.29	
	07-07-2024	15.273	31769	2.08	
	08-07-2024	16.900	28687	1.70	
	09-07-2024	16.909	36929	2.18	
	10-07-2024	16.818	40634	2.42	
	11-07-2024	16.842	40783	2.42	
	12-07-2024	16.412	40164	2.45	
	13-07-2024	16.680	40694	2.44	
	14-07-2024	16.776	44142	2.63	
	15-07-2024	16.822	41496	2.47	
	16-07-2024	16.840	40440	2.40	
	17-07-2024	16.857	38665	2.29	
	18-07-2024	16.756	43749	2.61	
	19-07-2024	16.648	41378	2.49	
	20-07-2024	16.858	43109	2.56	
	21-07-2024	16.607	41415	2.49	
	22-07-2024	16.844	39369	2.34	
	23-07-2024	16.865	36972	2.19	
	24-07-2024	16.895	40782	2.41	
	25-07-2024	16.860	39020	2.31	
	26-07-2024	16.818	37913	2.25	
	27-07-2024	14.104	34663	2.46	
	28-07-2024	16.367	40835	2.49	
	29-07-2024	16.902	40991	2.43	
	30-07-2024	16.923	41081	2.43	
	31-07-2024	16.897	51714	3.06	
August	01-08-2024	14.813	40513	2.74	
	02-08-2024	15.399	42278	2.75	
	03-08-2024	15.140	30620	2.02	
	04-08-2024	15.106	32029	2.12	
	05-08-2024	15.921	30223	1.90	
	06-08-2024	16.184	33488	2.07	
	07-08-2024	16.656	36240	2.18	
	08-08-2024	16.862	36415	2.16	
	09-08-2024	16.660	39825	2.39	

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	10-08-2024	16.424	31621	1.93	
	11-08-2024	18.344	42539	2.32	
	12-08-2024	17.760	37909	2.13	
	13-08-2024	16.511	36921	2.24	
	14-08-2024	16.656	35080	2.11	
	15-08-2024	19.816	43320	2.19	
	16-08-2024	24.274	48359	1.99	
	17-08-2024	23.312	46399	1.99	
	18-08-2024	22.874	52591	2.30	
	19-08-2024	24.364	44523	1.83	
	20-08-2024	23.009	46125	2.00	
	21-08-2024	24.673	46543	1.89	
	22-08-2024	24.916	47459	1.90	
	23-08-2024	24.486	49471	2.02	
	24-08-2024	24.096	50351	2.09	
	25-08-2024	21.128	48200	2.28	
	26-08-2024	22.797	45402	1.99	
	27-08-2024	20.646	39942	1.93	
	28-08-2024	22.363	48909	2.19	
	29-08-2024	22.030	41528	1.89	
	30-08-2024	24.107	46061	1.91	
	31-08-2024	23.938	51235	2.14	
September	01-09-2024	15.195	36763	2.42	
	02-09-2024	16.066	28381	1.77	
	03-09-2024	15.580	35036	2.25	
	04-09-2024	18.932	46342	2.45	
	05-09-2024	20.589	45421	2.21	
	06-09-2024	21.102	44871	2.13	
	07-09-2024	21.722	47585	2.19	
	08-09-2024	20.120	44822	2.23	
	09-09-2024	21.562	44777	2.08	
	10-09-2024	21.058	46977	2.23	
	11-09-2024	21.557	46712	2.17	
	12-09-2024	19.641	40531	2.06	
	13-09-2024	15.657	36297	2.32	
	14-09-2024	16.801	38047	2.26	
	15-09-2024	19.153	36810	1.92	
	16-09-2024	23.069	45818	1.99	
	17-09-2024	24.108	48202	2.00	
	18-09-2024	24.615	52972	2.15	
	19-09-2024	23.654	49731	2.10	
	20-09-2024	24.764	47948	1.94	
	21-09-2024	24.703	49786	2.02	
	22-09-2024	20.814	46300	2.22	
	23-09-2024	25.206	48491	1.92	
	24-09-2024	24.843	46809	1.88	
	25-09-2024	24.798	49597	2.00	
	26-09-2024	23.907	46790	1.96	
	27-09-2024	23.160	46134	1.99	
	28-09-2024	23.532	48042	2.04	
	29-09-2024	22.190	51080	2.30	
	30-09-2024	20.850	45877	2.20	
Quaterly Avg. Value		**19.70**	**42610.15**	**2.19**	

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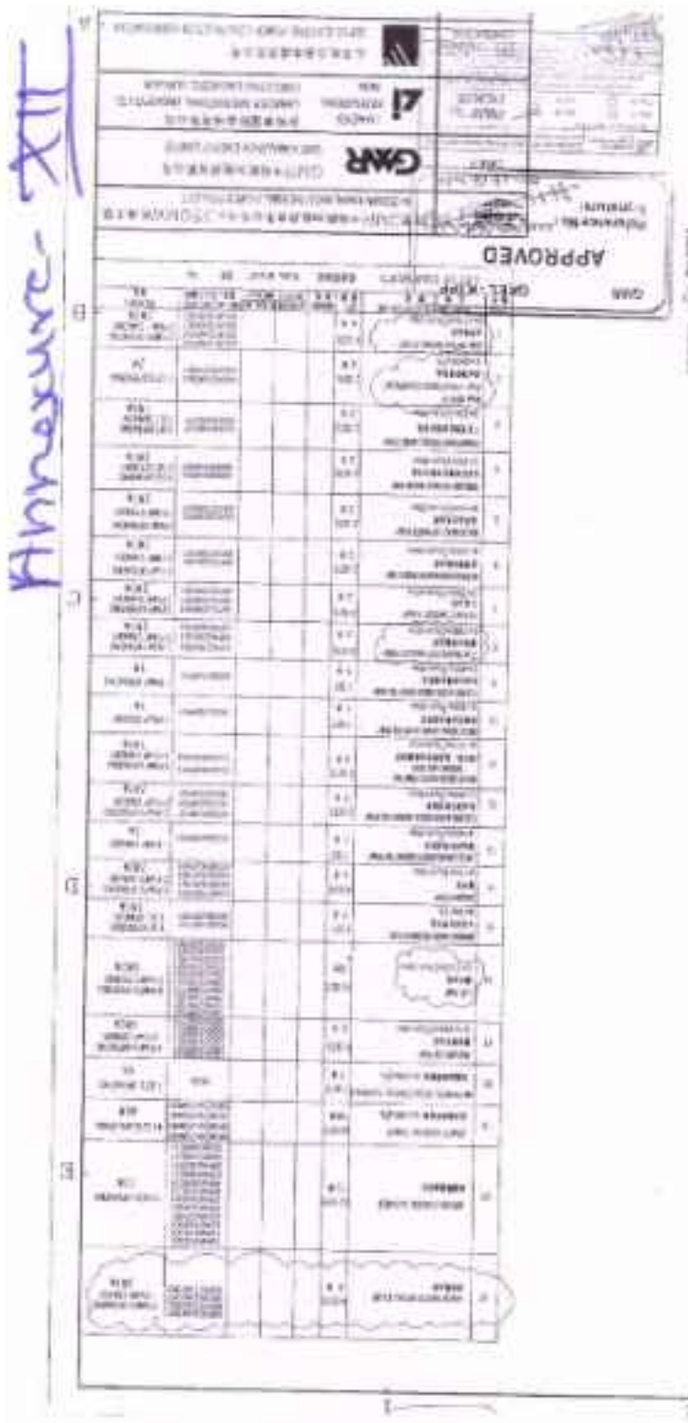
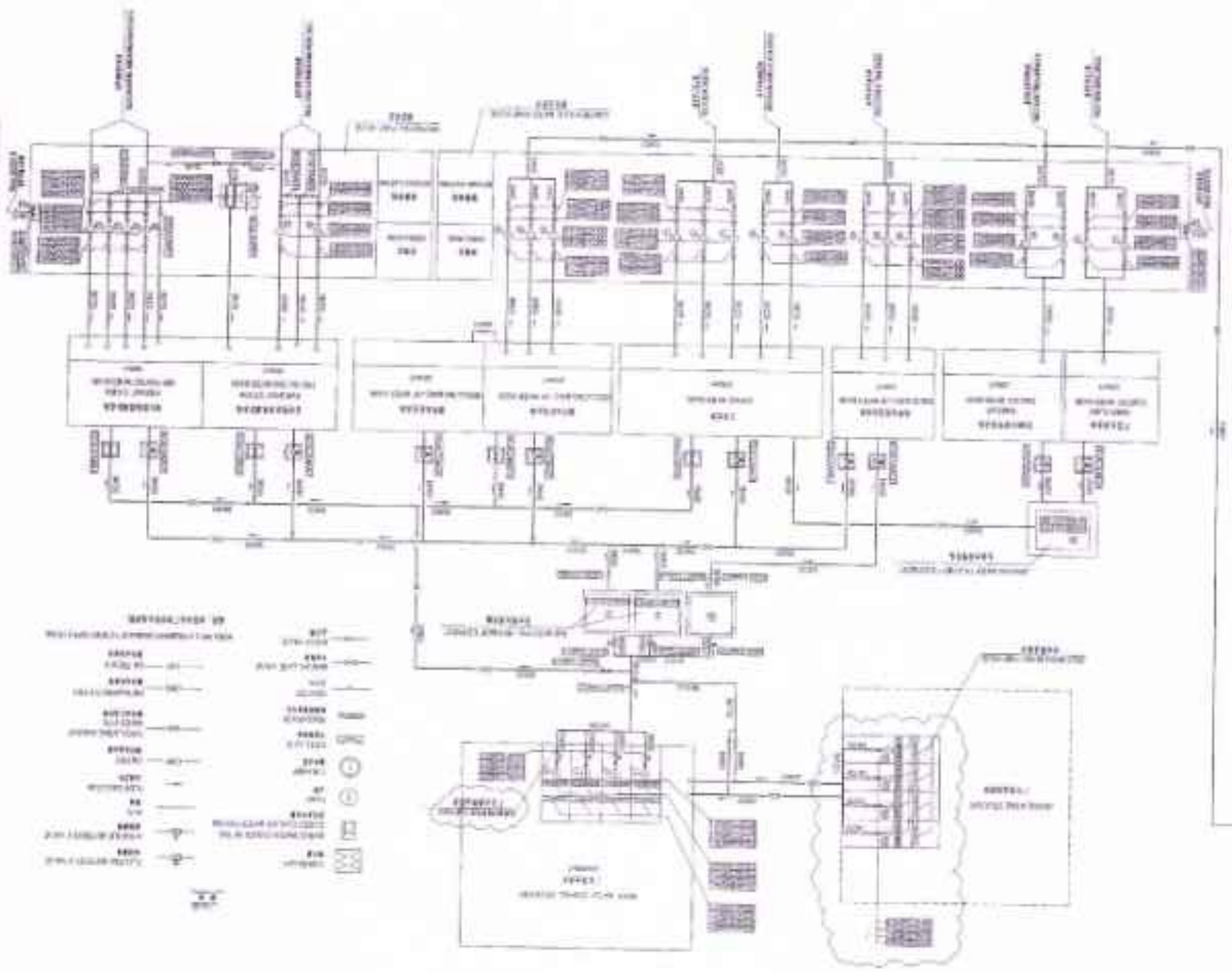
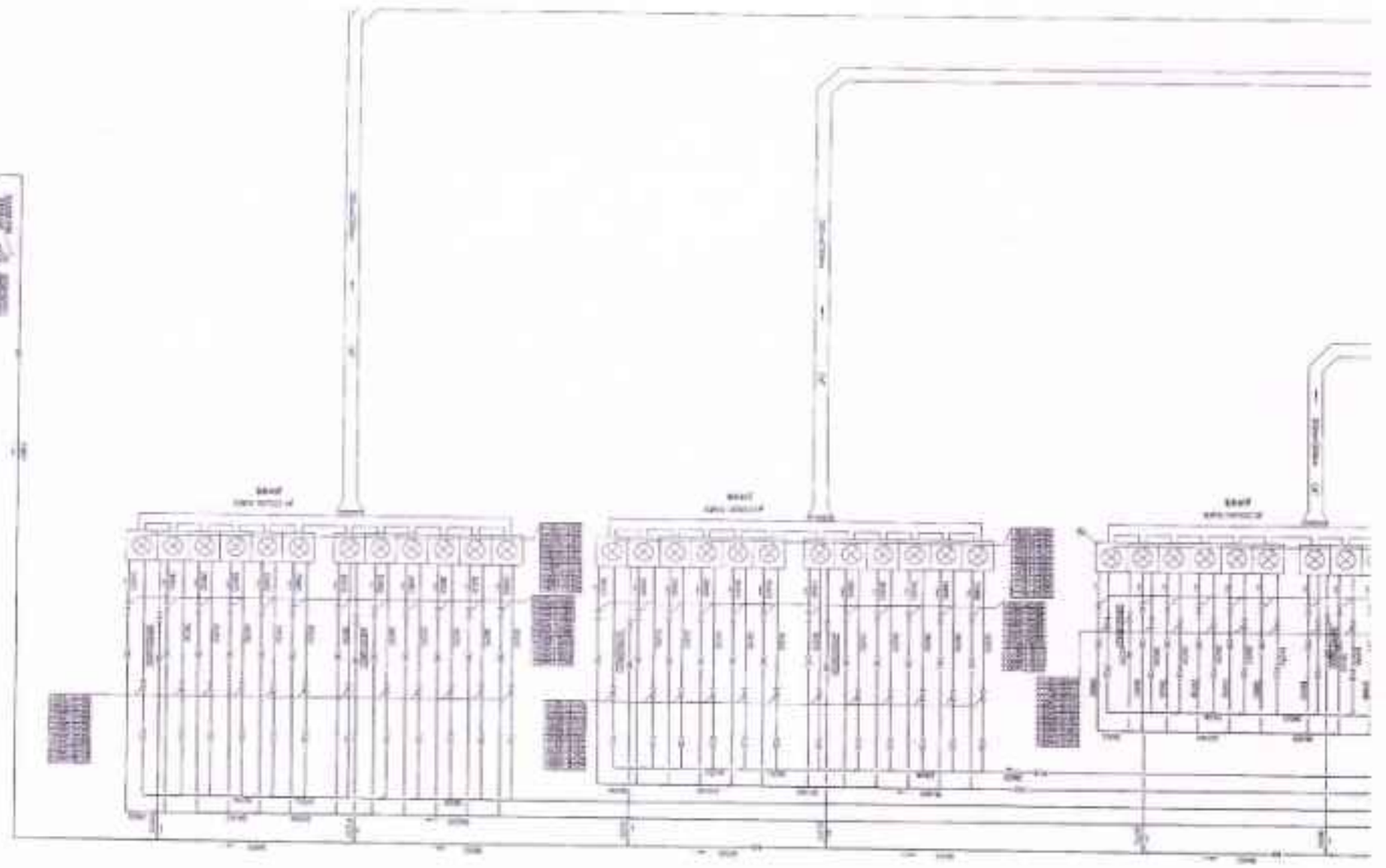
Annexure-XII







GMR KAMALANGA ENERGY LTD.

Annexure-XIII

~~ANNEXURE-I~~

Report on Environment improvement
initiatives undertaken for mitigation of fugitive emission

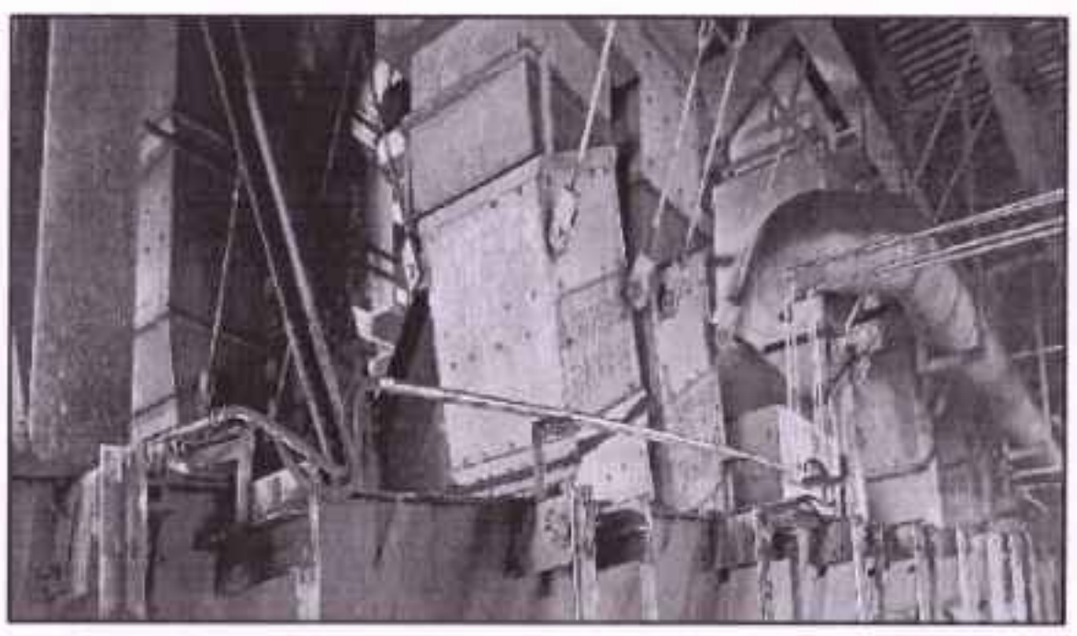
- *Installation of Dry Fog Dust Suppression System (DFDS) In CHP*
- *Fog Cannon deployment in Coal Yard*
- *Mechanize Wheel Washing System*

1. INSTALLATION OF DRY FOG DUST SUPPRESSION SYSTEM (DFDS) IN CHP:

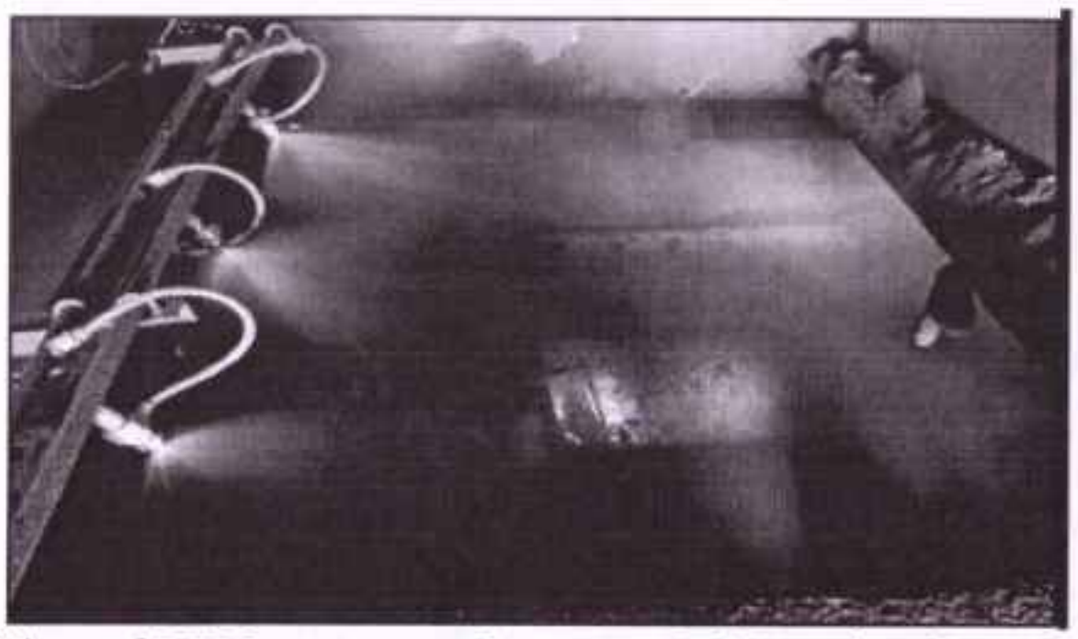
DFDS system uses a special air-atomizing nozzle that produces a very dry fog to agglomerate and remove airborne dust particles from the material (coal) handling and processing operations. The DFDS system utilizes compressed air and plain water to produce these 1 - 10 micron droplets (true fog). These ultra-fine water droplets attach (agglomerate) to like size airborne dust particles, sometimes referred to as PM-10 (particulate matter 10 microns or smaller). Subsequently, the slightly wetted dust particles become heavy enough to be removed from the air and fall back into the process. It is important to note that it is only wet the dust, not the material. This results in very low water and power consumption, requiring no expensive chemicals or significant wetting of the product (always less than 1/2 % by weight, typically no more than 0.1% moisture addition). DFDS system installed at crusher house, TT-6 &TT-7(Bunker area), Track Hopper(210 meters), Wagon Tripler(Pre-mist & DFDS) & Truck Tripler.

Benefit:

- Improving in Work zone and ambient air quality by effective controlling of fugitive dust emission from coal handling & processing.
- Safe and health working atmosphere for the workmen.
- Increasing of equipment efficiency.



View of DFDS system at Conveyor Belt head end - 3A/3B of Crusher House



View of DFDS system at Conveyor Belt Head end

DFDS system at Track Hopper

2. FOG CANNON DEPLOYMENT IN COAL YARD

02 nos. of Fog Cannon have been deployed for control of coal yard fugitive Dust. Fog Cannon has been designed to tackle the problem of airborne dust particles generated by Coal material handling activities. Fog

GMR KAMALANGA ENERGY LTD.

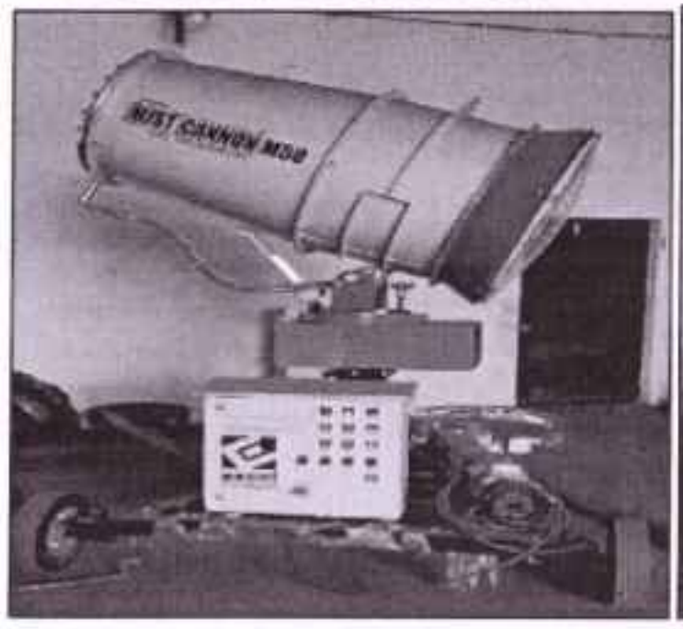
Cannon has been shown to suppress up to 95% of airborne dust particles. This fog cannon provided additional control measures apart from the high velocity jet sprinkler which is in place & working.

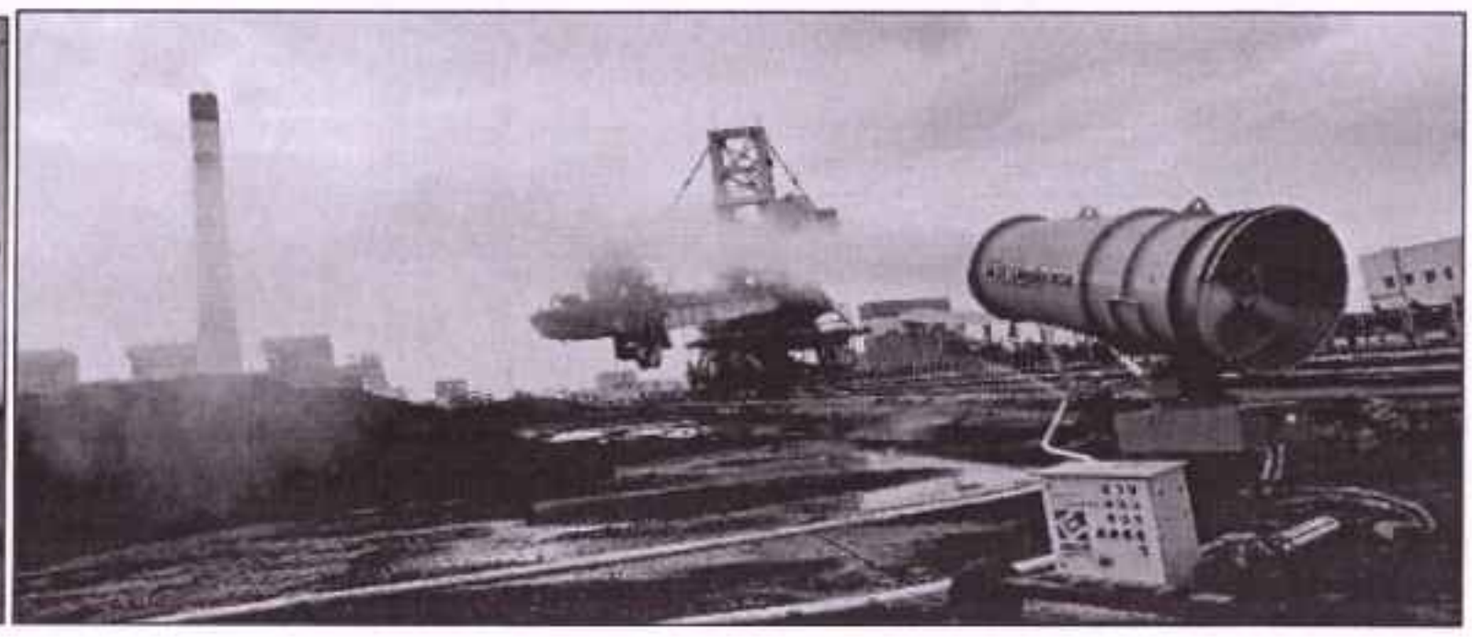
Project Detail:

1. Fog (mist) cannon model: Mist Cannon M50
2. Mist throwing range – up to 50 meter in ideal condition.
3. Cost of Rs. 9.89 Lakhs

Benefit:

- They help to Improve the workzone and ambient air quality by effective controlling of fugitive dust emission from coal handling activities like coal truck unloading, stacking, reclamation in the yard etc.
- reduce the health risk.





3. MECHANIZE WHEEL WASHING SYSTEM

In order to control the road fugitive dust, GMR Kamalanga Energy Limited has installed the Mechanised Wheel Washing System for cleaning wheels/tires and lower body parts of trucks / bulkers which are engaged in transportation of coal and fly ash. The wheel washing system is positioned just before the road weigh bridge, so that the vehicles will go to wheel washing system, then to weigh bridge and then exit from the plant area through Raw material gate.

Project Details:

1. Project cost: 42 Lakhs Appx.
2. Capacity: 35-40 Trucks/hour.
3. Clear water tank capacity: 45 m^3
4. Waste water recycle tank capacity: 60 m^3
   (With intermediate baffle wall to facilitate sedimentation process)
5. Water makeup – 10 KLD from plant recycled water.

Benefit: -To improve work zone and ambient air quality by control the road fugitive dust.

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Annexure-XIV

राष्ट्रीय प्रौद्योगिकी संस्थान
NATIONAL INSTITUTE OF TECHNOLOGY
राउरकेला ROURKELA- 769008, ओडिशा ODISHA

RIGHT TO INFORMATION

FTS/3265AB
Date: 22/06/2024

No. NITR/CE/2024/L/1243

To

The Member Secretary
The Ministry of Environment, Forest and Climate Change

Sub: Submission of Annual Ash Compliance Report (for the period of 1st April 2023-31st March 2024) of GMR Kamalanga Energy Limited, Dhenkanal, ODISHA

Respected Sir,

With reference to the subjected cited above, I am submitting herewith the softcopy of Annual Ash Compliance Report along with month wise generation and utilization data of GMR Kamalanga Energy Limited for the period of 1st April 2023-31st March 2024. The attachments also include the shapefiles of thermal power plant.

Kindly acknowledge the receipt of the same.

With warm regards,

Yours sincerely,

Spsingh 22/06/2024

Prof. Suresh Prasad Singh,
Department of Civil Engineering,
National Institute of Technology-Rourkela
Rourkela, Odisha

HEAD, DEPT. OF CIVIL ENGG.
National Institute of Technology
Rourkela - 769 008 (ODISHA)

Cc: 1) The Member Secretary, State Pollution Control Board, ODISHA
(Email: paribesh1@ospcboard.org)

2) "power cpcb" <power.cpcb@gov.in>;

GMR KAMALANGA ENERGY LTD.

GMR KAMALANGA ENERGY LIMITED
Dhenkanal, Odisha

Annual Ash Compliance Report
(Period 1st April' 2023 to 31st March'2024)

Date: 22/06/2024

Sr. No.	Details	
1.	Name of Power Plant	GMR Kamalanga Energy Limited
2.	Name of the company	GMR Kamalanga Energy Limited
3.	District	Dhenkanal
4.	State	Odisha
5.	Postal address for communication:	At/Po – Kamalanga via Meramandali P.S- Kantabania, Dist. - Dhenkanal, Odisha-759121
6.	E-mail:	manoj.mishra@gmrgroup.in
7.	Power Plant installed capacity (MW):	1050 MW (3X350 MW)
8.	Plant Load Factor (PLF):	82.20%
9.	No. of units generated (MWh):	7581.73 (MWh)
10.	Total area under power plant (ha): (including area under ash ponds)	468.87 ha (1158.57 Acres)
11.	Quantity of coal consumption during reporting period (Metric Tons per Annum):	5533746 (Metric Tons per Annum)
12.	Average ash content in percentage (per cent):	45 %
13.	Quantity of current ash generation during reporting period (Metric Tons per Annum i.e. MTPA): **Fly ash (MTPA):** **Bottom ash (MTPA):**	**1867601.63** **622535.57**
14.	Capacity of dry fly ash storage silo(s) (Metric Tons) :	4 x 1600 MT = 6400 MT
15.	Details of utilisation of current ash generated during reporting period (a) **Total quantity of current ash utilised (MTPA) during reporting period:**	**2490137.20**
	(b) **Quantity of fly ash utilised (MTPA):**	**1867601.63**
	(i) Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels)	820970.05
	(ii) Cement manufacturing	722080.15
	(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	324551.43
	(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:	-

GMR KAMALANGA ENERGY LTD

SPsingh
22/06/2024

	(xiv) Others (please specify)	-	
	(c) Quantity of bottom ash utilised (MTPA):	**622535.57**	
	(i) Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels):	-	
	(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:	622535.57	
	(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):	-	
	Total quantity of current ash unutilised (MTPA) during reporting period:	**NIL**	
16.	Percentage utilisation of current ash generated during reporting period (per cent):	**100%**	
17.	Details of disposal of ash in ash ponds: (a) Total quantity of ash disposed in ash pond(s) (Metric Tons) as on 31st March (excluding reporting period):	1074753.8 MT	
	(b) Quantity of ash disposed in ash pond(s) during reporting period (Metric Tons):	NIL	
	(c) Total quantity of water consumption for slurry discharge into ash ponds during reporting period (m^3)	NIL	
	(d) Total number of ash ponds: (i) Active: (ii) Exhausted (yet to be reclaimed): (iii) Reclaimed:	Both Lagoon-1 & 2 NIL –	
	(e) Total area under ash ponds (ha):	74.90 ha	
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)*	Lagoon-1	Lagoon-2
	(a) Status: Under construction or Active or Exhausted or Reclaimed	Active	Active
	(b) Date of start of ash disposal in ash pond (DD/MM/YYYY or MMYYYY):	12.11.2013	30.03.2014
	(c) Date of stoppage of ash disposal in ash pond after completing its capacity (DD/MM/YYYY or MM/YYYY): (Not applicable for active ash ponds)	Not Applicable	Not Applicable
	(d) Area (hectares):	38.46 ha	36.44 ha
	(e) Dyke height (m):	6.0 m	11.0 m
	(f) Volume (m^3):	9,58,333.33 m^3	15,63,166.67 m^3
	(g) Quantity of ash disposed as on 31st March (Metric Tons)	NIL	NIL
	(h) Available volume in percentage (per cent) and quantity of ash can be further disposed (Metric Tons): (Unit weight 1.2 g/cc)	100% 11,82,400.00	100% 19,28,648.63 MT
	(i) Expected life of ash pond (number of years and months)	2.5 Years with present arrangement	

GMR KAMALANGA ENERGY LTD.

Spsingh
22/06/2024

		(Considering secured agreement with cement plants (around 30%))
	(j) Co-ordinates (Lat. and Long): (please specify minimum 4 co-ordinates)	NW: 20°52'10" N, 85°15'36" E NE: 20°52'01" N, 85°15'47" E SW: 20°51'28" N, 85°15'35" E SE: 20°51'21" N, 85°15'50" E
	(k) Type of lining carried in ash pond: HDPE lining or LDPE lining or clay lining or No lining	HDPE lining
	(l) Mode of disposal: Dry disposal or wet slurry (in case of wet slurry please specify whether HCSD/MCSD/LCSD)	Wet slurry disposal through HCSD System
	(m) Ratio of ash: water in slurry mix (1:___):	1:0.5
	(n) Ash water recycling system (AWRS) installed and functioning: Yes, or No	YES (Ash water recycling system installed & it's under operational)
	(o) Quantity of wastewater from ash pond discharged into land or water body (m^3):	Nil
	(p) Last date when the dyke stability study was conducted and name of the organisation who conducted the study:	11th Oct'2022 V Engineering Consultants
	(q) Last date when the audit was conducted and name of the organisation who conducted the audit:	Internal Audit carried out at Monthly basis
19.	**Quantity of legacy ash utilised (MTPA):** i. Fly ash based products (bricks or blocks or tiles or fibre cement sheets or pipes or boards or panels):	-
	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):	-

20. **Summary:**

Details	Quantity Generated (MTP)	Quantity Utilized (MTP) & (percent)	Balance Quantity (MTP)
Current ash during reporting period	2490137.20	2490137.20 (100%)	NIL
Legacy ash	-	-	NIL
Total	**2490137.20**	**2490137.20 (100%)**	**NIL**

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**	Ash Utilization and Ash pond management is made as per the CPCB norms. Attached 1. Audit report, 2. Month wise generation & utilisation data 3. Shape file
22.	Signature of Authorised Signatory	Spsingh 22/06/2024

GMR KAMALANGA ENERGY LTD.

HEAD, DEPT. OF CIVIL ENGG.
National Institute of Technology
Rourkela - 769 008 (ODISHA)

GMR KAMALANGA ENERGY LIMITED, Dhenkanal, Odisha										
Ash Generation and Utilization Month-wise Report (April 2023-March 2024)										
Month	Ash Generated (MT)	Ash Utilization (MT)								
		Supply to cement plant	Brick making	Land filling	Mine filling	Road and flyover embankments	Others (Specify)	Total utilization	Utilization (%)	Remarks
April-23	202269	64158	52110	-	-	86001	-	202269	100.00	-
May-23	207652	73574	61016	-	-	73062	-	207652	100.00	-
June-23	198436	61936	62334	-	-	74166	-	198436	91.76	-
July-23	223300	52175	64762	-	-	106362	-	223300	106.45	-
Aug-23	204285	44500	52466	-	-	107319	-	204285	102.15	-
Sept-23	172679	45200	69641	-	-	057838	-	172679	100.00	-
Oct-23	213561	49508	82919	-	-	81134	-	213561	100.00	-
Nov-23	219733	63675	77158	-	-	78901	-	219733	100.00	-
Dec-23	188597	64080	60453	-	-	64064	-	188597	100.00	-
Jan-24	159300	46857	64686	-	-	47757	-	159300	100.00	-
Feb-24	234783	65621	87997	-	-	81165	-	234783	100.00	-
Mar-24	265542	90769	85428	-	-	89318	-	265542	100.00	-
Total	**2490137**	**722080**	**820970**	-	-	**947087**	-	**2490137**	**100.00**	-

Note: The term ash indicates both fly ash and bottom ash

Spsingh
22/06/2024

Prof. Suresh Prasad Singh

HEAD, DEPT. OF CIVIL ENGG.
National Institute of Technology
Rourkela - 769 008 (ODISHA)

GMR KAMALANGA ENERGY LIMITED

CONDITION ASSESSMENT OF ASH POND

FINANCIAL YEAR 2023-24

19-03-2024

V ENGINEERING CONSULTANTS, PUNE

INDEX

CHAPTER-1, INTRODUCTION

M/s GMR Kamalanga Energy Limited (hereinafter referred to as GKEL) is operating a coal based Thermal Power Project of installed capacity 3x350 MW, at Village -Kamalanga in District – Dhenkanal of Odisha.

As in all coal based thermal power stations, ash is produced as a by-product during combustion of coal for boiling water to produce steam required to rotate the turbines for power generation.

AS per the MOEF Gazette Notification dated 31 December 2021, the entire ash produced in all thermal power stations shall be utilized within the same financial year itself. Power plants, which fail to satisfy this requirement within the permissible grace period, shall have to pay hefty fines. In addition to the utilization of ash produced in the financial year, ash stored in ash ponds in the previous years (designated as Legacy ash) also shall be evacuated within stipulated periods. However the amendment dated 31st December 2022 to the above Notification has exempted ash stored in the operating ash ponds during previous years from the stipulations for legacy ash.

As per MOEF Notification, all thermal power plants can operate ash ponds limited to 0.1 hectare/MW, for temporary storage. Under this provision, GKEL can operate a temporary ash pond extending up to 120 hectares. GKEL is proposing to continue the existing ash pond extending to about 80 hectares as the temporary ash pond.

The Gazette Notification from MoEF & CC also stipulates that the safety of the ash dykes shall be assessed by a competent Geotechnical design Expert on annual basis and a Safety certificate shall be uploaded in the web site of thermal power stations before 30th April of every year.

To satisfy this stipulation for the year 2023-24, GKEL has assigned V Engineering Consultants (hereinafter referred to as VEC) to assess the safety of the GKEL ash dyke and to provide a Safety Certificate. As a part of this work, Mr. Vasudevan Cheloor (the ash dyke expert of VEC) visited the GKEL Project site on 22nd February 2024 and inspected the prevailing condition of the ash dyke. Based on the physical assessment at site and subsequent desk studies at VEC office, the following Report elaborating the Safety conditions of the existing ash dyke is prepared to facilitate the confirmation of safety of the existing dyke section.

CHAPTER 2, REFERENCE DOCUMENTS

The major documents referred in this study are listed below.

a) Guidelines on design, construction, O&M and annual certification of coal ash ponds-issued jointly by Central Pollution Control Board (CPCB) & Central Electricity Authority (CEA)- dated June 2023.
b) Extraordinary Gazette Notification dated 31st December 2021, issued by Ministry of Environment and Climate control (MOEF &CC).
c) Amendment to above EGN dated 31st December 2022, issued by MOEF&CC.
d) IS 8826: Guidelines for design of large Earth & Rock filled dams.
e) IS 7894: Code of Practice for stability analysis of earth dams.
f) IS 1904: Code of practice for design and construction of foundations in soil-General Requirements.
g) IITK-GSDMA Guidelines for seismic design of earth dams and embankments.
h) Stability Coefficients for Earth slopes , by A.W. Bishop and Norbert Morgenstern , published by Institution of Civil Engineers, London.

CHAPTER-3, SALIENT FEATURES OF EXISTING ASH POND

The existing ash pond is extending to about 80 hectares, with two storage lagoons and one common water collection pond. The ground level varies from EL 64 M to 71 m and 2 m high starter earthen dyke was constructed over the sloping ground. The top level of bund varied from EL 69 M to 71 M. Inside the lagoons, rock was present at shallow levels and the entire overburden earth was excavated for use in construction of the starter bund. The starter dyke has a 6 m top width and slopes of 2.5H:1 V, on the sides. The bottom of the lagoons have been lined with 750 micron HDPE liner, underlain by 150 mm sand cushion and covered with 150 mm earth cover. After filling the mother dyke, Lagoon-2 has been raised with top level of raised dyke at EL 72.5 M. The raised dyke inner slope has been lined with concrete, which is also impervious (permeability about 10 power (-10) which is much lower than clay blanketing having permeability of about 10 power (-6) cm/sec. The construction of dyke raising was completed in August 2018.

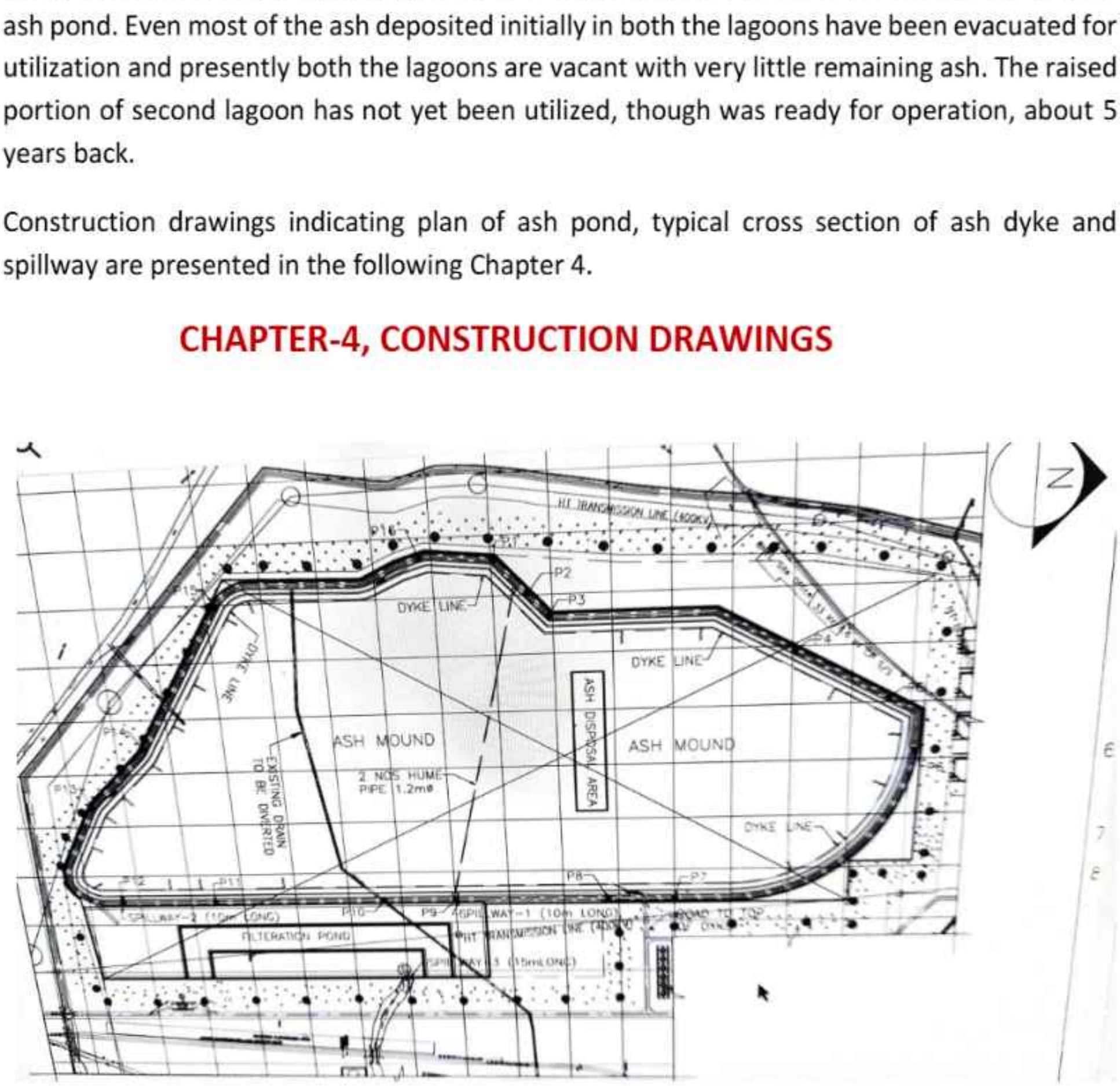
3 numbers of box culvert Spillways have been provided for water discharge from both lagoons to overflow pond and from overflow pond to the outside discharge channel. In order to control water accumulation depths in the storage lagoons, pipes have been embedded in the spillways.

To ensure the TSS of effluent overflowing the spillway in the water collection pond, to be within the allowable limits, the effluent collected in the water collection pond will pass through a filter bund with geo-textile membrane on upstream side, before discharging over the spillway to the outside discharge channel.

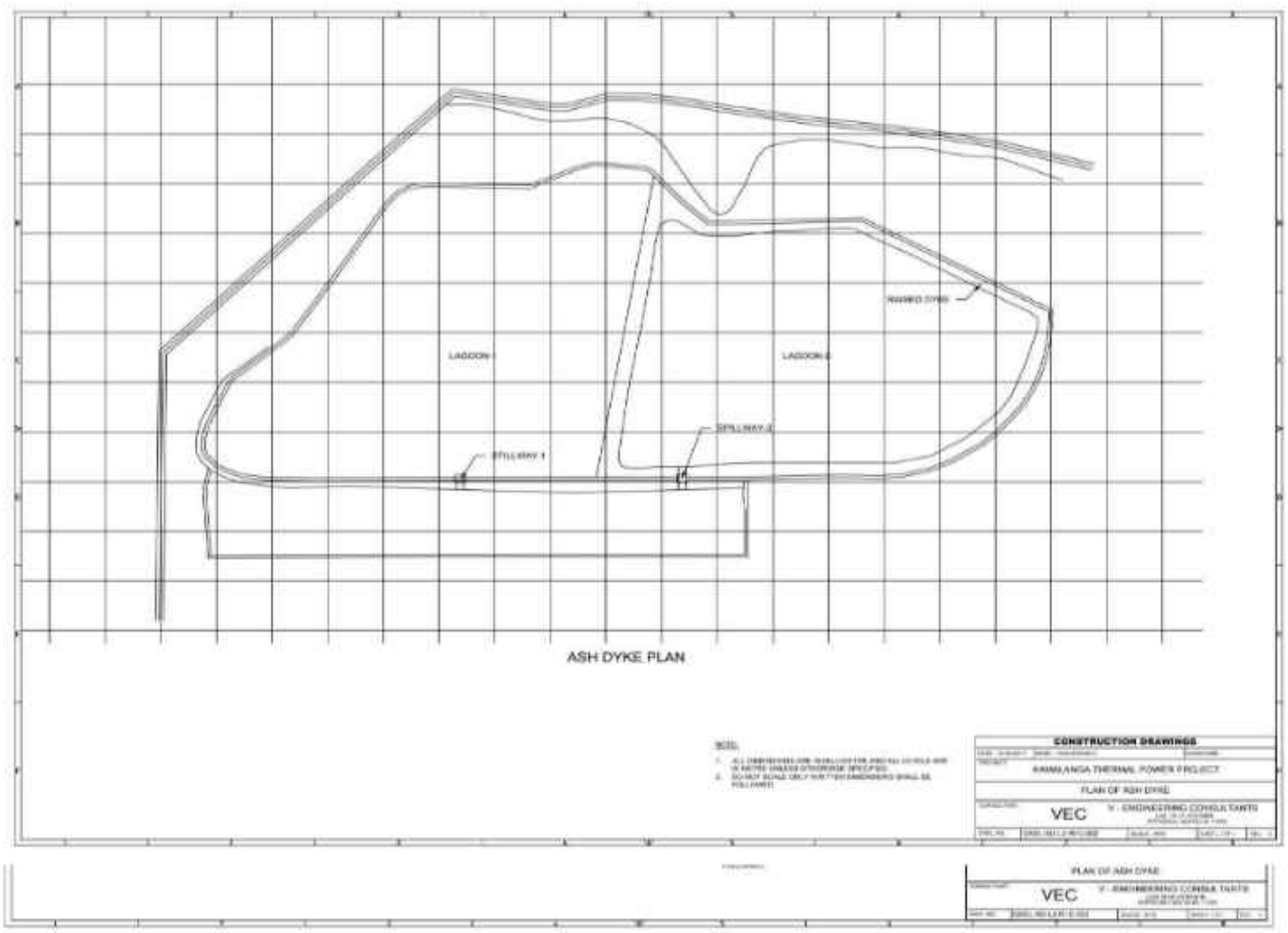
This plant was designed for ash disposal with HCSD system for both bottom ash and fly ash. Bottom ash mixed with fly ash before feeding to the HCSD system. However, for the past 5to6 years, the entire ash is being transported from the plant itself and no ash is being stored in the ash pond. Even most of the ash deposited initially in both the lagoons have been evacuated for utilization and presently both the lagoons are vacant with very little remaining ash. The raised portion of second lagoon has not yet been utilized, though was ready for operation, about 5 years back.

Construction drawings indicating plan of ash pond, typical cross section of ash dyke and spillway are presented in the following Chapter 4.

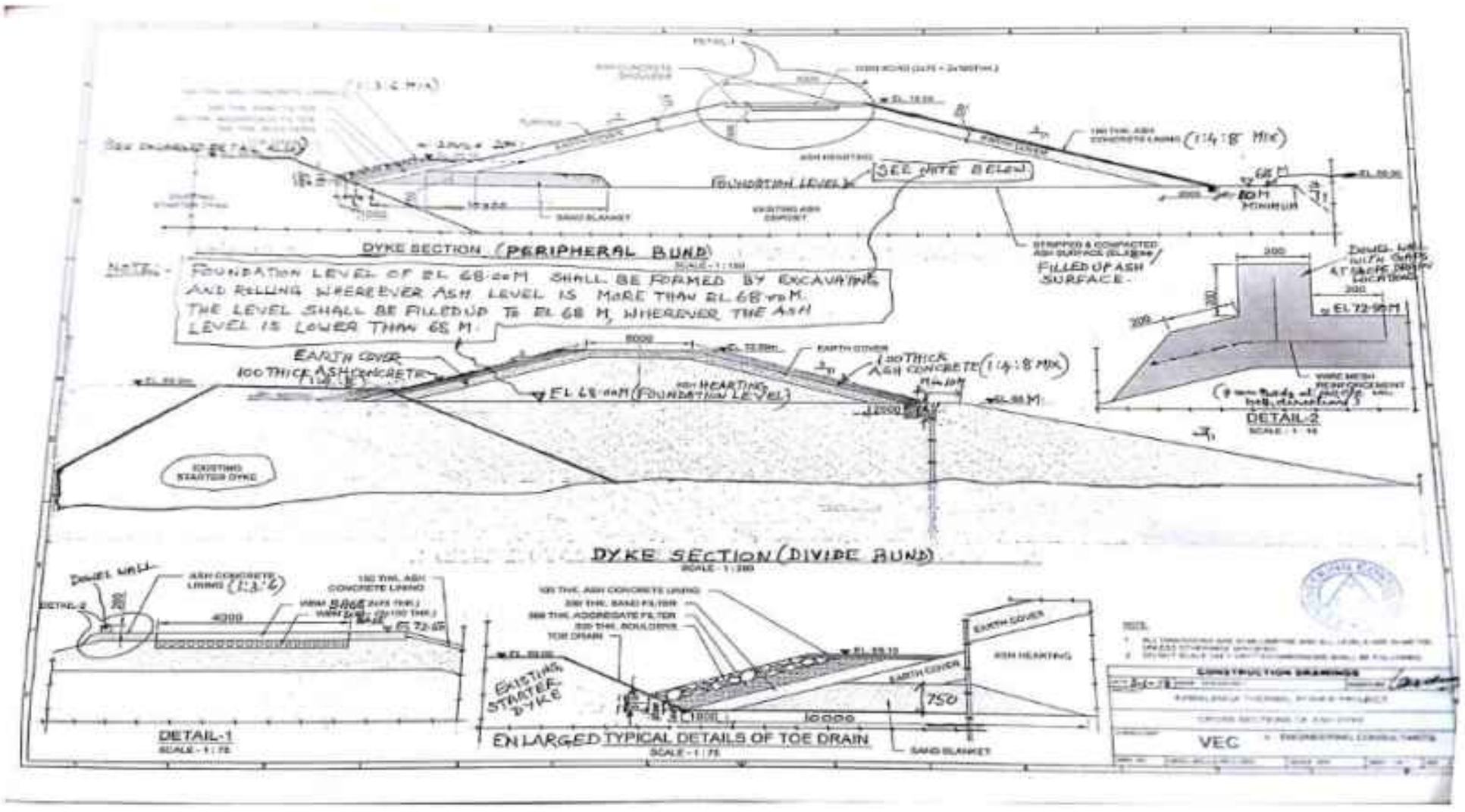
CHAPTER-4, CONSTRUCTION DRAWINGS



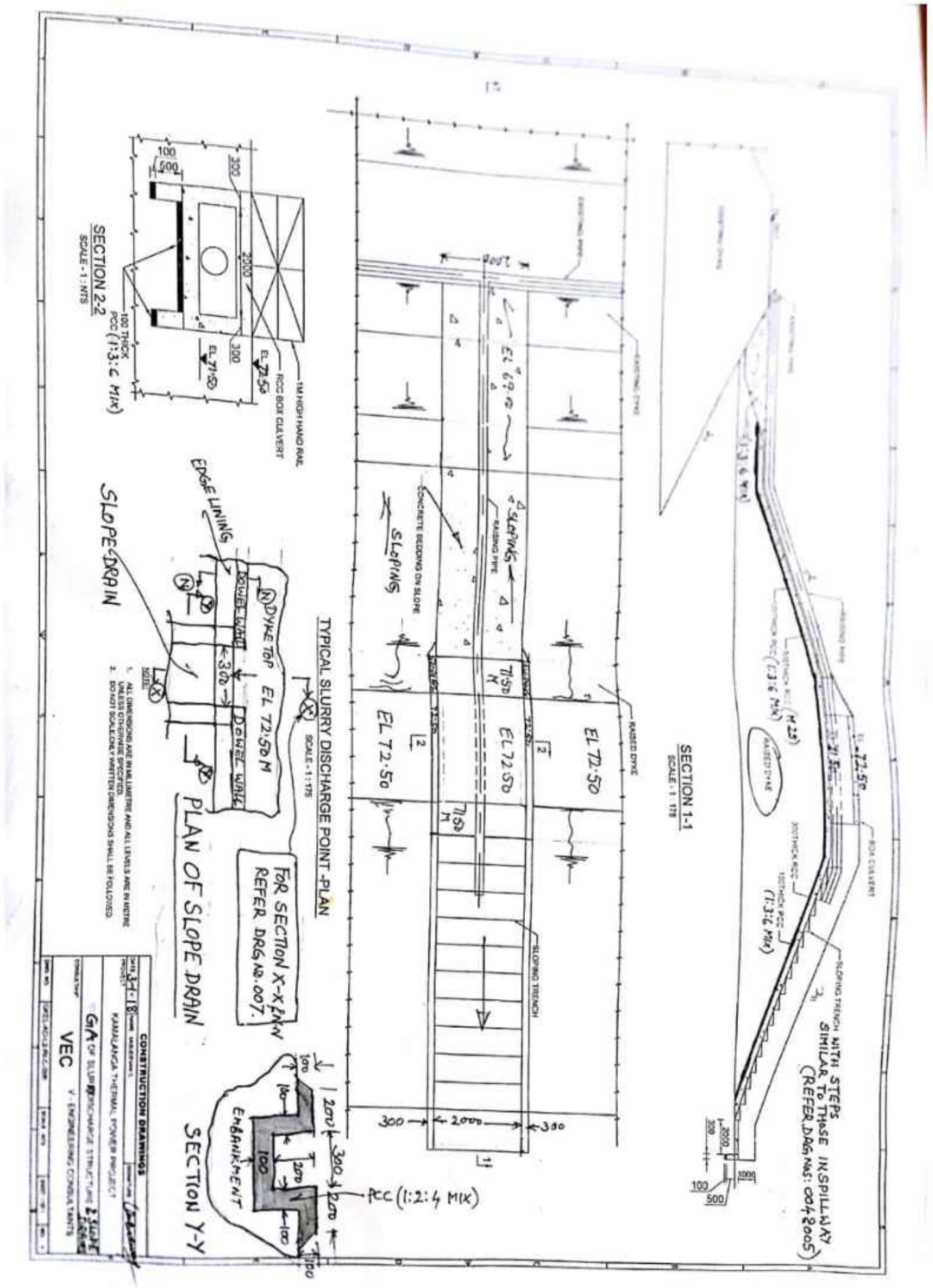
PLAN OF KAMALANGA ASH POND



PLAN OF LAGOON 2 RAISING



CROSS SECTION OF DYKE RAISING



SPILLWAY DETAILS

CHAPTER-5, PHOTOGRAPHS OF EXISTING DYKE

PHOTOGRAPH-1, EMPTY LAGOON WITH GREEN BELT ALROUND

PHOTOGRAPH-2, ROAD OVER DYKE TOP WITH GREENBELT OUTSIDE

PHOTOGRAPH-3, ROAD OVER DYKE & UPSTREAM SLOPE LINING

PHOTOGRAPH-4, SPILLWAY DOWNSTREAM VIEW

PHOTOGRAPH-5, RECOVERY PUMPHOUSE

PHOTOGRAPH-6, ADDITIONAL SPILLOVER POND

CHAPTER-6

MAIN OBSERVATIONS DURING INSPECTION OF ASH POND

In the GKEL plant, the fly ash is collected and stored in dry form in silos. The bottom ash is initially collected in wet form and then dewatered in the hydro bins and subsequently stored in silos. Direct loading facilities of conditioned ash to the trucks are available in all silos.

In view of the 100% ash utilization from the plant itself, the ash pond has not been utilized for the past 5 to 6 years. Only rain water falling directly within the ash dyke area is being collected in the ash pond lagoons. Presently both the lagoons are dry. The pipes embedded in the spillway will limit the depth of impoundment. Even in the case of continuous unprecedented rain fall when the lagoons may be filled with rain water, the spillways with spill level at 1 m below dyke top will ensure adequate evacuation of rain water, to avoid any over topping.

As the dyke is lined with impervious liner on the inner slopes and on the reservoir bottom, no seepage is likely to enter the dyke body, except through any gaps or holes etc, which will be negligible.

Due to the dyke area being unutilized for so many years, grass has been grown in both the lagoons. On the dyke top and on slopes no major vegetation is existing.

No appreciable settlement of dyke, which was originally constructed many years back (starter dyke about 11 years back and raising about 5 years back) is observed.

Around the dyke, a green belt of average 40 metre width has been provided. The average density of trees is 900 per acre.

CHAPTER-7, CONCLUSIONS ON HEALTH STATUS OF EXISTING DYKE

a) The design section of existing dyke with top width of 6 metre and side slopes of 2.5 to 3H:1V, having maximum height of about 7 metre above surrounding ground level has been verified to be adequate from stability point of view. The dyke section has been verified to be safe against sliding failure also.

b) The fact that no appreciable settlement has occurred even after many years from completion of construction, indicates that the quality of construction was in line with the specifications provided by the designer.

c) The presence of impervious liner on the inner dyke slope and reservoir bottom will ensure that there will not be any damage due to seepage of water into the dyke body.

d) An excellent vegetation cover present on the downstream slope will ensure that there will not be any rain cuts on the downstream dyke slope.

e) The bottom ash and fly ash are collected and stored in silos in dry form at the plant, and practically the entire ash produced in the plant is being transported out by various user agencies. In emergency conditions, the unutilized ash is being stored in the ash pond, which is also being evacuated within a short period for utilization. In GKEL, the ash transportation to the dyke has been designed with HCSD system and hence the quantum of water accumulation will be much less compared to lean slurry system.

f) The main possible danger is from rainwater accumulation during rainy season. The rain water collected in the lagoon, along with decanted water from ash slurry, is being discharged out into the water collection pond through pipes embedded in the spillways at lower levels initially and through spillways when full water/ash accumulation in the lagoons upto design FRL (1 metre below the dyke top level) . This will ensure maximum rain water accumulation to within the design free board of 1 metre, even in the unlikely event of unprecedented rain fall for long durations.

Overall the existing GKEL ash dyke is assessed to be in good health and safe during the intended operation.

CHAPTER-8, COMPLIANCE TO CEA GUIDELINES

MOEF&CC Gazette Notification 31.12.2021 mandates power plants to ensure Annual Certification of ash pond and dykes on safety of ash ponds and dykes, Capacity utilization/availability of ash ponds, water use/recycling and Wastewater disposal, and environmental pollution and green belt etc, according to the specification and procedures laid down by CPCB in Consultation with CEA, and submit annual implementation report about the Compliance of provisions in the notification by the 30th day of April, every year to Central Pollution Control Board (CPCB) and concerned State Pollution Control Board (SPCB) or Pollution Control Committee (PCC), Central Electricity Authority (CEA), and concerned Integrated Regional Office of Ministry of Environment, Forest and Climate Change by the coal or lignite based thermal power plants.

Annual certification of ash ponds and dykes shall be carried out by a qualified professional engineer for structural stability and safety assessment and to ensure that the design, construction, operation, and maintenance of the ash pond and ash dykes is consistent with recognized and generally accepted good engineering standards.

1. Annual certification shall be carried out once in every year and annual Implementation report about the compliance of provisions in the notification shall be submitted by the 30th day of April, every year.
2. Annual certification shall be by a qualified professional geotechnical engineer.
3. TPP shall make available any kind of record/Data etc. required at the time of certification.
4. Certifying Expert shall examine the Compulsory Periodic Maintenance Inspection Checklist for the Ash Pond provided by TPP.
5. Certifying Expert shall submit the report which shall cover the following: -

a) Structural stability of the active Ash Pond as per IS 7894

b) Slope Protection as per relevant IS code

c) Adequate Spillway Capacity

d) Dykes compaction

e) Downstream erosion protection

f) Check list for Annual Safety Audit and Check list for Fly Ash Generation and utilization

g) Interpretations from the compulsory maintenance inspections Check lists on the overall safety of the Ash Pond

h) Details of the actions taken on the deficiencies noted during the Maintenance inspections and annual certification inspection

6. Report of the annual certification shall inter alia include observations on points mentioned in Para A (6) of the notification as well as details of the actions taken on the deficiencies noted during the safety audit.

Check List for Annual Certification of Ash Ponds and Dykes for the period 1-4-2023 to 31-3-2024.		
Sr .No.	**Component**	**Observations/Remarks**
1	Name of Power Plant	GMR Kamalanga Energy Limited
2	Name of the company	GMR Kamalanga Energy Limited.
3	District	Dhenkanal

4	State	Odisha
5	Postal address for communication	GMR Kamalanga Energy Limited, Village Kamalanga, P.S. Katabania, Via Meramundali, Dhenkanal ,Odisha - 759121
6	E-mail:	Sushil.Choudhury@gmrgroup.in
7	Power Plant installed capacity (MW)	1050 MW(3x350)
8	No. of units generated(MWh)	3
9	Total area under power plant (ha) :(including area under ash ponds)	Total area under plant including ash pond- 463 hectares Area of ash pond alone-80 hectares.
10	Method of slurry discharge.	Designed for HCSD discharge with 75% ash concentration, but being operated with 50 to 60 percent ash concentration.
11	TSS of decant Water (Going outside/ for recirculation)	For the past so many years, there was no ash storage in the existing lagoons and hence no water overflow, except the rainwater during rainy season.
12	Maintenance of Dyke.	The dyke is maintained well.
	1)Top Width	6 M
	2) Top level of dyke	Lagoon-1, Starter dyke top varying from EL Lagoon-2, First raising top EL 72.5 M
	3) Free board	Design free board 1 m
	4) Earth covering and turfing	Starter dykes in both lagoons were made with complete earth. Turfing has been provided on the outer slopes. The raising in Lagoon-2 was carried out with ash hearting covered with earth on top and on sides .Outer slope has been protected with turfing.

	5) U/S slope protection	750 micron thick HDPE liner, covered with 50 mm thick precast concrete slab, on inner slope.
	6) WBM Road	WBM road has been provided on starter dyke top and on the top of first raising.
	7) Rock Toe, toe drain, berm, rock pitching	As no area falls under flood plains, no stone pitching is required and not provided. Rock toe, berms and toe drain provided are in good condition.
13	Instrumentation	
	a) Piezometer,	Piezometer wells are provided at all four sides to monitor water level fluctuation
	b) surface settlement	No instrumentation has been provided
14	Wet Patches/softening on downstream slope	No wet patches observed.
15	Gully Formation	No gully formation observed.
16	Rat holes/ animal burrows	No holes observed.
17	Growth of plants	No growth of plants was observed on the dyke top and on slopes.
18	Toe drain and surface drain	Toe drain and slope drains are in good condition
19	Facilities for inspection and maintenance of the dyke.	The dyke is only maximum 7 metre height and the road on top of dyke will provide adequate access for inspection.
20	Flood lighting	No flood lighting is provided over the dyke The ash pond area is located within plant area and plant area lighting is sufficient to facilitate emergency inspections if required in the night. Also the head lights of vehicles will be adequate for ensuring adequate visibility during nights.

21	Seepage or leakage	Due to non-operation for last 5 to 6 years, there is no water ponding . No seepage or leakage was observed.
22	Monolith joints	No joints were observed.
23	Foundation condition-Any damage or undermining of the downstream toe	The foundation condition was seen as safe and no undermining at the outer toe was observed.
24	Slope stability of dyke	Computations for Slope stability analysis carried out are presented under Annexure-B Computations of Check for sliding failure is presented under Annexure-C.
	1. Dyke Slope stability, as per IS 7894 to be examined and write the results and submit the report.	Minimum factor of safety under steady seepage condition is 1.71, against acceptable value of 1.5 recommended in the IS Code. Maximum displacement under seismic condition is less than 1 meter as recommended in the IIT, Kanpur Guidelines. Factor of safety against sliding failure-2.04, which is more than permissible value of 1.75, stipulated in IS 1904.
	2. Dyke slopes should be examined for irregularities in alignment and variances from smooth uniform slopes, unusual changes from original crest alignment and elevation, evidence of movement at or beyond the toe, and surface cracks which indicate movement.	Dyke slopes were examined to be as per design and no irregularities like movements and cracks were observed.
25	Condition of Drainage Systems	The spillway is in good condition. As there is no ash disposal, no water is flowing out.
26	Condition of Slope Protection	No damage observed to the slope protection works on both slopes..

27	Environmental Pollution	No environmental pollution was observed during inspection.
28	Greenbelt	Green belt of average width 40 metre has been provided alround the dyke. Average density of trees is about 900 trees per acre.
29	Any other information	The existing ash pond is not under operation for the last 5 to 6 years. Under the present condition of 100 % ash transportation from the plant itself, no ash disposal is planned in the near future also. Hence, there is no danger from slurry filling. The rainwater accumulated will be drained out through pipes embedded in the spillway at lower levels and through the spillways when reservoir is full. Hence, there is no danger to the dyke from rain water also. There exists a system of periodical inspection of the dyke area and identification of defects for prompt rectification. A sample inspection report is attached in the Assessment Report for ready reference, under Annexure-D.
30	Signature of Authorized Signatory	 (Vasudevan Cheloor) Ash dyke design expert
31	Qualification and experience details of Inspecting expert	A. Name -Vasudevan Cheloor B. Educational qualification- i) BSc(Engg) Degree in Civil Engineering from NIT, Kozhikode, Kerala in 1969. ii) M.Tech Degree in Civil Engineering (Marine Structures- a combined course covering hydraulics, geotechnical engineering and Structural Engineering) from NIT, Suratkal, Karnataka in 1972.

		C. Professional Membership- Life member of Indian Geotechnical Society-Delhi Chapter. D. Professional Experience- Over 50 years of experience In the design of hydropower projects, ash dykes, ash mounds, reservoir embankments etc. E. Organizations worked Karnataka Power Corporation Ltd, Bangalore -11 years NTPC Limited, New Delhi -24 years GMR Consultancy services, New Delhi-5 years AF Consultants, NOIDA (Now renamed as AFRI)-4 years F. Consultancy services provided to thermal power projects operated by IPPs in the design of ash dykes and ash mounds (Reliance Power-Sasan & Rosa, GMR-Kamalanga & Warora, Moser Baer-Anuppur, DB Power-Raigarh, Jindal Power-Raigarh and Talcher Kaniha)

ANNEXURE-A, GENERAL CAUSES OF FAILURES OF ASH DYKES

Ash dykes are embankments made of earth and ash, constructed in multi-phase. Usually, the starter dykes are made of earth and the raisings are made of ash hearting with earth cover.

Earthen embankments are vulnerable to nature's actions like rainfall; earthquakes etc. in addition to the forces transferred by ash /slurry fill. Though precautions are provided in the design to withstand maximum possible events, due to the heterogeneous character of earth, uniform strength cannot be developed throughout and some weak spots may be present within the dyke body. Such weak spots will indicate weakness signs first, such as cracks, seepages, boils, sinkholes, settlements, heaving signs, springs, wet spots, rain cuts, slippages, rat holes etc. Earthen dykes will never fail suddenly without expressing first such weakness signs (except during overtopping, where the failure will be sudden).

If we regularly monitor and identify the weakness signs, as soon as they develop, and take appropriate remedial measures as early as possible, the weakened spots/areas in the embankments can be strengthened against the developed weaknesses, thereby avoiding propagation of the weakness to larger areas, which in turn will avoid any failure of the embankment.

It is comparable to identifying diseases and treating to cure in human beings. Periodic inspection of dykes is equivalent to Routine Health Check Ups for human beings and Maintenance activities are equivalent to Treatment for diseases in men. Thus by adopting periodic inspection and maintenance procedures, the health of ash dykes cancan be ensured.

Statistics indicate that majority of the embankment failures have occurred due to overtopping with water. Overtopping with water will cause instant failure of embankments, as the water falling with high velocity on the downstream slope will cut the slope instantaneously.

Other types of possible failures are as listed below.

1) **Formation of cracks in the dyke body due to differential settlements within dyke body or in the foundation.**
   If unattended, the size of cracks will progressively increase in width and length, eventually leading to failure of embankments. Differential settlements will generally occur due to under compaction of foundation or dyke body.
2) **Formation of voids in the shape of pipes within the dyke body or in foundation due to erosion of materials due to water seepage.**
   If unattended, these voids will increase in diameter and length progressively eventually leading to failure of dykes. This type of failure is generally called piping failure. The pipes are generally formed because of under compaction at certain locations or due to inadequate internal drainage arrangement leading to excess exit gradient starting the erosion of materials at the dyke toe. Piping failure will also occur due to seepages emerging on the outer slope above rock toe, which are generally caused due to shrink, inadequate compaction.
3) The roots of Vegetation growing on the dyke body may dry out and shrink, creating voids leading to solution channels and may lead to piping failure if many such voids are interconnected.
4) Rat holes formed in the dyke body can also cause failure if many such holes got interconnected, leading to a continuous seepage path.
5) Rain cuts on the dyke slopes and on top of dyke.
6) Erosion of upstream slope due to wave action.

No embankment will fail instantly, if overtopping is prevented. All other types of failures will provide advance warnings in the form of cracks, seepage, sink holes, settlements etc. in a small scale initially. Only if these failure symptoms are ignored and not repaired, they will aggravate progressively and lead to failures over a long time.

Overtopping can be avoided by providing sufficient free board and elaborate water escape arrangements.

Other types of failures can be prevented by promptly attending to all warning signs, by carrying out appropriate remedial actions on priority basis. An efficient inspection and maintenance system will prevent all such damages and ensure the safety of ash dykes.

Ash dykes will be healthy only if they are

- Well- designed
- Well- constructed
- Well- maintained
- Well- operated

The designer will include all safety requirements in the design.

The construction shall be carried out as per the specifications provided by the designer, including quality assurance procedures.

Periodic inspection and prompt repairs before every monsoon are essential to ensure safety of the dyke. All water evacuation paths provided and planned shall be maintained without any blockage such as silt deposition, vegetation growth etc.

During operation stage, the ash slurry discharge and water management shall be carried out as envisaged in the design especially the maximum ash and water levels, ensuring design free board and water evacuation arrangements as planned in the design.

ANNEXURE-B, STABILITY ANALYSIS OF ASH DYKE

For stability analysis, the dyke section with maximum height is considered, with following features.

Starter dyke-made up of earth, 2 M height , top width of 6 M, side slope 2. 5H:1V.

Rocky strata are available at about 2 M below ground level.

Raised dyke- made up of ash hearting and earth cover on slopes and on top.
Top width-6 m, side slope 3H:1V, maximum height-4.5 m

Total height of combined dyke above GL=5.5 M.

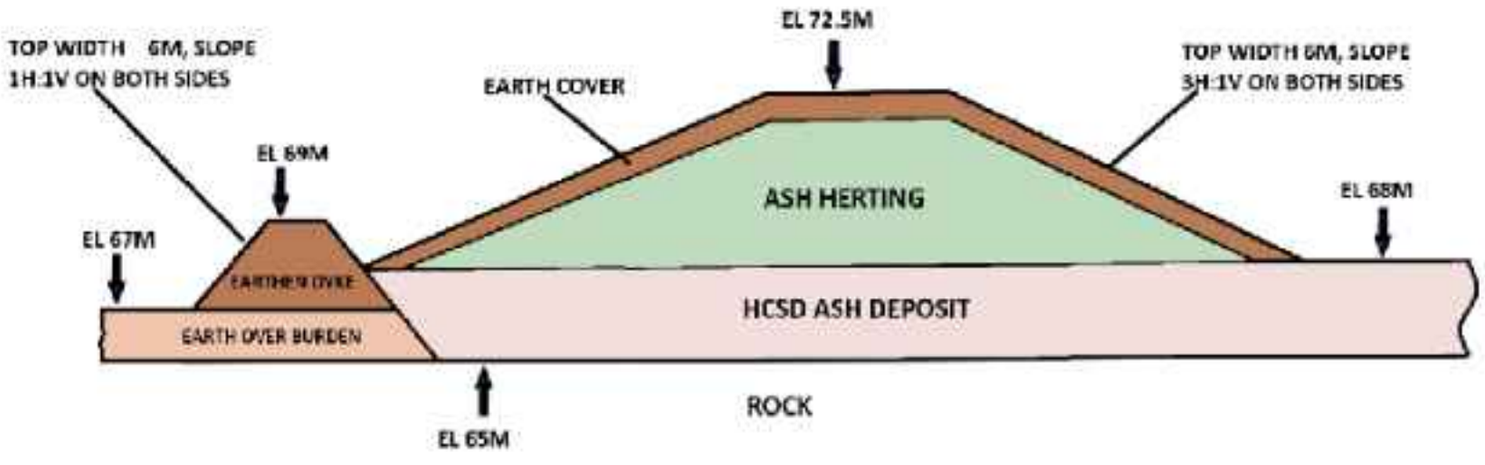
Though the overburden has been excavated from the reservoir bottom, for stability under steady seepage condition, the outer slope height above GL only will be effective.

Materials used for dyke construction have the following properties.

Earth- Bulk density-18 kN/cum, Cohesion- 21 kN/sqm, Friction angle-20 degrees

HCSD Ash- Bulk density 13 kN/cum, Cohesion-0, Friction angle 30 degrees.

The section considered for stability analysis is indicated below.



DYKE SECTION FOR STABILITY ANALYSIS

6.1 Stability under static conditions

In general, the factor of safety of an earthen embankment will depend mainly on seven Variables-Height of slope (h), Depth factor (D) indicating position of rock level, Slope angle (Beta), Pore pressure (u), cohesion intercept (c'), friction angle (phi) and Bulk density (Gamma).

However, an accurate and general solution can be made possible by 3 factors.

For a given value of the dimensionless number (c' / (gamma x h)), the factor of safety (F) against slip failure depends only on the geometry of the section, expressed by the values of cot (beta) and D, pore pressure r_{un} and angle of shearing resistance (phi).

In the paper titled "Stability coefficients for earth slopes "prepared by A.W. Bishop and Norbert Morgenstern and published by the Institution of Civil Engineers, London, the authors have presented two stability coefficients m and n, for different values of pore pressure variation (r_{un}= c'/ (gamma x h)), embankment slopes and angle of internal friction.

The Factor of Safety can be expressed as $F=m-n*r_{un}$.

As per IS: 7894, Code of Practice for Stability Analysis of Earth dams, the stability analysis shall be carried out mainly under four conditions:

a) **End of Construction condition:**

This condition will be critical only where the rate of embankment raising is at the rate of more than 15 metre per year. However, in the case of GKEL, the dyke was constructed many years ago and the maximum dyke height was only 7 metre. Hence, this condition is considered as not critical and hence not proposed to be examined.

b) **Sudden draw down condition:**

As the ash pond is designed to fill gradually and the outflow will be only at the design spilling levels, there is no chance of water level coming down suddenly, sudden draw down condition will never occur and hence this case is not proposed to be examined.

c) **Steady seepage condition:**

This condition is applicable to ash dyke also and minimum factor of safety against slope slip failure shall be 1.5 as per IS 7894. The analysis is proposed to be carried out with the 7 m high dyke, resting on ground, with water up to the design FRL (full height of dyke). The gradual ash filling on the upstream side also will stabilize the peripheral dyke progressively and hence the actual factor of safety against slope failure will be much more than what is estimated in the stability analysis considering full height water accumulation.

Further, as the upstream slope of ash dyke is lined with HDPE liner, water is not likely to seep into the dyke section and hence the actual dyke section will not behave like a hydraulic structure. Due to this also, the effective stability of the dyke will further increase only.

6.2 Seismic condition.

This case is applicable to ash dykes also and is examined as explained below.

The Kamalanga area falls under Seismic Zone III, which is only moderately dangerous. In addition, the maximum height of dyke above ground level is only 5.5 metre, which falls under the category of low dams. Hence, the risk is very less.

Recent studies have suggested that the seismic stability of earth and waste slopes evaluated with seismically induced permanent deformation procedures based on the landmark works of Newmark and Makdisi &Seed is a more appropriate solution. The calculated seismic displacement from these procedures is viewed approximately as an index of embankment performance under seismic loading. Seismic displacement procedures will always be approximate in nature due to complexities of the dynamic response of the earth/ materials

involved and the variability of the earthquake ground motion. However, when viewed as an index of potential seismic performance, the calculated seismic displacement can and has been used effectively in practice to evaluate earth structure designs.

Earthen slopes experience considerable deformation in strength and stiffness during seismic activities.

It is clearly observed that permanent displacement increases with increase in slope angle. The pattern of increase in permanent displacement is almost linear.

IIT Kanpur has recommended that the materials of all new dams and embankments should be compacted to a density that will cause them to dilate rather than liquefy during earthquake shaking. It is recommended that the compacted density of material should exceed 95% of Standard Proctor Maximum Dry Density (SPMDD) for rail or road embankments. For GKEL ash dyke also this compaction density has been achieved.

From the experience and literature studies, it is considered that a maximum permanent displacement up to 1 metre during earthquake will not make earth dams and embankments functionally unsuitable.

IS 8826-Guidelines for design of Large earth & rock fill dams recommend that the materials used for homogeneous dams shall fall within the categories-GC, CL, CI, SP, SM or CH.

The earth and ash materials used for Kamalanga ash dyke falls under the permissible groups. It can be safely concluded that the acceptable materials compacted to an in-situ dry density not less than 95% of Standard Proctor MDD, is not likely to liquefy and permanent displacement of embankment under seismic conditions will be within the acceptable value of 1 metre.

6.3 RESULTS OF STABILITY ANALYSIS

6.3.1 Static condition:

From the studies carried out by Bishop and Morgenstern on the stability of earthen embankments, it is found that the Factor of Safety against slip failure will be increasing continuously in a more or less straight-line manner with increase in the values of non-dimensional factor ((c/(gamma*h) (hereinafter referred to as stability factor).

In the case of GKEL, the starter dyke, founded on earth was constructed with c-phy soil.

The raised dyke has been constructed with ash hearting (c==0) covered with earth (c-phy soil) on the top and slopes. The raised dyke is founded on ash fill.

In the dyke section considered for stability analysis, out of total 141 sqm, 38 sqm consists of earth and 103 sqm consists of ash. Various possible slip circles will pass through partly in earth and partly in ash. Hence the shearing resistance offered by the dyke section against slip failure, will be the combined resistance offered by both materials together.

As the proportion of ash and earth will be different for different slip circles, it is proposed to carry out the stability analysis separately with the following three ash-earth combinations and the minimum value of factor of safety obtained will be considered as the conservative factor of safety for Kamalanga ash dyke.

Case-1, Total dyke section made up of earth

Case-2, Total dyke section made up of ash

Case-3, The total dyke section is made up of material having weighted average properties.

Dyke Section	H M	Gamma kN/cum	C kN/Sqm	Phy Degrees	Average Slope	St.Number c/(h*gamma)	FS
Total Earth	5.5	18	21	20	4.27H:1V	0.2121	1.71
Total Ash	5.5	13	0	30	4.27H:1V	0	1.744
Weighted Avg material	5.5	14.31	5.66	27.30	4.27H:1V	0.0719	2.608

Minimum Factor of Safety=1.71

Computation of FS

Case-1, Earth section

For SN=0.025, m=1.961, n=1.775, FS=1.961-.23*1.775=1.552
For SN=0.05, m=2.23, n=1.799, FS=2.23-0.23*1.799=1.816
For SN=0.2121, FS=1.816+(1.816-1.552) (0.2121-0.05)/ (0.05-0.025) =1.71

Case-2, Ash section

For SN=0, m=2.309, n=2.454, FS=2.309-.23*2.454=1.744

Case-3, weighted average material

For SN=0.025, m=2.689, n=2.531, FS=2.689-0.23*2.531=2.10
For SN=0.025, m=2.957, n=2.546, FS=2.957-0.23*2.546=2.371
FOR SN=0.079, FS= 2.371+(2.371-2.1) (0.0719-0.05)/ (0.05-0.025) =

The minimum factor of safety computed against slope slip failure of 1.71 is greater than the minimum factor of safety of 1.5 stipulated by IS Codes.
However, it may be further noted that the above analysis has been carried out on very conservative manner, considering water storage within the reservoir for the full height of dyke and consequent pore pressure distributed uniformly below the phreatic line for the entire height of dyke section. But in the actual case, as pipes are embedded in the spillway, the water depth will always be limited to maximum of about 2 metre, above the deposited ash. Because of this, the actual factors of safety against slip failure will be much higher.
Further in view of providing impervious liners on the upstream slope of the dyke, the entry of water in to the dyke section through seepage is minimized and hence the lined dyke section is practically not a hydraulic structure. Even if there are some gaps and holes in the liners, the net seepage area will be only a negligible fraction of the total area and hence the quantum of resulting seepage will not be sufficient to saturate the dyke body to develop the design phreatic line considered in the conservative stability analysis. Because of this also the actual factor of safety will be much higher than the estimated value under the conservative analysis.

In view of the estimated factor of safety being more than acceptable value, even under very conservative conditions, the existing dyke section is certified as safe under the intended operating conditions.

6.3.2 Seismic condition

As the dyke section is made of acceptable categories of soil and ash and also compacted to an in-situ dry density not less than 95% of Standard Proctor MDD, the soil and ash hearting are not likely to liquefy and permanent displacement of embankment under seismic conditions is expected to be within the acceptable value of 1 metre.

ANNEXURE-C, CHECK FOR SLIDING OF DYKE BODY

In the case of unlined earthen embankments, the water pressure from the water accumulation in the lagoon will be dissipated due to seepage through the dyke body and hence no horizontal force will be acting on the dyke body. But in a lined dyke, there will not be any seepage through the dyke body and hence the complete hydro static pressure will act on the dyke body as a horizontal pressure. This may cause sliding of the dyke bottom unless there is adequate frictional resistance between the dyke body and foundation.

Maximum hydrostatic head considering water fill up to dyke top=5.5 m

Horizontal force per metre length=5.5*5.5/2=15.125 t.

Base width of starter dyke=10 m.

Weight of starter dyke per metre length=16x1.8=28.8 tonnes

Frictional force between starter dyke and base soil=2.1x10x1+28.8*tan 20 degrees

=21+28.8X0.364=31.48 tonnes

Factor of safety against sliding=31.48/15.125=2.08, more than allowable value of 1.75, stipulated in IS: 1904, Code of practice for design and construction of foundations in soil.

ANNEXURE-D, SAMPLE INSPECTION REPORT

GMR Kamalanga Energy Limited Kamalanga, Dhenkanal, Odisha	GMR	
EHS DEPARTMENT	Doc No: GKEL/27/EHS/008/003 (W.E.F-15.05.2020)	
INSPECTION CHECKLIST OF ASH POND	Rev No. – 00	Insp. Date: 16/02/24
SCOPE OF WORK: INSPECTION OF ASH POND & ASH WATER RECOVERY SYSTEM		

S No.	Item Description	Status	Remarks
A	**Inlet System**		
1	Ash dumping if any and points in Lagoon 1 & 2	NO	
2	Inlet distribution Pipe Condition & leakage if any	OK	NO leakage
B	**Ash Pond & Embankment (Lagoon 1 & 2)**		
3	Ash filled level	L1 - 1%	L2 - 5%
4	Water accumulation	NO	
5	Free board (min 01 mtr)	OK	
6	Fugitive emission	NO	
7	Road condition on embankment	OK	
8	Upstream HDPE Lining condition	OK	
9	Upstream concrete lining condition	OK	
10	Spill way condition & over flow if any	OK	NO Overflow
11	Any leakage from embankment	NO	
12	Any leakage in ash slurry line	NO	
13	Abnormality in embankment condition	NO	
14	Grass turfing condition	OK	
15	Vegetation growth	OK	
16	Toe drain condition	OK	
17	Access to garland pipeline for regular inspection.	yes	
C	**Filtration Pond & Rock Dyke**		
18	Rock dyke condition	OK	
19	Membrane condition on the upstream side of rock dyke.	OK	
20	Ash water Leakage from base of the rock dyke	NO	
21	Vegetation growth in filtration ponds & rock dyke	yes	Removal in Progress
D	**Ash water recovery system (Decantation Pond & Sump)**		
22	Accumulation of Ash in the decantation pond	NO	
23	Availability of pumps	02	
24	Operation status of pumps	02	
25	Sump status	OK	
26	Outlet - from Decanted pond	OK	
E	**Others**		
27	Approach road	Ok	
28	Illumination	–	Day light job.

Checked by: Name Niranjan Behera Designation: AM Sign: Date: 16/02/24

Name Manoj Rout Designation: A.M Sign: Date: 16/02/24

Reviewed by: Name SUSLT Kar Choudhury Designation: Dept. Head Sign: Date: 16/02/24

GKEL ASH DYKE SAFETY CERTIFICATE

It is hereby confirmed that I (Vasudevan Cheloor- ash dyke expert of V Engineering Consultants) have inspected the existing ash dyke in the GMR Kamalanga Energy Limited, on 22nd February, 2024 , for assessing the health of ash dyke. Based on my observations at site and desk studies carried out at my office, I hereby certify that the existing GKEL ash dyke having a maximum height of about 5.5 M above ground is found to be safe from design, construction and operation point of view. This ash dyke has been constructed with the top level at EL 72.5 M, top width of 6 metre and side slopes of (2.5 to 3) H:1 V on both upstream and downstream.

This ash dyke has been designed for wet slurry disposal by HCSD method, thereby limiting the quantum of water accumulation in the lagoons. For the last 5 to 6 years, 100 percent ash is utilized from the plant itself and hence no ash is being deposited in the ash pond. Even almost all the ash deposited earlier has been evacuated and utilized and hence the ash pond is practically empty. Moreover, since the upstream slope and reservoir bottom has been lined with impervious lining, negligible water seepage can occur into the dyke body. However, to be on conservative side, I carried out Slope Stability Analysis, ignoring the presence of impervious lining, and confirmed that this dyke will have a minimum Factor of safety of 1.71, against slip failure during steady seepage conditions, which is more than 1.5 (the minimum value stipulated in IS 7894). Also, it is estimated that during seismic conditions, the maximum deflection at top will not be more than 1m, the permissible limit recommended in IIT Kanpur Guidelines. The dyke was checked for safety against sliding failure also and the factor of safety against shear failure has been estimated to be 2.04 against the required minimum value of 1.75 as per IS 1904.

Based on my assessment and desk studies, I hereby declare and certify that the existing ash dyke with top level at EL 72.5 M, at GMR Kamalanga Energy Limited is safe under all intended operating conditions.

I would also like to emphasize that a well-designed, well-constructed, well maintained and well operated dyke will never fail instantaneously without advance warning signs of weakness, unless water flows over the dyke top. Hence, by promptly repairing the weak areas, and by ensuring that the design free board is maintained without any overfilling of ash, the safety of the dyke can be ensured during the entire operation stage.

I also certify that I am competent to assess the safety of ash dykes, by virtue of my educational qualification (M.Tech degree in Civil Engineering) and professional experience extending to more than 50 years in the design of ash dykes, earthen embankments, reservoir embankments, earth dams etc.

Dated –19th March ,2024.

V ENGINEERING CONSULTANTS VEC

(VASUDEVAN CHELOOR),
M.Tech (Civil Engineering),
Ash dyke specialist and Proprietor,
V Engineering Consultants.

Annexure-XVI

SPEED POST

No. 5-22/SER/CGWA/2012 – 73
Govt. of India
Central Ground Water Board
South Eastern Region
Bhujal Bhawan, Khandagiri,
Bhubaneswar –751030.
Date: 18.01.2012

To

The Member Secretary
Central Ground Water Authority
Ministry of Water Resources
West Block -2, Wing-3 (Ground Floor),
Sector-1, R.K. Puram,
New Delhi – 110066.

Sub: Forwarding of Report on Rain Water Harvesting in respect of M/s. GMR Kamalanga Energy Limited, Vill:- Kamalanga, Dhenkanal, Odisha – Reg.

Sir,

As per the conditions on NOC to M/s. GMR Kamalanga Energy Limited, Vill:- Kamalanga, Dhenkanal, Odisha, the firm has submitted report on Rain Water Harvesting for its Thermal Power Plant . The same is being forwarded for your kind perusal and necessary action.

Encl:- As above.

Yours faithfully,

19/1

(D.Y Sirsikar)
Regional Director

Copy to: M/s. GMR, HIG-28,Gangadhar Meher Marg, Jaydev Vihar, Bhubaneswar, Odisha - 751013, for information.

19/1

(D.Y Sirsikar)
Regional Director

GMR KAMALANGA ENERGY LTD.

GMR Energy

GMR Kamalanga Energy Limited

GMR

Administration Office:
H/G - 28, Ganapathar Meher Marg
Jaydev Vihar
Bhubaneswar 751 013
T +91-0674-2303995
F +91-0674-2303994
W www.gmrgroup.in

Ref. No.: GKEL/BBSR/CGWA/11-12/1417

Date: 29.11.2011

To

The Regional Director,
Central Ground Water Board,
South Eastern Region,
Bhujal Bhawan,
Khandagiri Square,
Bhubaneswar - 751030

Ref: **Your Letter 21-4(64)/SER/CGWA/2008/985, Dt.15th Sep. 2008**

Sub. : **Submission of Rain Water Harvesting Report For M/s GMR Energy Ltd..for its Thermal power plant at Village-Kamalanga, Block-Odopada, Tehsil-Dhenkanal Sadar, Dist. Dhenkanal,Orissa.**

Dear Sir,

Herewith we are submitting the detailed rain water harvesting report for approval from your end.

Thanking you,
Yours faithfully,

For **M/s GMR Kamalanga Energy Ltd.**

K V V RAO
MANAGING DIRECTOR

Encl:
1. Rain Water Harvesting report

Received with
Refund DD 29/11/2011
(P.H. Copy)
Despatcher
Central Ground Water Board
South Eastern Region
Bhujal Bhawan
Khandagiri Square, N.H-V
Bhubaneswar-751 030

GMR KAMALANGA ENERGY LTD.

Regd. Office:
25/1, Skip House, Museum Road
Bangalore-560 025
Site Office:
PO: Kamalanga, via Meramundali,
P/S: Bhuvana, Tahsil: Odapada
Dist: Dhenkanal 759121, Orissa

Annexure XVII

Visiontek Consultancy Services Pvt. Ltd.

(Committed For Better Environment)

ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017 Certified

VISIONTEK

Annexure-2

Ref: **Envlab/23-24/TR-11212** *Date: 26.10.2024*

GROUND WATER ANALYSIS REPORT

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd,Dhenkanal**
2. Sampling Location : **GW-1: Piezometric Well – 1 GW-2: Piezometric Well – 2**
   : GW-3: Piezometric Well – 3 GW-4: Piezometric Well – 4
3. Date of Sampling :07.10.2024
4. Date of Analysis :07.10.2024 to 16.10.2024
5. Sample Collected By :VCSPL Representative in presence of Client's Representative

Sl. No	Parameter	Unit	Testing Methods	Standard as per IS - 10500:2012	Analysis Results			
					GW-1	GW-2	GW-3	GW-4
1.	Colour	Hazen	APHA 2120 B	5.0	<5	<5	<5	<5
2.	Odour	--	APHA 2150B	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3.	Taste	--	APHA 2160 C	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity	NTU	APHA 2130 B	5	1.3	2.1	<1.0	<1.0
5.	pH Value	--	APHA 4500H$^+$B	6.5-8.5	7.92	7.94	7.72	7.54
6.	Total Hardness (as $CaCO_3$) (max)	mg/l	APHA 2340 C	200	86.0	67.0	54.0	20.0
7.	Iron (as Fe) (max)	mg/l	APHA 3500 Fe B	1.0	0.12	0.07	0.43	<0.3
8.	Chloride (as Cl) (max)	mg/l	APHA 4500 Cl B	250.0	124	81	27.1	155
9.	Residual, free Chlorine (min)	mg/l	APHA 4500 Cl B	0.2	ND	ND	ND	ND
10.	Dissolved Solids (max)	mg/l	APHA 2540 C	500.0	448.0	496.0	324.0	472.0
11.	Calcium (as Ca) (max)	mg/l	APHA 3500 Ca B	75.0	24.0	11.8	35.2	16.4
12.	Copper (as Cu) (max)	mg/l	APHA 3111 B,C	0.05	BDL	BDL	BDL	BDL
13.	Manganese (as Mn) (max)	mg/l	APHA 3500Mn B	0.1	0.047	0.53	0.073	0.03
14.	Sulphate (as SO_4) (max)	mg/l	APHA 4500 SO_4^{2-} E	200.0	30.4	24.32	24.2	14.19
15.	Nitrate (as NO_3) (max)	mg/l	APHA 4500 NO_3^- E	45.0	0.50	0.55	1.09	0.53
16.	Fluoride (as F) (max)	mg/l	APHA 4500 F,C	1.0	0.84	0.67	0.36	0.30
17.	Phenolic Compounds (as C_6H_5OH) (max)	mg/l	APHA 5530 B,D	0.001	BDL	BDL	BDL	BDL
18.	Mercury (as Hg) (max)	mg/l	APHA 3500 Hg	0.001	BDL	BDL	BDL	BDL
19.	Cadmium (as Cd) (max)	mg/l	APHA 3111 B,C	0.003	BDL	BDL	BDL	BDL
20.	Selenium (as Se) (max)	mg/l	APHA 3114 B	0.01	BDL	BDL	BDL	BDL
21.	Arsenic (as As) (max)	mg/l	APHA 3114 B	0.01	BDL	BDL	BDL	BDL
22.	Cyanide (as CN) (max)	mg/l	APHA 4500CN^- C,D	0.05	BDL	BDL	BDL	BDL
23.	Lead (as Pb) (max)	mg/l	APHA 3111 B,C	0.01	BDL	BDL	BDL	BDL
24.	Zinc (as Zn) (max)	mg/l	APHA 3111 B,C	5.0	0.42	0.25	0.57	1.70
25.	Anionic Detergent (max)	mg/l	APHA 5540 C	0.2	BDL	BDL	BDL	BDL
26.	Chromium (as Cr^{+6}) (max)	mg/l	APHA 3500Cr B	--	BDL	BDL	BDL	BDL
27.	Mineral Oil (max)	mg/l	APHA 5520 B	0.5	ND	ND	ND	ND
28.	Alkalinity (max)	mg/l	APHA 2320 B	200.0	157.0	64.7	137.0	34.7
29.	Aluminium as Al (max)	mg/l	APHA 3500Al B	0.03	BDL	BDL	BDL	BDL
30.	Boron (max)	mg/l	APHA 4500 B,B	0.5	0.18	0.31	0.20	0.29
31.	Magnesium as Mg(max)	mg/l	APHA 3500Mg B	30	5.2	5.30	7.30	2.0
32.	Total Coliform (as TC)	MPN/100ml	APHA 9221 B	--	<1.8	<1.8	<1.8	<1.8

Note: CL: Colourless, Al: Agreeable, U/O: Unobjectionable, ND: Not Detected.
BDL (Below Detectable Limits) Values: Cu<0.02 mg/l, Mn<0.05 mg/l, C6H5OH<0.05 mg/l,Hg<0.002 mg/l, Cd<0.01 mg/l, Se<0.001 mg/l, As<0.004 mg/l, Pb<0.01mg/l, Zn<0.05 mg/l, Cr+6<0.02 mg/l, Al<0.1 mg/l, B<0.1 mg/l, TC(MPN 0-0-0)<1.8.

Reviewed by *Approved by*

GMR KAMALANGA ENERGY LTD.

Visiontek Consultancy Services Pvt. Ltd.

(Committed For Better Environment)

ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 (OH&S), ISO/IEC 17025:2017 Certified

Ref: **Envlab/23-24/TR-11213** *Date : 26.10.2024*

GROUND WATER ANALYSIS REPORT

1. Name of the Industry : **M/s GMR Kamalanga Energy Ltd, Dhenkanal**
2. Sampling Location : **GW-5: Bore well at Durgapur GW-6: Bore well at Manpur**
   :GW-7: Bore well at Barasahi GW-8 : Bore well at Budhapanka
3. Date of Sampling : 07.10.2024
4. Date of Analysis : 07.10.2024 to 16.10.2024
5. Sample Collected By : VCSPL Representative in presence of Client's Representative

Sl. No	Parameter	Unit	Testing Methods	Standard as per IS - 10500:2012	Analysis Results			
					GW-5	GW-6	GW-7	GW-8
1.	Colour	Hazen	APHA 2120 B	5.0	<5	<5	<5	<5
2.	Odour	--	APHA 2150B	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3.	Taste	--	APHA 2160 C	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity	NTU	APHA 2130 B	5	1.2	2.4	3.8	<1.0
5.	pH Value	--	APHA 4500H$^+$B	6.5-8.5	7.98	7.30	7.73	7.48
6.	Total Hardness (as $CaCO_3$) (max)	mg/l	APHA 2340 C	200	180	164	168	131.0
7.	Iron (as Fe) (max)	mg/l	APHA 3500 Fe B	1.0	0.27	0.21	0.23	0.25
8.	Chloride (as Cl) (max)	mg/l	APHA 4500 Cl B	250.0	25.3	23.3	29.1	91.3
9.	Residual, free Chlorine (min)	mg/l	APHA 4500 Cl B	0.2	ND	ND	ND	ND
10.	Dissolved Solids (max)	mg/l	APHA 2540 C	500.0	473.0	396.0	440	484.0
11.	Calcium (as Ca) (max)	mg/l	APHA 3500 Ca B	75.0	55.6	44.8	36.8	56.0
12.	Copper (as Cu) (max)	mg/l	APHA 3111 B,C	0.05	BDL	BDL	BDL	BDL
13.	Manganese (as Mn) (max)	mg/l	APHA 3500Mn B	0.1	<0.05	<0.05	0.067	<0.05
14.	Sulphate (as SO_4) (max)	mg/l	APHA 4500 SO_4^{2-} E	200.0	83.3	53.3	23.0	27.0
15.	Nitrate (as NO_3) (max)	mg/l	APHA 4500 NO_3^- E	45.0	0.86	7.46	1.48	1.67
16.	Fluoride (as F) (max)	mg/l	APHA 4500 F,C	1.0	0.82	0.36	0.74	0.34
17.	Phenolic Compounds (as C_6H_5OH) (max)	mg/l	APHA 5530 B,D	0.001	BDL	BDL	BDL	BDL
18.	Mercury (as Hg) (max)	mg/l	APHA 3500 Hg	0.001	BDL	BDL	BDL	BDL
19.	Cadmium (as Cd) (max)	mg/l	APHA 3111 B,C	0.003	BDL	BDL	BDL	BDL
20.	Selenium (as Se) (max)	mg/l	APHA 3114 B	0.01	BDL	BDL	BDL	BDL
21.	Arsenic (as As) (max)	mg/l	APHA 3114 B	0.01	BDL	BDL	BDL	BDL
22.	Cyanide (as CN) (max)	mg/l	APHA 4500CN$^-$ C,D	0.05	BDL	BDL	BDL	BDL
23.	Lead (as Pb) (max)	mg/l	APHA 3111 B,C	0.01	BDL	BDL	BDL	BDL
24.	Zinc (as Zn) (max)	mg/l	APHA 3111 B,C	5.0	BDL	BDL	1.2	BDL
25.	Anionic Detergent (max)	mg/l	APHA 5540 C	0.2	BDL	BDL	BDL	BDL
26.	Chromium (as Cr^{+6}) (max)	mg/l	APHA 3500Cr B	–	BDL	BDL	BDL	BDL
27.	Mineral Oil (max)	mg/l	APHA 5520 B	0.5	ND	ND	ND	ND
28.	Alkalinity (max)	mg/l	APHA 2320 B	200.0	173.0	141.0	121.0	165
29.	Aluminium as Al (max)	mg/l	APHA 3500Al B	0.03	BDL	BDL	BDL	BDL
30.	Boron (max)	mg/l	APHA 4500 B,B	0.5	<0.1	<0.1	0.27	0.29
31.	Magnesium as Mg(max)	mg/l	APHA 3500Mg B	30	28.2	12.6	12.5	4.7
32.	Total Coliform (as TC)	MPN/100ml	APHA 9221 B	--	<1.8	<1.8	<1.8	<1.8

Note: CL: Colourless, Al: Agreeable, U/O: Unobjectionable, ND: Not Detected.
BDL (Below Detectable Limits) Values: Cu<0.02 mg/l, Mn<0.05 mg/l, C6H5OH<0.05 mg/l,Hg<0.002 mg/l, Cd<0.01 mg/l, Se<0.001 mg/l, As<0.004 mg/l, Pb<0.01mg/l, Zn<0.05 mg/l, Cr+6<0.02 mg/l, Al<0.1 mg/l, B<0.1 mg/l,. TC(MPN 0-0-0)<1.8.

Reviewed by *Approved by*

Plot No.- M-22 & 23, Chandaka Industrial Estate, Patia, Bhubaneswar, Khordha, Odisha-751024, India Tel.: 0674-3511721
E-mail: visiontek@visiontek.org, visiontekin@gmail.com
Visit us at: www.visiontek.org

GMR KAMALANGA ENERGY LTD.

Annexure- XVIII

Cumulative plantation details rom 2011 to till date		
Tree plantation	Nos. of Tree planted	Species
FY: 2011-12	25000	Karanj , Teak, Peltophorum (Radhachuda), Akoshmone, Neem, Kassod (Rani chakkunda) , Shisham, Jamun, Bodom, Gamhar, Imali, Kadamb, Siris, Cheeku, Guava, Amrud, Amlatas, Maulsari, Ashok (Sita Ashok, Indian Cork Tree, White Cheesewood, Spathodea, Trumpet Tree, Bougainvillea, Krishna-chura, Guleturo, Kachnar, Kavior, Murraya (Marchula) Thevetia, kaner, Arjuna, Kachnar species, Mango, Rain tree, Acacia Species, Simarouba tree, Mahagani, Lemon, , Mosambi, Jamrul, Kamrakh, Pomagranate, Pitronjova, Karavir, pink siris, Sajana, Jack fruit, Ber etc.
FY: 2012-13	25000	
FY: 2013-14	43000	
FY: 2014-15	85134	
FY: 2015-16	50157	
FY: 2016-17	46441	
FY: 2017-18	43633	
FY: 2018-19	40350	
FY: 2019-20	24080	
FY: 2020-21	7213	
FY: 2021-22	2342	
FY: 2022-23	2958	
FY: 2023-24	2360	
FY: 2024-25	1435	
Total	**399103**	

GMR KAMALANGA ENERGY LTD.

Annexure-XIX

7586.

e-Registration ID No. 5C1007615
e-Registration document No. 10 1007739
Book No. 1 Date 24.11.10
Year 2010.

Registering Officer
Dhenkanal 24/11/10

11943 ଡିଜିଟାଲ ଷ୍ଟାମ୍ପ 2
138071 PB 0082
Rs.0813416 24 11 10
ODISHA NON-JUDICIAL STAMP
D.S.R. DHENKANAL

District Sub-Registrar
Dhenkanal 24/11/10

Biranchi

Biranchi Prasad

DEED OF SURRENDER OF LEASE

THIS DEED OF SURRENDER is made this 24th day of November 2010.

BETWEEN

M/s. GMR Kamalanga Energy Ltd., being a Company incorporated under the Companies Act, 1956 (Act 1 of 1956) having its registered office at Skip House, 25/1, Museum Road, Bangalore-560025 & having its Corporate Office at HIG-28 BDA, Gangadhar Meher Nagar, Jaydev Vihar, Bhubaneswar-751013 represented by Sri K.V.V.Rao, Managing Director, S/o Late K.Bhanumurty, aged about 59 years resident at 2C, Santhrupti, 3rd Block, 14C Cross, MCHS Colony, 6th Sector, HSR Layout, Bangalore who has been authorized to execute the Deed for and on behalf of the Company (hereinafter called "The Company" or "the Lessee") which expression unless excluded or repugnant to the context includes its administrator, successors, representative and assignees of the ONE PART.

AND

For GMR KAMALANGA ENERGY L.

(K.V.V. RAO)
MANAGING DIRECTOR
24.11.010

Divisional Head
DCO, Angul Divisi
24.11.010

GMR KAMALANGA ENERGY LTD.

True Copy

THE ORISSA INDUSTRIAL INFRASTRUCTURE DEVELOPMENT CORPORATION established under CIIDC Act,1980 (Orissa Act 1 of 1981) and having its Head Office at IDCO TOWERS, Janapath, Sahidnagar, Bhubaneswar – 751 022, represented by its authorized representative Sri Biranchi Narayan Barik, Divisional Head, IDCO, Angul Division (hereinafter called "The Corporation" or the "Lessor") which expression shall, unless excluded or repugnant to the context, include his successors and assigns) of the OTHER PART

WHEREAS a piece of Pvt. land measuring **Ac.228.025** in villages Mangalpur under Odapada Tahasil in the District of Dhenkanal was transferred in favour of the Company for a period of 90 years for establishment of industries for a consideration amount of **Rs.9,78,78,090.99** (Rupees nine crores seventy eight lakhs seventy eight thousand ninety & paise ninety nine) only by the Corporation as per Registered Deed No.5774/09 dated.24.9.09 of District Sub-Registrar, Dhenkanal.

WHEREAS the above Company desires to surrender the lease hold land measuring **Ac.37.90** in village Mangalpur under Odapada Tahasil in the District of Dhenkanal more fully described in Schedule – A in favour of Corporation (The Orissa Industrial Infrastructure Development Corporation) for its subsequent utilization for establishment of industries (Exchange of Govt. Gochar land).The consideration amount of the surrendered land measuring **Ac.37.90** is **Rs.1,62,68,302.37** (Rupees one crore sixty two lakhs sixty eighty thousand three hundred two & paise thirty seven.) only proportionately.

AND WHEREAS the rent reserved by and contained in the Deed of lease on the part of the Corporation to be paid has been paid by the said Corporation up to the date of this deed.

AND WHEREAS at the request of the Company, the Corporation has agreed to accept from the Company the surrender of the property described in Schedule – A annexed hereto for its eventual utilization for establishment of industries (Exchange of Govt. Gochar land).

NOW THIS DEED WITNESSES as follows:

That in consideration of the above agreement the said Company as beneficial owner hereby surrenders to the Corporation the property as described in the Schedule-A and demised under the Deed of lease to the intent that the residue of the said term of 90 in words (Ninety) Years created by the said deed of lease and all other rights and interest of the said "Company" in the said property shall cease to be in force and to exist in the Company from the date of this surrender.

The lessee aforesaid do hereby surrender and relinquish all his rights, title, interest and possession in the said properties more particularly described in the Schedule–A, annexed hereto, absolutely and for ever.

For GMR KAMALANGA ENERGY LTD.

(K.V.V. RAO)
MANAGING DIRECTOR
24.11.010

Divisional Head
IDCO, Angul Divisio
24.11.010

GMR KAMALANGA ENERGY LTD.

True Copy

R.D 8/12/10

The said Lessee hereafter entitled to deal with the said properties described in Schedule-A for establishment of Industries. The Lessee hereby releases the said Lessor, the Lessee from all claims, demands and liabilities in respect of the said lease.

The balance land measuring Ac.190.125 described in Schedule-A shall remain in possession of M/s GMR Kamalanga Energy Ltd. and all his right, title, interest and possession thereto in any way shall not be affected by this deed of Surrender.

The Lessor shall also re-fix the land premium, ground rent, cess etc. there-to.

All the covenants and conditions contained in the said earlier lease deed shall continue and remain in force & this deed of Surrender shall be supplemental to the original Lease deed No.5774/09 dated.24.9.09.

The Original Lease Deed shall be read as the deed for an area of **Ac.190.125** instead of **Ac.228.025**. Both the parties hereto shall not claim any compensation / damages for any constructions and improvements erected on the said land.

SCHEDULE – A (Pvt. Land)

Village: Mangalpur, Police Station:Mottanga

Tahasil : Odapada, District : Dhenkanal

Declaration No.26357 dt.19.6.08.

Sl. No.	Khata No.	Plot No.	Lease area in Ac.	Surrender area in Ac.	Balance area in Ac.
1	2	3	4	5	6
1	316	1550(P)	0.57	0.30	0.27
2	330	1553(P)	0.07	0.07	0.00
3	407	1491(P)	0.07	0.07	0.00
		Total:-	**0.71**	**0.44**	**0.27**
Exchange of Gochar Land.					
4	38	3693	0.90	0.90	0.00
5	38	3693 7522	0.32	0.32	0.00
6	58	4021	0.02	0.02	0.00
7	58	4030	0.11	0.11	0.00
8	60	4063	0.12	0.12	0.00
9	60	4066	0.10	0.10	0.00
10	60	4064(P)	0.10	0.10	0.00
11	70	3695(P)	2.48	2.48	0.00
12	79	3631	0.24	0.24	0.00
13	79	3632	0.78	0.78	0.00
14	79	3633	0.04	0.04	0.00
15	79	3636	0.47	0.47	0.00
16	79	3637	0.72	0.72	0.00

For GMR KAMALANGA ENERGY LTD.

(K.V.V. RAO)
MANAGING DIRECTOR
24.11.010

Divisional Head
DCO, Angul Division
24.11.010

GMR KAMALANGA ENERGY LTD.

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17	79	3639	0.57	0.57	0.00
18	79	3641	1.00	1.00	0.00
19	79	3694	0.92	0.92	0.00
20	81	3627	1.55	1.55	0.00
21	92	4017(P)	0.06	0.03	0.03
22	93	375[illegible]	0.05	0.05	0.00
23	93	375[illegible]	0.09	0.09	0.00
24	93	3757	0.11	0.11	0.00
25	93	375[illegible]	0.12	0.12	0.00
26	93	375[illegible]	0.11	0.11	0.00
27	116	402[illegible]	0.19	0.19	0.00
28	116	402[illegible]	0.06	0.06	0.00
29	116	402[illegible]	0.14	0.14	0.00
30	116	403[illegible]	0.06	0.06	0.00
31	116	403[illegible]	0.06	0.06	0.00
32	116	403[illegible]	0.11	0.11	0.00
33	116	4018(P)	0.20	0.20	0.00
34	133	349[illegible]	0.34	0.34	0.00
35	142	4040(P)	0.58	0.58	0.00
36	143	402[illegible]	0.03	0.03	0.00
37	143	402[illegible]	0.10	0.10	0.00
38	166	4041(P)	0.77	0.77	0.00
39	198	362[illegible]	0.28	0.28	0.00
40	205	369[illegible]	0.60	0.60	0.00
41	205	369[illegible]	0.20	0.20	0.00
42	205	3698	0.12	0.12	0.00
43	205	3691/7926	0.11	0.11	0.00
44	205	3768(P)	1.43	0.94	0.49
45	226	349[illegible]	0.40	0.40	0.00
46	226	349[illegible]	0.21	0.21	0.00
47	234	3702(P)	0.27	0.27	0.00
48	234	3703(P)	0.11	0.11	0.00
49	234	3702/7627	0.84	0.84	0.00
50	234	3703/7224	0.08	0.08	0.00
51	234	3703/7[illegible]89(P)	0.06	0.06	0.00
52	242	3618	0.33	0.33	0.00
53	242	3619	0.26	0.26	0.00
54	253	35[illegible]2	0.80	0.80	0.00
55	260	3617	0.47	0.47	0.00
56	305	3621	0.44	0.44	0.00
57	314	34[illegible]0	0.27	0.27	0.00
58	314	40[illegible]9	0.06	0.06	0.00
59	353	40[illegible]3	0.06	0.06	0.00
60	364	40[illegible]4	0.09	0.09	0.00
61	367	4057	0.37	0.37	0.00
62	367	40[illegible]8	0.40	0.40	0.00
63	367	40[illegible]0	0.05	0.05	0.00
64	373	36[illegible]4	0.06	0.06	0.00

For GMR KAMALANGA ENERGY LTD

(K.V.V. RAO)
MANAGING DIRECTOR
24.11.010

Divisional Head
DCO, Angul Divisio
24.11.010

GMR KAMALANGA ENERGY LTD.

True Copy

R.O 24/12/10

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65	373	363	0.35	0.35	0.00
66	384	402	0.03	0.03	0.00
67	384	402	0.06	0.06	0.00
68	405	376	0.08	0.08	0.00
69	405	376	0.15	0.15	0.00
70	405	376	0.26	0.26	0.00
71	437	405	0.18	0.18	0.00
72	451	369	0.36	0.36	0.00
73	461	403	0.47	0.47	0.00
74	474	3754 (P)	0.46	0.42	0.04
75	504	362	0.06	0.06	0.00
76	531	348	0.20	0.20	0.00
77	533	403	0.10	0.10	0.00
78	533	4037	0.05	0.05	0.00
79	533	3493/76 33	0.04	0.04	0.00
80	580	3703/817 4(P)	0.04	0.04	0.00
81	582	3644	0.32	0.32	0.00
82	611	3487	0.51	0.51	0.00
83	626	4034	0.15	0.15	0.00
84	657	3701	1.75	1.75	0.00
85	674	3486	2.58	2.58	0.00
86	676	3642	0.66	0.66	0.00
87	676	3643	0.19	0.19	0.00
88	687	4029/71 55	0.06	0.06	0.00
89	695	3750 (P)	0.94	0.28	0.66
90	695	3751 (P)	0.40	0.24	0.16
91	695	3752	0.26	0.26	0.00
92	695	3728(P)	0.75	0.15	0.60
93	695	3753	0.45	0.45	0.00
94	699	3760	0.06	0.06	0.00
95	699	3770 (P)	0.11	0.04	0.07
96	705	3761	0.07	0.07	0.00
97	705	3762	0.07	0.07	0.00
98	705	3763	0.11	0.11	0.00
99	705	3764	0.05	0.05	0.00
100	705	3765	0.12	0.12	0.00
101	730	3691	0.43	0.43	0.00
102	730	3697	0.34	0.34	0.00
103	730	3699	0.21	0.21	0.00
104	730	3700	0.40	0.40	0.00
105	754/10	3623(P)	0.18	0.18	0.00
106	754/10	3622	0.75	0.75	0.00
107	754/224	7224/83 74	0.37	0.37	0.00
108	754/24	4065	0.09	0.09	0.00
109	754/27	3645	0.07	0.07	0.00
110	754/28	3702/78 26	0.80	0.80	0.00
111	754/340	4019	0.07	0.07	0.00
112	754/360	3493/85 07	0.12	0.12	0.00

For GMR KAMALANGA ENERGY LI

(K.V.V. RAO)
MANAGING DIRECTOR
24.11.010

Divisional Head
DCO, Angul Divisio
24.11.010

GMR KAMALANGA ENERGY LTD.

True Copy

R.D 8/12/10

113	754/376	4040/8523	0.36	0.36	0.00
114	754/377	4040/8524	0.15	0.15	0.00
115	754/378	4040/8525	0.13	0.13	0.00
116	754/99	3488	0.55	0.55	0.00
		Total:-	**39.51**	**37.46**	**2.05**
		G.Total:-	**40.22**	**37.90**	**2.32**

IN WITNESS WHEREOF the parties hereto have respectively signed on the day and year first above written.

for GMR KAMALANGA

IN THE PRESENCE OF WITNESS
1. Ganga Dhar Choudhury (Co-ordinator)
S/o. Krushna Chandra Choudhury
C/o. GMR Kamalanga Energy Ltd
Kunjakanta, Dhenkanal

2. Debadutta Patnaik (Manager-Legal)
S/o-Late Biroshi Chandra Patnaik
GMR Kamalanga Energy Ltd
At-Kunjakanta Dhenkanal

For and on behalf of the Company

Sri K.V.V.Rao, MANAGING DIRECTOR
Managing Director,
For M/s. GMR Kamalanga Energy Ltd.
24.11.010

IN THE PRESENCE OF WITNESS
1. Hari Hara Behera
C/O Bhagabat Bihora
IDCO Angul Div.

2. [illegible] 4/01
IDCO Angul Division

For and on behalf of the Corporation

Sri Biranchi Narayan Barik,
Divisional Head, IDCO,
Angul Division.
Divisional Head
IDCO, Angul Division
24.11.010

Document drafted and prepared by me.

For GMR KAMALANGA ENERGY LTD.
24.11.10
(K.V.V. RAO)
MANAGING DIRECTOR

Divisional Head
IDCO, Angul Division
24/11/10

GMR KAMALANGA ENERGY LTD.
GMR

True Copy
R.O
8/12/10

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भारत 14334 ओड़िशा सांख्या
166077 >B 0082
INDIA R.0000050 12 09 12
ORISSA NONJUDICIAL STAMP
D.S.R. DHENKANAL

12/9/12

Registration No 501206388
Registration document No. 1050120 6228
Book No. 1 Date 12.9.12
Year 2012

Admissible under Rule ...
Excessively stamped under the Indian (Orissa Amendment) Act, 20.. Schedule I.A. No..... and O.T.P. & I.T. Act, 1956/O.D.A. Act, 1982/ Exempted from/Does not require stamp duty
Fees paid

12/9/12
Registering Officer
Dhenkanal

Registering Officer
Dhenkanal

file. 179033-00
UF 200.00
179233-00

7.9.12

DEED OF SURRENDER OF LEASE

THE DEED OF SURRENDER is made on this 07th Day of Sept. 2012.

BETWEEN

The Orissa Industrial Infrastructure Development Corporation (established under Orissa Act of 1 of 1981)and having its Head Office at IDCO Towers, Janpath, Saheed Nagar, Bhubaneswar-751002 hereafter called "The surrendered" which expression shall unless excluded or is repugnant to the context include its' successors, authorized representative Sri Biranchi Narayan Barik, Divisional Head, IDCO, Angul assignees of the **ONE PART**.

AND

THE GOVERNOR OF ORISSA represented by the **Collector, Dhenkanal** (hereinafter called "The State") which expression where not repugnant to the context shall include his successor in office and assigns) of the **OTHER PART**.

WHEREAS a piece of Pvt. land measuring **Ac.536.84** in villages **Kamalanga** under Odapada Tahasil in the District of Dhenkanal was transferred in favour of the IDCO for a period of 99 years for establishment of industries for a consiceration amount of **Rs.23,57,99,645.47** (Rupees twenty three crores fifty seven lakhs ninety nine thousand six

07.09.12
Divisional Head
IDCO, Angul Division

07.09.12
COLLECTOR
DHENKANAL

GMR KAMALANGA ENERGY LTD.
GMR

hundred forty four & paise forty seven) only by the Lessor as per Registered **Deed No.453/10 dated.22.1.10** of District Sub-Registrar, Dhenkanal.

WHEREAS the above Lessee desires to surrender the lease hold land measuring **Ac.20.38** in village Kamalanga under Odapada Tahasil in the District of Dhenkanal more fully described in **Schedule – A** in favour of THE GOVERNOR of Orissa represented through the Collectcr, Dhenkanal (hereinafter referred to as "The State Government") the Lessor for consequent de-reservation & alienation of Gochar land. The consideration amount of the surrendered land measuring **Ac.20.38** is **Rs.89,51,636.94** (Rupees eighty nine lakhs fifty one thousand six hundred thirty six & paise ninety four) only proportionately.

AND WHEREAS the rent reserved by and contained in the Deed of lease on the part of the Corporation to be paid has been paid by the said Corporation up to the date of this deed.

AND WHEREAS at the request of the Corporation, the State Government have agreed to accept from the Corporation, the surrender of the property described in **Schedule – A** annexed hereto for its utilization Exchange of Govt. Gochar land for the consequent de-reservation and alienation of Gochar land.

NOW THIS DEED WITNESSES as follows:

That in consideration of the above agreement the said Corporation as beneficial owner hereby surrenders to the State Government the property as described in the **Schedule-A** and demised under the Deed of lease to the intent that the residue of the said term created by the said deed of lease and all other rights and interest of the said "Corporation in the said property shall cease to be in force and to exist in the Corporation from the date of this surrender".

The lessee aforesaid do hereby surrender and relinquish all his rights, title, interest and possession in the said properties more particularly described in the **Schedule–A**, annexed hereto, absolutely and for ever.

The said Lessor is hereafter entitled to deal with the said properties described in **Schedule-A** in any manner that they deem fit as owner. The Lessor hereby releases the said Lessee, the Corporation from all claims, demands and liabilities in respect of the said lease.

The balance land measuring **Ac.516.46** shall remain in possession of the lessee and all his right, title, interest and possession thereto in any way shall not be affected by this deed of Surrender.

The Lessor shall also re-fix the land premium, ground rent, cess etc. there-to.

All the covenants and conditions contained in the said earlier lease deed shall continue and remain in force & this deed of Surrender shall be supplemental to the original **Lease deed No.453/10 dated.22.1.10**.

The Orginal Lease Deed shall be read as the deed for an area of **Ac.516.46** instead of **Ac.536.84**. Both the parties hereto shall not claim any compensation / damages for any constructions and improvements erected on the said land.

07.09.12
Divisional Head
IDCO, Angul Division

07.09.12
COLLECTOR
DHENKANAL

GMR KAMALANGA ENERGY LTD.
GMR

SCHEDULE – A (Pvt. Land)

Village: Kamalanga, Police Station:Mottanga
Tahasil : Odapada, District : Dhenkanal
Declaration No.26350 dt.19.6.08.

Sl. No.	Khata No. as per lease deed.	Plot No. as per lease deed.	New Khata No. as per current ROR corrected in favour of IDCO	New Plot No. as per current ROR corrected in favour of IDCO	Lease area In Ac.	Surrender area in Ac.
1	5	2787	758/888	2787	0.20	0.20
2	5	2788	758/888	2788	0.45	0.45
3	5	2791	758/888	2791	0.30	0.30
8	28	2824	758/888	2824	0.02	0.02
9	41	2831	758/888	2831	0.06	0.06
10	43	676	758/888	676	0.50	0.50
11	43	671	758/888	671	1.17	1.17
12	54	650	758/888	650	0.46	0.46
13	55	536/8638	758/888	536/8638	0.23	0.23
14	56	672	758/888	672	1.02	1.02
15	76	2811	758/888	2811	0.14	0.14
16	77	530	758/888	530	0.40	0.40
17	112	387/8797	758/888	387/8797	0.59	0.59
18	112	387/8799	758/888	387/8799	0.35	0.35
19	155	2820	758/888	2820	0.12	0.12
20	219	665	758/888	665	0.42	0.42
21	219	658	758/888	658	0.49	0.49
22	219	664	758/888	664	0.10	0.10
23	224	2789	758/888	2789 (P)	0.16	0.01
24	228	2819	758/888	2819	0.16	0.16
25	235	660	758/888	660	0.42	0.42
26	235	652	758/888	652	0.45	0.45
27	235	659	758/888	659	0.08	0.08
28	235	662	758/888	662	0.27	0.27
29	235	651/8066	758/888	851/8066	0.06	0.06
30	249	2822	758/888	2822	0.01	0.01
31	313	2808	758/888	2808	0.22	0.22
32	330	2830	758/888	2830	0.06	0.06
33	331	2815	758/888	2815	0.27	0.27
34	379	2826	758/888	2826	0.16	0.16
35	401	2812	758/888	2812	0.16	0.16
36	424	651	758/888	651	0.41	0.41
37	453	2818	758/888	2818	0.17	0.17
38	456	2827	758/888	2827	0.08	0.08
39	487	528	758/888	528	0.40	0.40
40	487	528	758/888	528/9037	0.26	0.26
41	487	528	758/888	528/9036	0.47	0.47
42	506	2817	758/888	2817	0.18	0.18
43	537	529	758/888	529	0.82	0.82
44	537	648	758/888	648	0.39	0.39

07.09.12

Divisional Head
IDCO, Angul Division

DIRECTOR
DHENKANAL

GMR KAMALANGA ENERGY LTD.

45	537	649	758/888	649	0.15	0.15
46	546	2821	758/888	2821	0.01	0.01
47	563	387	758/888	387	0.72	0.72
48	563	533	758/888	533	0.27	0.27
49	563	387/8800	758/888	387/8800	0.38	0.38
50	564	2814	758/888	2814	0.30	0.30
51	564	2778	758/888	2778	0.34	0.34
52	589	2813	758/888	2813	0.33	0.33
53	589	2832	758/888	2832	0.17	0.17
54	592	2779	758/888	2779	0.36	0.36
55	592	2784	758/888	2784	0.45	0.45
56	592	2790/8593	758/888	2790/8593	0.12	0.12
57	616	2783	758/888	2783	0.60	0.60
58	632	2807	758/888	2807	0.14	0.14
59	640	521	758/888	521	1.15	1.15
60	640	2823	758/888	2823	0.02	0.02
61	643	663	758/888	663	0.71	0.71
62	643	667	758/888	667	0.15	0.15
63	644	532	758/888	532	0.21	0.21
64	644	535	758/888	535	0.41	0.41
65	716	536	758/888	536	0.61	0.61
66	758/279	2825	758/888	2825	0.25	0.25
					20.53	**20.38**

IN WITNESS WHEREOF the parties hereto have respectively signed on the day and year first above written.

IN THE PRESENCE OF WITNESS

1. Satchidananda Nayak, Sr. Asst. IDCO, Angul. 07.09.12

2. Hari Hor Behera, Angul. 07.09.12

For and on behalf of the Corporation

07.09.12

Divisional Head
IDCO, Angul Division

(Sri Biranchi Narayan Barik)
Divisional Head, IDCO,
Angul Division.

IN THE PRESENCE OF WITNESS

1. Biswaleswar Pant, H.C. Revenue Section, Collectorate, Dhenkanal. 07.9.12

2. Sruruti Ranjan Mohapatra, Sr. Asst. Revenue Section, Collectorate, Dhenkanal. 07.09.12

For and on behalf of the Governor of the State of Orissa

21/8/12

Collector, Dhenkanal
DHENKANAL

GMR KAMALANGA ENERGY LTD.

Endorsement of the certificate of admissibility

Admissible under rule 25: duly stamped under the Indian stamp (Orissa Amendment act 1 of 2008) Act 1899, Schedule 1-A No.
Fees Paid : A16-179033 ,, User Charges-100 ,Total 179133

Date: 27/09/2012

Signature of Registering officer

Endorsement under section 52

Presented for registration in the office of the Sub-Registrar **DHENKANAL** between the hours of 10:30 AM and 02:30 PM on the **27/09/2012** by **ORISSA INDUSTRIAL INFRASTRACTURE DEVELOPMENT CORPRATION REP BY SRI BIRANCHI NARAYAN BARIK** , son/wife of , of **DIVISIONAL HEAD, IDCO, ANGUL** , by caste , profession and finger prints affixed.

Biranchi Barik

Signature of Presenter / Date: 27/09/2012

Signature of Registering officer

Endorsement under section 58

Execution is admitted by :

Name	Photo	Thumb Impression	Signature	Date of Admission of Execution
ORISSA INDUSTRIAL INFRASTRACTURE DEVELOPMENT CORPRATION REP BY SRI BIRANCHI NARAYAN BARIK		2032038	Biranchi Barik	27-Sep-2012
GOVERNOR OF ODISHA REP THGROUGH COLLECTOR DHENKANAL	------	------	------	------

Identified by **HARIHAR BEHERA** Son/Wife of **N/A** of **IDCO, ANGUL** by profession **Cultivation**

Name	Photo	Thumb Impression	Signature	Date of Admission of Execution
HARIHAR BEHERA		1216812	Hariharbehera	27-Sep-2012

GMR KAMALANGA ENERGY LTD.

Annexure-XX

Attachment for point no 24

PUBLIC NOTICE

It is hereby published for the general public that our project "1050MW" Thermal Power Project at Village-Kamalanga, District- Dhenkanal, Orissa by M/s. GMR Energy Limited, Bangalore" has been accorded environmental clearance by the Ministry of Environment & Forests, New Delhi. The copies of the clearance letters are available with the State Pollution Control Board / Committee and also available in the Website of the Ministry of Environment and Forests in the http://envfor.nic.in

Sd/- Manager

INDIAN EXPRESS

Dt. 11/02/2008

ନୋଟିସ୍ / ବିଜ୍ଞାପନ

ଏତଦ୍ଦ୍ୱାରା ସର୍ବସାଧାରଣଙ୍କ ଅବଗତି ନିମନ୍ତେ ଜଣାଇ ଦିଆଯାଉଅଛି ଯେ, ଜିଏମ୍‌ଆର ଏନର୍ଜି, ବାଙ୍ଗାଲୋର ଦ୍ୱାରା ୧୦୫୦ ମେଗାୱାଟ୍ ଥରମାଲ ପାୱାର ପ୍ରୋଜେକ୍ଟ ଗ୍ରାମ-କମଳାଙ୍ଗ, ଜିଲ୍ଲା-ଢେଙ୍କାନାଳ, ଓଡିଶା ରେ ଅବସ୍ଥାପିତ କରାଯାଉଅଛି । ଏଥିନିମନ୍ତେ ପରିବେଶ ଏବଂ ଜଙ୍ଗଲ ମନ୍ତ୍ରଣାଳୟ,ଭାରତ ସରକାରଙ୍କ ଦ୍ୱାରା ପରିବେଶ ମଞ୍ଜୁରୀ ପାଇଅଛି । ମଞ୍ଜୁରୀ ପତ୍ରର ଅବିକଳ ନକଲ ରାଜ୍ୟ ପରିବେଶ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ, କମିଟିଙ୍କ ନିକଟରେ ଉପଲବ୍ଧ ଏବଂ ପରିବେଶ ଓ ଜଙ୍ଗଲ ମନ୍ତ୍ରଣାଳୟର Website http://envfor.nic.in ରେ ମଧ୍ୟ ଉପଲବ୍ଧ ଅଟେ ।

Sd/ Manager

DHARITRI

Dt. 11/02/2008

GMR KAMALANGA ENERGY LTD.

Annexure-XXI

GMR Energy

GMR Kamalanga Energy Limited

GMR

Administration Office:
HIG - 28, Gangadhar Meher Marg
Jaydev Vihar
Bhubaneswar 751 013
T +91-0674-2303995
F +91-0674-2303994
W www.gmrgroup.in

Ref.No. –GKEL/OSPCB/GKEL/13-14/3164
Dated - 31.07.2013

To

The Sr. Environment Engineer (C)
State Pollution Control Board, Odisha
(Deptt. of Forest & Environment, Govt. of Odisha)
Paribesh Bhavan, A/118, Nilakantha Nagar, Unit-VIII,
Bhubaneswar, Odisha – 751 012

Sub : Environment Management Cell in the industry – Regarding.
Ref : Your office letter no – 13020/ Ind – I – Con – 1402 dated 17.07.2013 received by us on 29.07.2013

Dear Sir,

With reference to the above subject and letter cited above, we are enclosing herewith the updated status of environment management cell of our thermal power plant for your kind information and perusal please.

Kindly acknowledge receipt of the same.

Thanking you,

Yours sincerely,
for GMR Kamalanga Energy Limited

(S.Nageswara Rao)
Associate Vice President & Project Head

Encls. : Status of Environment Management Cell (Six pages)

GMR KAMALANGA ENERGY LTD.

Regd. Office:
25/1, Skip House, Museum Road,
Bangalore-560 025
Site Office:
PO, Kamalanga, Via Meramundali
P.S. Dhenkanal, Tahasil, Odapada
Dist. Dhenkanal 759121, Orissa

STATUS OF ENVIRONMENTAL MANAGEMENT CELL IN M/S GMR KAMALANGA ENERGY LIMITED.

A. Total investment made for the factory:Rs.4100.00 Cr

Investment made on installation of pollution control measures: Rs.125 Cr

Recurring expenses on environmental protection (Per Annum): 1.06Cr

B. Details of persons available in the Cell:

Sl No	Name of the persons	Designation	Duty assigned	Mobil No/Email	Qualification	Experience
01	Susanta Sahoo	AGM - EHS	EHS	07894420913 susanta.sahoo@gmrgroup.in	B.Tech (Mechanical) + Diploma in Env. Management. + Diploma in Industrial Safety	19 Year
02	Chittaranjan Mahali	Manager-EHS	Environment. Conditions Compliance.	09178462822 chittaranjan.mahali@gmrgroup.in	B.Tech (Mechanical) + Post Diploma in Industrial Safety.	13 Years.
03	Sangram Dhal	Manager-Chemist	Lab In-charge	09777580328 Sangram.dhal@gmrgroup.in	B.Sc.(Chemistry) + M.Sc. (Pollution Control)	21 Years.
04	Shyamalendu Mohapatra	Associate Manager (Horticultur e)	Plantation /Green belt Development	07894471103 Shyamalendu.Mohapatra@gmrgroup .in	B.Sc.(Ag) +M.sc (Horticulture)	07 years
05	Subash Rout	Co-ordinator (Chemist)	Water Lab	07894450366	B.Sc. (Chemistry)	05 Years
06	Jayakumar T.	Sr. Co-ordinator (Chemist)	Air Lab	07894471096	B.Sc (Chemistry)	11 Years

GMR KAMALANGA ENERGY LTD.

C. Pollution control management during night hours:

Sl No	Name of the Persons	Designation	Mobil No/Email
01	Chittaranjan Mahali	Manager (EHS)	09178462822 chittaranjan.mahali@gmrgroup.in
02	Sangram Dhal	Manager-Chemist	09777580328 Sangram.dhal@gmrgroup.in

D. Laboratory facility building infrastructure if any:

a. Building /infrastructure (Sq.ft) :8000 Sq.ft.

b. Parameters analysed critical parameters of air and water:- pH, Suspended solids, Total dissolved solids & Total suspended solid (TDS & TSS),Dissolved oxygen (DO),Chemical oxygen demand (COD),Biochemical oxygen demand (BOD),Sulphide ,Residual free chlorine, Oil and grease, Total ammonical nitrogen (NH3-N),Bacteriological contamination ,PM 10, PM 2.5, Sulphur dioxide (SO2) (µg/m3), Oxides of Nitrogen (NOx) (µg /m3), Carbon monoxide (CO) (mg).

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c. Name of the equipment's:

Sl No	Name of Equipment	Unit	Quantity
1	Electrical anemograph	Set	1
2	Dew Point Meter.	Set	1
3	Rain Gauge.	Set	1
4	Mercury Barometer.	Set	1
5	Maximum & Minimum Thermometer.	Set	1
	Hygrometer.	Set	
6	Dry &Wet Bulb Thermometer.	Set	1
7	High Volume Sampler.	Set	1
8	Stack Monitoring Kit.	Set	1
9	Ion Activity Meter.	Set	1
10	COD Measure instrument.	Set	1
11	Biochemical incubator.	Set	1
12	BOD measuring instrument.	Set	1

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13	Sound level meter.	Set	1
14	Redundant/ total chlorine Meter.	Set	1
15	Electromagnetic radiation detector.	Set	1

d. Accreditation if any: Action is being incited for accreditation from competent authority.

e. Frequency of sample collection and analysis

i. Water: Thrice in a Month.
ii. Air: Daily (on line monitoring system)
iii. Stack: Air: Daily (on line monitoring system)

f. Monitoring done by 3rd party if any:

Name of the 3rd party	Parameter analyzed	Frequency of Monitoring
S. S. Environics (India) Pvt. Ltd.	**For Water & waste water analysis** pH DO (Minimum) Chloride Total Dissolved Solids Suspended Solids* Oil & Grease BOD (3) days at 270C Arsenic as As Lead as Pb Cadmium as Cd	Thrice in a Month

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	Hexavalent Chromium as Cr +6 Copper as Cu Zinc as Zn Selenium as Se Cyanide as CN Fluoride as F Sulphates (SO4) Phenolic Compounds as C6H5OH Iron as Fe Nitrate as NO3	
	For AAQ Monitoring: PM 10 (particulate Matter size <10 microns)(µg/m3) PM 2.5 (particulate Matter size <2.5 microns)(µg/m3) Sulphur dioxide (SO2)(µg/m3) Oxides of Nitrogen (NOx) (µg /m3) Carbon monoxide (CO) (mg/m3)	Weekly 5 days.

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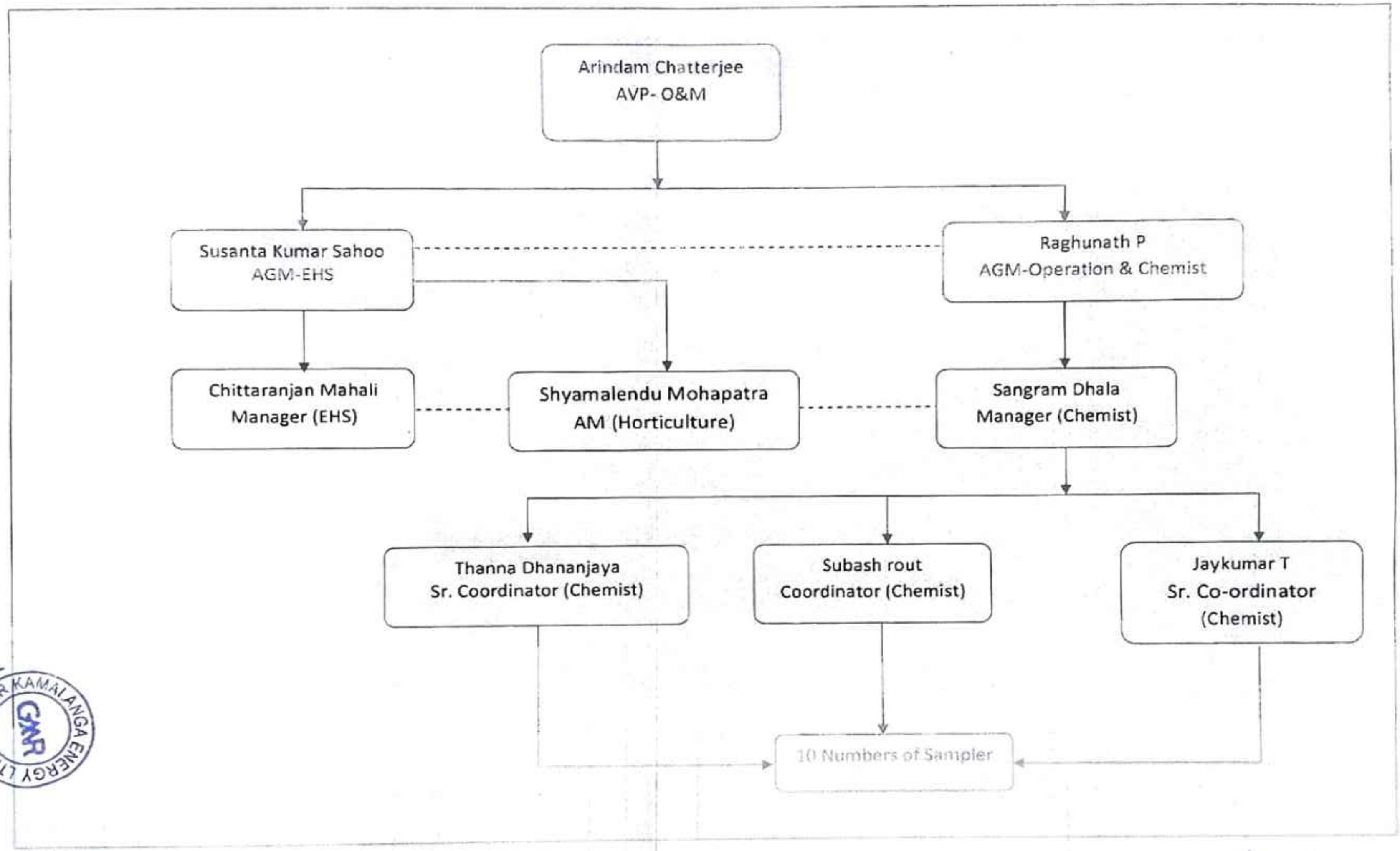
E. Reporting system of the Environment Management cell (please enclose Organization Chart)

ORGANISATION CHART OF ENVIRONMENT MANAGEMENT CELL



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Annexure-XXIII

Creating tomorrow today

ENVIRONMENT MANAGEMENT PLAN

For

GMR KAMALANGA ENERGY LIMITED

(4x350 MW THERMAL POWER PLANT)

DHENKANAL, ODISHA.

GMR KAMALANGA ENERGY LTD.

CORPORATE EHSQ POLICY & IMS POLICY

GMR

Group Environment, Health, Safety and Quality (EHSQ) Policy

We, at GMR Group with interests in diversified businesses, driven by our core Values & Beliefs, are committed to our stakeholders and meet customer satisfaction through integrated EHSQ management system to achieve Corporate Sustainability, in all our existing and future businesses.

To attain this objective, we shall

- Implement and maintain an integrated EHSQ management system to achieve sustainable performance
- Adopt and sustain a Business Excellence framework for continual business process improvement
- Protect environment, conserve natural resources, reduce energy consumption, improve occupational health and safety performance and mitigate risks by adopting optimal production processes and services, driven by environment friendly technologies
- Comply and endeavour to exceed all applicable legal and other requirements
- Continuously strive to achieve satisfaction of all stakeholders through contribution to social development
- Communicate effectively about the EHSQ system across the Group; create awareness and increase the competency of all employees through training
- Establish specific organizational structure for guidance, implementation and regular review of EHSQ management system

G M Rao
Group Chairman

15th June 2013

Revision: 1

Effective from: 08-March-2013

GMR KAMALANGA ENERGY LTD.

GMR Kamalanga Energy Limited

Integrated Management System Policy

(ISO 9001:2015, ISO 14001:2015, ISO 45001:2018)

GMR Kamalanga Energy Limited is committed to establish and follow an Integrated Management System in line with the GMR Corporate EHSQ Policy and through which it aims to be amongst the sustainable and competitive producer of power in terms of quality, cost and delivery by focusing on total customer satisfaction with a commitment to maintain environment friendly, safe, healthy and sustainable working conditions in all its operations creating opportunities for people and wealth for all stake holders.

To achieve the above, our priorities lie in the following areas:

- Ensure Continual Improvement in processes through review mechanism & feedback system from all its stake holders.
- Comply all applicable legal and other requirements of Environment, Health & Safety with commitment, consultation & participation from entire chain of work force from all category and ensure continual improvement in EHS performance through management review.
- Ensure optimization of natural resources through continuous monitoring and review of our processes.
- Prevention of pollution, injury & ill health; and continual improvement in EHSQ performance by appropriate supervision, operational practices & Technologies.
- Involvement of employees at all levels to inculcate EHSQ culture by identifying Risks & opportunities for continual improvement in the processes.
- Provide Training & Learning to employees to ensure competence and awareness in order to effectively carry out the requirements of Integrated Management System.

Date: 1-Aug-19

S N Barde
CEO (Energy)
GMR Energy Limited

Effective from: 08-March-2013

GMR KAMALANGA ENERGY LTD.

TABLE OF CONTENTS

FIGURE/TABLE/ANNEXURE

GMR KAMALANGA ENERGY LTD.

1.1 INTRODUCTION

As a principal Employer, we consider Environment, Health & Safety Protection (EHS) as an integral part of our business. We are committed to protect the environment in which we operate and to ensure the health and safety of the employees, contractors, visitors and community. In addition to relevant statutory requirements, we have adopted these guidelines for all workmen and community in order to maintain the desired standards.

It is the responsibility of the contractors, GMR and Client's representatives to ensure that the workmen of contractors and any subcontractors are fully informed of the environment Management plan / procedures and that they follow it in their work.

We declare emission and discharge from all our activities/processes will be within the prescribed standards.

The GMR Kamalanga Energy Ltd., EHS team is the owner of this Environment Management Plan.

To revise this document, discuss your suggestion with the EHS team in writing and seek approval for change through the EHS team. If your proposal is accepted, this document will be revised to include your suggestion and then re-issued with the current revision and approvals posted on the cover sheet.

1.2 EHS Policy:

GMR GROUP has declared a written **Corporate Environment, Health, Safety and Quality Policy (EHSQ Policy)** signed by the GMR Group Chairman, appropriate to the scale and nature of the risks involved in the Project/ Process activities. This policy will be implemented in a transparent manner. All employees of GMR GROUP should be familiar with the EHSQ Policy and shall implement this policy in compliance with Safety, Health and Environmental standards and code of practices of its customers and in accordance with applicable law and regulations.

GMR KAMALANGA ENERGY LTD.

1.3 Environment Management Plan:

Prevention is better than cure. To achieve the objective of prevention of any environmental pollution/ hazard, awareness of Environment norms to be followed precautionary measures to be taken. This is possible only if all pollution control equipments established as per requirement, maintained properly, regular awareness/training programmes are conducted and actions taken in the light of Environment audits conducted from time to time.

1.4 Applicable Environment, Health and Safety Requirements:

The GMR Kamalanga Energy Ltd., employees and agencies shall be required to achieve compliance with the following applicable standards and also others if any as per requirement.

- The Environment (Protection) Act, 1986 as amended thereon,
- The Environment (Protection) Rules, 1986 as amended thereon, 2014,
- The Water (Prevention & Control of Pollution) Act, 1974,
- The Water (prevention and control of pollution) Cess Act, 1977,
- Air (Prevention & Control of Pollution) Act,1981,
- Public Liability Insurance Act, 1991,
- Noise Pollution (Regulation and Control) Rules, 2000 as amended thereon 2009,
- Ozone Depleting Substances (Regulation) Rules, 2000,
- Environmental Impact Assessment Notification 2006,
- Fly Ash Notification 1999 as amendment thereon 2009 and 2016,
- Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016,
- Batteries (Management and Handling) Rules, 2001 and 2011,
- Solid Waste Management Rules, 2016,
- e-Waste Management Rules, 2016,
- Construction and Demolition Waste Management Rules, 2016,
- Plastic Waste Management Rules 2016,
- Bio-Medical Waste Management Rules, 2016,
- Notified standards for industrial emissions, effluents, noise level, vehicular emission etc.
- The Indian Electricity Act 2003 & Indian Electricity Rules 1956,
- The Indian Explosive Act- 1984 Amended 1985 & Rules,
- The Motor Vehicle Act- 1988,
- Gas Cylinder Rules, 2004.
- Factories Act 1948 or any modifications thereof or any other law relating thereto and state rules there under introduced from time to time.

GMR KAMALANGA ENERGY LTD.

1.5 Responsibility:

The GKEL Management is committed for the protection of Environment. The Management acknowledges responsibility for promoting the highest environment protection standards and is committed in developing appropriate systems and procedures to achieve the objective of emission and discharge well within the prescribed standards.

2.1 Profile of Organization & Plant Details:

GMR Kamalanga Energy Ltd. (GKEL) is a SPV of GMR Energy Ltd. of Infrastructure major GMR Group. GMR Group has in its portfolio Airports, Power Plants, Urban Infrastructure, Highway and Agri Business. GMR Group spread its wings domestically and internationally in all sectors like Airport, Power plants, Infrastructure development.

2.2 Location and Accessibility

The power plant is proposed to be located at Village-Kamalanga, District -Dhenkanal, Odisha and has the following coordinates

Latitude : 200 51′ 11.82″ N to 200 52′ 33.2″ N

Longitude : 850 15′ 24.84″ E to 850 16′ 29.7″ E

Site Elevation : 65m to 75m AMSL

Total area of 1158.57 acres has been acquired for 4x350 MW. The topography of the site is moderately undulated with an average elevation of 70 m AMSL. The site is optimally suited for considering the topography and availability of fuel and water at the proximity.

Highway: NH 55 at a distance of 2.5 km and NH 23 at a distance of about 4.2 km from the project site.

Rail: The nearest railway station is Budhapank on Nirgundi –Talcher section of East Coast Railway, at a distance of about 2 Km.

Airport: The nearest airport is Bhubaneswar at a distance of 135 Km.

Port: Nearest port is Paradeep at a distance of 180 Km.

Water Source: River Brahmani is at 1.5 Km which is water source for the proposed project.

2.3 **Plant Details:-**The process for power generation system comprises of Boiler (steam generator), Turbine with accessories, Generator unit, Transformer and equipment's all arranged to operate as complementary parts of a complete monolithic set. The super saturated steam from the boilers 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 salient features of the plant area -

1. STEAM TURBINE - 4 x 350 MW
2. PF FIRED BOILERS - 4 x 1185 TPH
3. MULTI FLUE CHIMNEY - 2 x 275 METERS.
4. ESP - 4 NOS.
5. COAL HANDLING PLANT - 2000 TPH
6. TRACK HOPPER– 1, WAGON TIPPLER – 1, STACKER RE-CLAIMER - 2
7. ASH HANDLING WITH HCSD SYSTEM and ASH POND.
8. ASSOCIATED UTILITY SYSTEMS
9. RAW WATER RESERVOIR & RLY LINE.
10. FLY ASH BRICKS/BLOCK MAKING PLANT – 1 X 1000NOS./HOUR

Process flow sheet of the proposed power generation process is presented in Figure below.

The process for power generation system comprises of Boiler (steam generator), Turbine with accessories, Generator unit, Transformer and equipment's all arranged to operate as complementary parts of a complete monolithic set. The super saturated steam from the boilers 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.

Coal from the coal mines in BOBR / Box wagons is transported by rail via Budhapank railway station and in plant rail tracks up to our coal yard. The coal wagons are weighed on in-motion weighing platforms before they are pneumatically discharged to the track hoppers/Wagon tippler.

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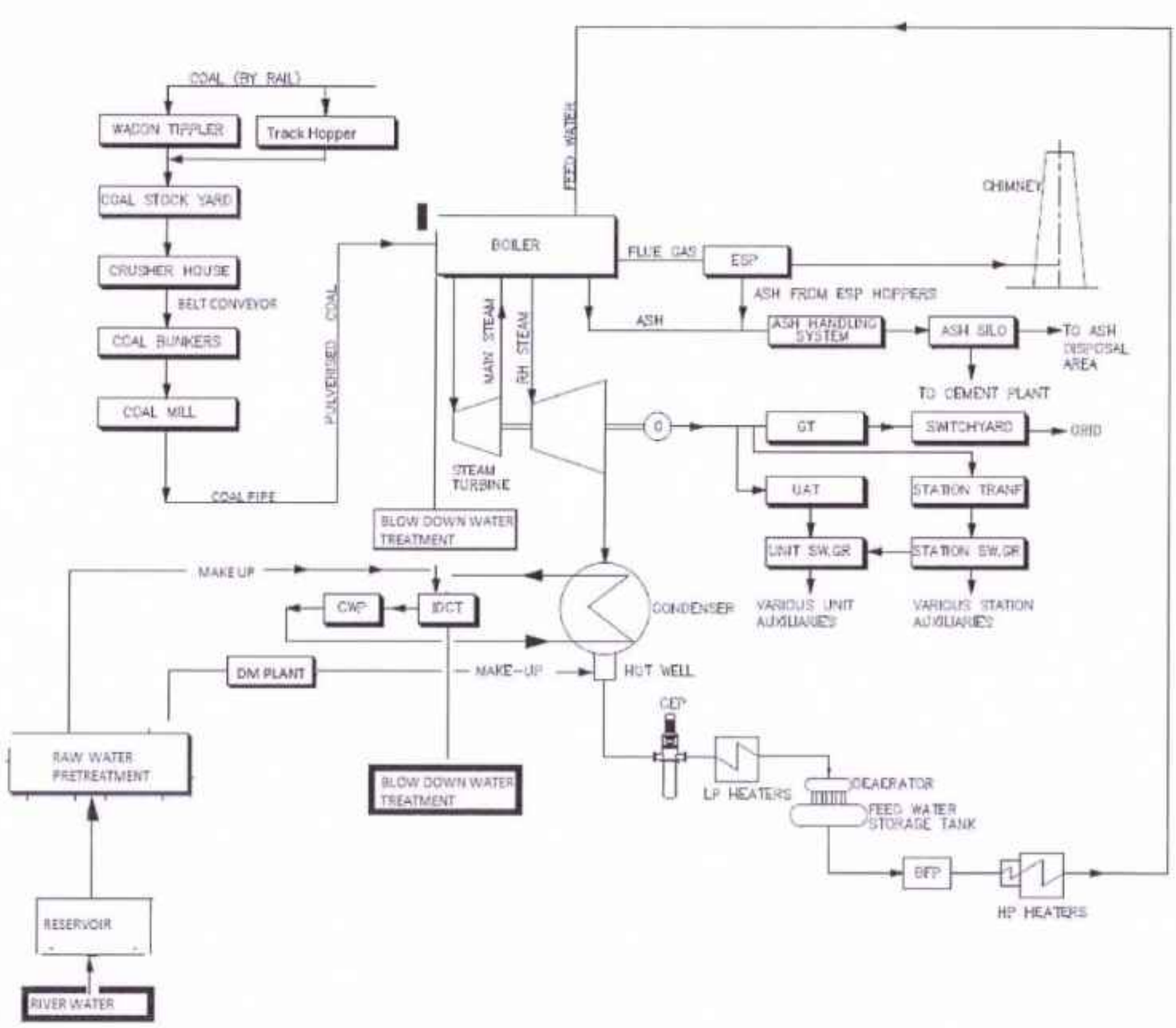
Process Flow Diagram:-



Coal from the track hoppers is conveyed directly to the crusher building. Coal is crushed in the crushers from 300mm to 25mm or less as required for process. This crushed coal is conveyed up to the coal bunkers and stored there. Required amount of crushed coal is fed to the pulverizer mills through coal feeders. Pulverizer mills crush the coal to the required size for firing inside the boiler.

Natural circulation, drum type, two pass, radiant, single reheat, balanced draft, semi outdoor type coal fired steam generating units are used for steam generation. Initial lighting is achieved through the oil firing (First LDO followed by HFO) and subsequently the load gets transferred to coal firing on stabilization. Plant is deigned to use E grade coal (3300 Kcal/Kg) for better heat transfer. Boiler feed water for steam generation is recycled through condenser hot well, make up water requirement being

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met by DM plant. Condenser cooling water requirement is made by the induced draft cooling water system in the plant.

The maximum rating for the boiler is 1185 TPH with final SH outlet steam temperature being 540°C @178 Kg/Cm². In the steam coming out from the SH enters into the HP turbine where it gets expanded and returns back to RH at 326 °C @ 36.73 Kg/Cm² and comes out of RH outlet header at 540 °C @ 35.59 Kg/Cm². The steam from the header moves to IP turbine where it further expands and then moves towards LP turbine. After final expansion in LP turbine it moves to condenser where it changes its phase giving out its latent heat (hear steam converts in to water) and thus the cycle continues. In the second pass economizer utilize the heat from the flue gas and add this sensible heat to feed water there by increasing its temperature. The second pass also contains the low temperature SH which utilize the sensible heat of flue gas and increases the steam temperature to derive more work.

The turbine-generator converts the heat enthalpy to electrical energy through 400 kV switchyard of power station. Power distribution is achieved for end user areas via 33kV, 6.6 kV & 440 V sub-stations.

Suitable electro static precipitator receives the flue gas from steam generators. Dust collection efficiency has been so designed to keep the SPM level less than equal to 50 Mg/m³. The collected dust from ESP hopper pneumatically conveyed with the support of the service air to ash storage silos. Bottom ash from boiler hoppers also conveyed and stored in dewatering beans in ash handling system. Ash handling system has provisions for dry ash unloading after suitably conditioning it and wet ash conveying to ash storage reservoir with help of high concentration slurry discharge system.

The whole plant is designed for Zero liquid discharge system. All excess liquid effluents will be treated for reuse in the process.

3.1 Air Environment

Coal based thermal power plants emit fly ash as the major pollutant besides varying degree of other pollutants namely: coal dust, Sulphur dioxide and oxides of nitrogen, carbon monoxide/carbon dioxide, heat etc.

The coal characteristics as considered in predication of impacts, i.e. sulfur: 0.36% and ash content: 33-44% as well as ESP efficiency (not less than 99.95%) shall be maintained in long run of project to restrict the ground level impacts within predicted levels.

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3.2 Coal Handling System

Coal will be received at the coal storage yard by rail wagons. Different qualities of coal received in various batches needs to be blended at project site to maintain required calorific value as well as ash content. The coal handling operation is normally carried out by reclaimers, dozers etc. and thereby, large amount of fine coal dust becomes airborne. The crushed processed coal is conveyed to the coal bunkers with overhead conveyor belts and at transfer points coal dust becomes air borne causing fugitive emissions.

Dust emission is mostly of fugitive type and necessitates installation of close conveyor system along with suitable dust trapping/control (dust suppression /dust extraction) facility at various transfer points. At coal stack yard, to prevent dust emission due to wind erosion, frequent spraying of water is recommended. This also prevents spot fires.

3.3 Coal Crusher & Bunkers

Coal is crushed in two phases, i.e. primary and secondary crushers to obtain the required size of coal for proper combustion. The main pollutant emitted in the crushing and its storage process is fine coal dust (suspended particulate matter). Though crushing operation is not a continuous one, but during its operation, large amount of coal dust is generated which will spread in the vicinity.

For fine dust control, bag filters have been successfully tried in similar operations. Better efficient dry collection system is provided and shall prove to be long term cost effective because of possibility of coal recovery in the process.

3.4 Boiler

As a result of pulverized coal combustion in the boiler furnace, fly ash is generated along with oxides of Sulphur and nitrogen. The SO_2 emission rate will be governed by the quality of coal with respect to its Sulphur content, while the fly ash in stack flue gas would depend upon ash content of coal as well as performance efficiency of ESPs. NOx emission will primarily depend on the furnace temperature, air to fuel ratio thereby governing the oxygen supply for complete combustion and type of burner technology.

3.5 Flue Gas

For high efficiency collection of fly ash from boiler flue gas, multiple field ESPs will be provided having design efficiency about 99.95%. Although the control efficiency of proposed ESPs are given as 99.95% (design specifications), the prescribed regulatory standard for PM emission from proposed category of power plant (50 mg/Nm^3; 99.95% control efficiency) has been considered for estimating PM emission from the

Thermal power plant and to represent worst case scenario of ground level impact. Even with this approach, the predicted ground level impact of PM from the 4x350 MW units would be negligible.

As far as SO_2 is concerned, at present no control equipment for SO_2 has been envisaged in view of low Sulphur content in Indian coal as well as the insignificant impact prediction at ground level, which could be achieved through provision of common twin flue stack of 275 m height for 4x350 MW units. However, as per the revised notified norms of flue gas emission dated 07.12.2015, flue gas treatment for SO_2 and other parameter to be provided to meet the emission standard

The NOx emissions would be controlled through dry low NOx (DLN) burner system to comply the guidelines/stipulated norms.

The performance of ESPs depends considerably on resistivity of fly ash particles, SO_3 content etc. in flue gas. The low sulfur high ash content Indigenous (Indian) coal causes insufficient SO_3 and high variability in fly ash resistivity, which results in lowering ESP efficiency. In view of this necessary provision shall be made/built-in for flue gas pre-treatment with NH_3 depending on the requirement in the long run of the project.

3.6 Fly Ash Handling System

Fly ash from the ESP hoppers will be removed pneumatically. Proper maintenance is to be done at regular intervals to prevent fugitive emissions.

3.7 General Measures

The following air pollution control measures have been installed.

- For minimizing the SPM levels in ambient air, use of high grade coal may be advocated. The high grade coal will have higher calorific value and low ash content compared to ordinary coal and thus it would minimize the investment on Bag filter/ESP.
- Furnaces and boilers should be operated with proper air fuel ratio so that fuel consumption is reduced and NOx emissions are minimized. Low NOx burners/ De-NOx system to be installed for further reduction in NOx emissions.
- The stack is to be designed so as to take care of emergency release conditions, for additional load of flue gas under boiler start up and shutdown periods.
- All the internal roads are to be asphalted/concreted to reduce dust emissions due to vehicular movement.

- The combustion units shall at all times be maintained properly for obtaining optimum efficiency and to ensure that the emission rates remain within the standard.

- Instruments for Continuous on line monitoring of flue gases for measuring the levels of PM10, PM2.5, SOx, NOx, CO/CO_2, O_2 is being installed in the stack. Port holes and sampling facilities have been provided at suitable locations as per OSPCB/CPCB guidelines to enable stack monitoring by statutory authorities/environmental audit team as and when required through portable instruments.

- Ambient air quality w.r.t. PM10, PM2.5, SO2, NOx and CO/ CO_2, O_3 should be regularly monitored at minimum 07 nos. of sampling locations around the project site with one or two locations in upwind direction and more locations in predominant downwind directions to delineate the impact from the project. The identification of monitoring locations shall be done in consultation with the State Pollution Control Board officials.

- An electronic weather station for recording wind speed, wind direction, temperature, relative humidity, and rainfall is to be installed in the project premises.

- The fugitive emissions of coal dust from coal storage facilities, from crushers and at coal transfer points is being reduced by adopting suitable measures like bag filters/water sprinklers/fog system.

- About 100 m wide green belt as proposed is to be develop all along the boundary of proposed 4x350 MW power plant premises and township for attenuation of fugitive emissions and noise abatement.

- Personal protective devices such as dust filters, ear muffs, safety shoes/gumboots, HT resistive hand gloves etc. is to be provided to the workers to combat occupational hazards.

4.1 Noise Environment

Manufacturers and suppliers of major equipments like compressors, turbines, and generators to be asked to take required measures for minimizing the noise levels generated by the machines i.e. using noise absorbing material for enclosures or using appropriate design/technology for fabricating/assembling machines.

The operators working in the high-noise areas, i.e. compressor, boiler houses, blowers, generators, feed pumps, steam generation plant, turbo-generator etc. are to be strictly instructed to use ear-muffs/ear-plugs.

The control room is designed to meet low noise levels with a provision for deep windows and fire resistant doors.

Green belt is developing to attenuate noise and the extent of green belt shall be as per CPCB guidelines.

4.2 Measures for Minimizing Impacts due to Vibrations

Low vibration generating machines/equipment is to be selected to meet international standards and foundations are to be so designed to minimise vibrations and secured properly.

Personnel working near the vibrating machinery in different units to be provided with well-designed vibration resistant hand gloves/foot wares and suitable PPEs.

Vibration generating sources and their platforms is to be maintained properly to minimize vibrations and related impacts.

Training of personnel is recommended to create awareness about the damaging effects of vibrations.

5 Ash Management

Ash generation in large quantities is one of the major environmental concerns at proposed coal based Thermal Power Plant, in view of its handling and management. Actual generation of ash depends upon quality (ash content) of coal to be used at a power station apart from its power generation capacity.

M/S GKEL shall delineate suitable, site specific action plan for 100% utilization of fly ash in accordance with the provisions given in MoEF notification on ash utilization.

5.1 Fly Ash Utilization

In view of Thermal power plant and to comply the requirement of 100% fly ash utilization, M/s GKEL may explore the following fly ash utilization avenues:

As per the literature fly ash has been used in mass concrete at various dams and hydraulic structures mainly due to development of higher strength at a later date as compared to Portland cement.

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Use of fly ash in the manufacture of precast concrete products such as masonry blocks has been well established at various places in the country.

Fly ash can be used for manufacture of cement and the relevant standards have been prescribed by ISI/BIS (Ref. IS No. 3812 - 1981 and IS 10154 Fly Ash 1980). The cement manufactured fly ash can also be utilized in mass concrete construction in dams and similar hydrology structures.

Fly ash can also be sintered to produce sintered fly ash which is an important light weight aggregate for making structural concrete. It can also be used for a number of other purposes such as :

i. In making bricks from clay type soils

ii. As fine aggregate in mortar and concrete block

iii. As a filler in rubber, paint, bituminous concrete and bituminous products

iv. As a raw material for glass manufacturing

v. In soil stabilization

vi. In sand blasting in place of sand, for cleaning turbine blades

vii. As a filler layer under road pavements

viii. In oil well sealing

ix. In the manufacture of aerated concrete

5.2 Possible Utilisation of Fly Ash

Fly ash can be utilized for many useful purposes. It could be categorized as follows :

Category A : Leading to low value products/Uses

Category B : Medium value products

Category C : High value products

For utilization of ash, it is essential to plan for dry fly ash collection system as part of the project. In case of ash utilization is not reaching to 100%, the balance ash should be disposed off using High Concentration Slurry Disposal (HCSD) technology. This technology suggests preparation of ash slurry wherein the concentration is 70% by weight (i.e. ash/water = 70/30). The high concentrated slurry so formed can be transported to ash pond in the form of paste under high pressure through 125 mm NB 9.52 mm thick M.S. seamless pipe line by piston diaphragm pumps.

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5.3 Brief Description of HCSD System

The dry fly ash collected in the ash silo will be fed to ash conditioner through rotary feeder.

Rotary feeder controls the mass flow rate of dry fly ash.

The ash is moistened by adding little water (about 10% by weight) in the ash conditioner

The moistened ash will be fed in to slurry mixing tank and thoroughly mixed with water

The concentration of the ash slurry in the mixing tank would be about 70% by weight (i.e. ash/water = 70/30)

The level of slurry in the ash slurry tank, flow of dry ash as well as water are required to be monitored and maintained by providing necessary instruments in the control system such as flow meter, density meter, etc.

The high concentrated slurry so formed would be transported to ash pond in the form of paste under high pressure.

5.3 Advantages of HCSD System

Dense ash slurries use significantly less water than dilute slurries. Disposal of the ash slurries to the dump yards through pipelines is safe reliable and devoid of spillage. Rate of evaporation is quite high thereby promoting rapid consolidation of the slurry layer. It forms a surface crust which is dust free.

6.0 Ash Pond Management

Ash pond is an essential requirement at project coal based thermal power station. The pond size will depend upon quantum of ash generation the level of utilization. The total area identified for ash pond can be divided into three parts/compartments. At any given time one part shall be used for ash dumping while other two parts of ash pond could be utilized for planting Bio-fuel trees & medicinal plants, plantation corresponding to high rate transpiration system (HRTS) etc. which could also be useful for stabilization/reclamation of ash pond area on later date. One of the these compartments could also be used for disposal of dry ash following ash mound (dry compaction) technology. Fly ash disposed in dry form can later be utilized for any of the above indicated purposes.

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In case of 100% ash utilization/evacuation implemented at project, a major portion of land earmarked for ash pond would remain vacant; hence a portion of it should be used for construction of classifier slurry/sludge settling pond and Blowdown down water retention pond (separately) with 7-10 day retention capacity.

7.1 Solid/Hazardous Waste Management

A record w.r.t quantity, quality and treatment/ management of solid/hazardous waste shall be maintained by the environmental management cell at the project

The spent transformer oils, spent lubricants generated at proposed project shall be handled/managed as per the norms prescribed in Hazardous waste (Management & Handling) Rules 1989 as Amended in 2003, i.e. after obtaining necessary approval from CPCB/OSPCB.

The waste oil/ spent oil likely to be generated from the proposed project is required to be carefully handled and stored in an environment friendly manner. Such oil need to be finally disposed off by way of sale to the processing units registered with the Ministry of Environment & Forest, Govt. of India for its further processing and reuse.

All oily sludge generated from ETP must be disposed off through environmentally compatible manner as per the prescribed Hazardous waste management rules.

7.2 Domestic Solid Waste

The domestic solid waste generated at proposed project including Township and plant area shall be managed as per the MoEF Notification S.O. 908 (E) dated 25th September 2000.

The domestic solid waste normally constitutes about 50% organic matter. This material can be composted to yield the compost which can be used along with the chemical fertilizer in the surrounding farms. Studies carried out by various authorities have clearly shown that the yield that is obtained by using chemical fertilizers along with compost is normally more than the yield obtained by the use of chemical fertilizer alone. The progressive farmers will hence readily accept to utilize the produced compost. The quantity of the compost produced is quite small as compared to the anticipated demand and hence no problem is visualized in its sale.

7.3 Sanitary Landfilling

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The non-compostable material that will be removed from the township solid waste will have to be disposed off. Similarly, if for some reasons the composting cannot be carried out, the whole quantity will have to be landfilled. For the entire operation, adequate land must be made available. These materials can be disposed off by using sanitary landfilling.

In general, the process involves filling of low-lying land with refuse in such a manner as to ensure the process to remain sanitary. Normally, after the material is deposited at the site, it is spread, compacted and covered at the end of every days operation with a layer of earth. The earth layer prevents the possibility of rats burrowing through it, fly breeding etc. Sanitary landfilling is normally carried out in 3 ways:

i) Trench Method

ii) Area Method

iii) Ramp Method

Trench method is normally used in the case of flat terrain or where the soil can be easily excavated.

Area method is suitable for irregular or marshy waste land having a high level of groundwater as in such cases excavation for the more orderly method of trench and ramp types cannot be carried out.

Ramp method is commonly used in the case of flat or gently rolling areas.

8.1 Green Belt Development

With a view to attenuate air pollutants, to abatement of noise propagation from power generation units and uptake of treated effluent to some extent, it is recommended to develop a 100m wide green belt all along the periphery of project site and 30-50m wide green belt in colony area from total 1158 (Approx.) Acre land of project site, about 359 Acre land has been delineated in layout plan for proposed green belt development. In addition to this, afforestation and bio-diversity improvement programmes shall be undertaken in the surrounding villages.

As per CPCB guidelines for development of green belt, the project site and surrounding study area falls in Eastern plain with dry sub-humid climate and medium to deep black red and yellow soils (Dhenkanal district). The plant species suitable for green belt development need to be selected based on the following criteria:

- Fast growing

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- Thick canopy cover
- Perennial and evergreen
- Large leaf area index
- High sink potential

8.2 Guidelines for plantation

The plant species identified for green belt development should be planted using pitting technique. The pit size should be either 45 cm x 45 cm x 45 cm or 60 cm x 60 cm x 60 cm. Bigger pit size is preferred on marginal and poor quality soils. Soil proposed to be used for filling the pit should be mixed with well decomposed farm yard manure or sewage sludge at the rate of 2.5 kg (on dry weight basis) and 3.6 kg (on dry weight basis) for 45 cm x 45 cm x 45 cm and 60 cm x 60 cm x 60 cm size pits respectively. The filling of soils should be completed at least 5-10 days before the actual plantation. Healthy seedlings of identified species should be planted in each pit. Proper density of plants (about 1500 nos. per hectare) will require to be maintained within the green belt.

8.3 Green Belt species at proposed GKEL-Thermal power plant

Keeping in view the nature of pollutants expected from power plant and pollution attenuation coefficient of plants, the following plant species as per the CPCB guidelines for development of green belt are short-listed for planting: revised with LAI

1. Acacia nilotica (Babhul)
2. Acacia catechu (Khair)
3. Ailanthus excelsa (Maharukh)
4. Albizia lebbeck (Shiris)
5. Albizia procera (Safed shiris)
6. Azadirachta indica (Limba)
7. Bauhinia variegata (Kanchan)
8. Calotropis gigantea (Rui)
9. Calotropis procera (Mandare)
10. Cassia siamea (Sonmohor)
11. Dalbergia sissoo (Shisham)

12. Dendrocalamus strictus. (Bamboo)
13. Ficus benghalensis (Bara)
14. Ficus hispida (Bhuiumbar)
15. Madhuca indica (Mahul)
16. Pongamia pinnata (Karanji)
17. Jatropha curcas
18. Syzygium cumini (Jamun)
19. Tectona grandis (Sagwan)
20. Terminalia arjuna (Anjan)
21. Terminalia bellerica (Behada)
22. Anono squamosa (Aata)
23. Anacardium occidentalis (Kaju)
24. Nerium oleander (kaniar)
25. Cassia fistula (Sunari)
26. Terminalia chebula (Harida)
27. Lagerstroemia parviflora (Sena/Sidha)
28. Hibiscus rosasinensis (Mandar)
29. Psidium guayava (Pijuli)
30. Moringa oleifera (Sajana)
31. Zizyphus Jujuba (Bara Koli)
32. Aegle marmelos (Bela)
33. Ficus glomerata (Dimiri)

8.4 Avenue Plantation

Minimum of two rows of plants are required for plantation on roadside to minimize the pollution effects. While planting, care should be taken to ensure that plants in

second row fall in between the two plants of first row. The species suitable for planting on road sides are listed below:

1. Acacia leucophloea (Hivar)
2. Acacia nilotica (Babhul)
3. Azadirachta indica (Limba)
4. Bauhinia variegata (Bahunia)
5. Cassia siamea (Casia)
6. Dalbergia sissoo (Shisham)
7. Dendrocalamus strictus (Bamboo)
8. Pongamia pinnata (Karanj)
9. Samanea saman (Rain tree)
10. Saraca indica (Ashoka)
11. Tamarindus indica (Chinch)

The planting arrangement should be based on optimal use of available land and quantum of irrigation water and treated wastewater. A suitable budget to be allocated for the green belt development.

9.0 Biological Environment

Development of green belt with carefully selected locally grown (endemic) plant species is of prime importance due to their capacity to attenuate pollution impacts and providing habitat to micro-fauna

While developing the green belt, trees of upper, middle and lower canopy foliage shall be mixed and planted uniformly. Fruit bearing and ornamental trees shall also be distributed randomly so as to attract avi-fauna for nesting and breeding in the green belt area.

The combination of proposed green belt and large scale river water as well as rain water storage reservoirs will provide new habitat for birds, aquatic fauna etc. and improves microclimate of the region as per the past experience at similar project sites

Periodical assessment of status of terrestrial ecology in the project area including species richness, dominance and diversity of flora and avifauna by an independent agency would be useful in the long run

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The proposed large scale open surface water reservoir shall be properly fenced with controlled entry points (for purely maintenance / recreation purposes) to prevent accidental hazards

The possibility of fish culture may be explored in the proposed water storage reservoirs

10.0 Occupational *Health*

In view of the possible exposure of the operators to hydrocarbons and heat radiation as well as high voltage electrical hazards at different work places, a properly scheduled periodical diagnostic and health checkups shall be undertaken for the employees, especially for operators and lower level workers engaged at critical work places. If required, based on health records, suitable rotation of duties for workers may be implemented at critical work zones.

Potential hazards, safety procedures, emergency measures etc. shall be displayed at suitable locations at all workplaces to mitigate occupational hazards

Workers at different units may be trained properly to follow safety norms strictly to prevent incidences/accidents, about the procedures to be followed under emergency situations to minimize the intensity of impacts

Awareness programmes shall be conducted periodically for the workers regarding occupational hazards, safety aspects, emergency preparedness and environmental protection

Strict enforcement for use of personal safety and protective devices provided to them, while they are on duty

11. Environmental *Management System*

The EMS shall be developed at project appropriately to obtain IMS governing certification, which may also be indirectly useful for withstanding the current open competition in global economic system. The EMS shall broadly include:

- Establishment and maintenance of documented environmental objectives and targets at all relevant levels starting from quality assurance of feed/fuels, at each relevant operation/function at individual utilities, off sites, power modules etc. including environmental policy matters of the organization.
- Allocating responsibilities at different levels for achieving the set objectives and targets. In order to assess the performance of environmental management system, periodical assessment studies by an independent agency would be highly useful.

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11.1 Post-project *Environmental Monitoring*

11.1.1 Air *Environment*

Schemes for monitoring stack and ambient air quality shall be adopted. The ambient air quality monitoring the ground level concentrations and fugitive emissions as per CPCB/OSPCB guidelines/ Standards /Norms.

Continuous PM, SO_2, NOx, CO/CO_2 and Hg analysers should be installed for all flues of stack with data recorders/loggers in the central control room.

Regular monitoring of ground level concentrations of SPM, RPM, SO_2, NOx, be carried out.

Following equipments are recommended to be procured by the project authorities for implementing the above mentioned monitoring schemes:

RDS: (PM10/ PM2.5)

Blower	1.0-1.5 m^3/min capacity with adapter for uniform suction through filter and a properly calibrated manometer assembly for the determination of flow rate through filter paper
Particle size separator	A suitable/approved particle size separator (cyclone/cascade impacter) shall be provide for RPM measurement etc.)
Rotameter	For gaseous sampling, calibrated rotameter (0-5 LPM) for maintaining flow rate should be provided
Main housing	The main housing should be rectangular with a stand of about 1.25 m height

SO2 Analyser (pulse fluorescence technique)

Range	0 – 100 ppm
Min. detectable limit	0.001 ppm
Accuracy	± 2% of full scale

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Response time 5 sec.

5 sec.

NOx Analyzer (chemiluminscence technique)

Range	0 – 100 ppm
Min. detectable limit	0.001 ppm
Accuracy	± 2% of full scale
Response time	5 sec.

5 sec.

11.1.2 Noise Environment

Monitoring of the noise levels and exposure is essential to assess the effectiveness of Environmental Management Plan implemented to reduce noise levels. A precision digital sound level meter with octave bands and statistical analysis modules and noise exposure meter may be procured for the same. Audiometric tests should be conducted periodically for the employees working close to the high noise sources.

AMBIENT NOISE STANDARDS

AMBIENT NOISE STANDARDS (specified below)		**Day time (in dBA) Leq**	**Night time (in dBA) Leq**
i	Industrial	75.0	70.0
ii	Commercial	65.0	55.0
iii	Residential	55.0	45.0
iv	Sensitive	50.0	40.0

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AMBIENT NOISE STANDARDS FOR AUTO MOBILES (specified below)		Noise in dBA Leq	Value
i	Passenger or commercial vehicles upto 4 tonns	85.0	
ii	Passenger or commercial vehicles above 4 tonns and upto 12 tonns	89.0	
iii	Passenger or commercial vehicles exceeding 12 tonns	91.0	

11.1.3 Vibration Monitoring

Monitoring of the vibration levels is essential to assess the efficiency of maintenance schedules and vibration prevention measures undertaken at major installations

A good quality vibration analyzer should be procured for this purpose. Audiometric tests on workers are also helpful in monitoring the effectiveness of vibration protection devices and of vibration abatement programmes. The examination should be performed under the supervision of medical professionals.

12. Water Environment

12.1 Water *Source*

The source of water for this project has been identified as the Brahmani River which is at a distance of 1.5 km from the project. The water is transported through a pipeline and stored in an on-site reservoir which has a maximum capacity of 10 lakh m^3 within the plant premises.

12.2 *Water Consumption Utilization*

The process for power generation system comprises of Boiler (steam generator), Turbine with accessories, Generator unit, Transformer and equipment's all arranged to operate as complementary parts of a complete monolithic set. The super saturated steam from the boilers 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 raw water, before entering the boiler, undergoes a pre-treatment process to remove contaminants in the water and protect the boiler from corrosion. The stream passes through a mechanical clarifier and compressor p/h in the process. The output stream from the compressor is passed on to the boiler, while the stream arising from the compression turbine is sent to a cooling water circuit.

a) Industrial operations:

The raw water from the reservoir is utilised by various industrial processes as follows:

- The raw water first undergoes treatment to remove contaminants in a Reverse Osmosis (RO) plant.
- The treated water then passes through the de-mineralisation plant where the effluent is stored in a neutralisation pit, after which it goes for further utilisation.
- This is then sent to the cooling water circuit as part of the CT make-up.
- The treated water is then passed through the boiler for heating, in addition to being used as fire water, oil area service water and for TG house washing.
- The effluent from the above mentioned processes are then treated in the oil or industrial waste water treatment plants before being collected in the clean basin.

b) Domestic operations

The raw water from the reservoir, after under-going treatment, is also utilised for domestic procedures as detailed below:

- The water is supplied to the nearby township and its associated facilities to serve all the existing domestic needs. The water is then treated in a Sewage Water Treatment Plant that is present in the township.
- The water is also utilised for the domestic workings in the plant and on-site. The resultant contaminated water is treated in a domestic waste water treatment plant and stored for further use in a Clean Water Basin.

c) Green Belt Developments

To attenuate the impact of fugitive emissions, GKEL has developed a green belt along the plant boundary, dust prone area and township. The clean water from the various treatment plants is stored in a Clean Water Basin. This water is used for horticulture purposes and is supplied in the form of road spray and through pipes.

12.3 Water and waste water treatment

a) Raw water treatment

The water entering the reservoir from the river undergoes pre-treatment to limit the contamination entering the boiler and thus reducing risk of corrosion in all the equipment. The water enters the Reverse Osmosis (RO) plant where salt-free water is taken out from the raw water after the sand filtration. After degasification the water is passed through the De-Mineralisation plant and stored in the D/M storage tank.

The DM Plant meets the requirement of the steam generator feed water make up, Auxiliary Cooling water (ACW) system make-up with a total productive output of 2700 m^3 per day of DM water based on the steam generator feed water make up at 3 % MCR. There are three streams at the DM plant, each stream for an output of 78 m^3

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/hr. Each stream of the DM pant consists of a strong acid cation unit, de-gasser system, strong base anion unit and a mixed bed unit. Two activated carbon filters are used for de-chlorination purposes and also used for removing traces of oil and greases present in the DM plant influent. The DM water from the mixed based unit is led to the DM water storage tanks (1 nos.) of capacity of 1000 m^3 each and is transferred to the condensate storage tanks. The condensate storage tanks are sized to meet the maximum requirement of DM water when the units are under start up. Thereafter, the effluent is collected in a neutralization pit and, after necessary treatment; clear water goes to the guard pond for further utilization.

b) Effluent Treatment Plant (ETP):

The effluent treatment plant treats the industrial wastewater from the plant to satisfy the required standard for each effluent stream. Treated effluent streams are taken to the recycle water pond in the sewage treatment station. The recycle water pond has the capacity of 5000 m^3 and ensures 24 hours holding basin at maximum throughout from each stream. The treated water is utilized in steam generation, dust suppression in coal yard etc. One on-line monitoring equipment for continuous monitoring of parameters like TSS, pH, temperature has been provided. The schematic flow for wastewater treatment at the power plant is shown below:

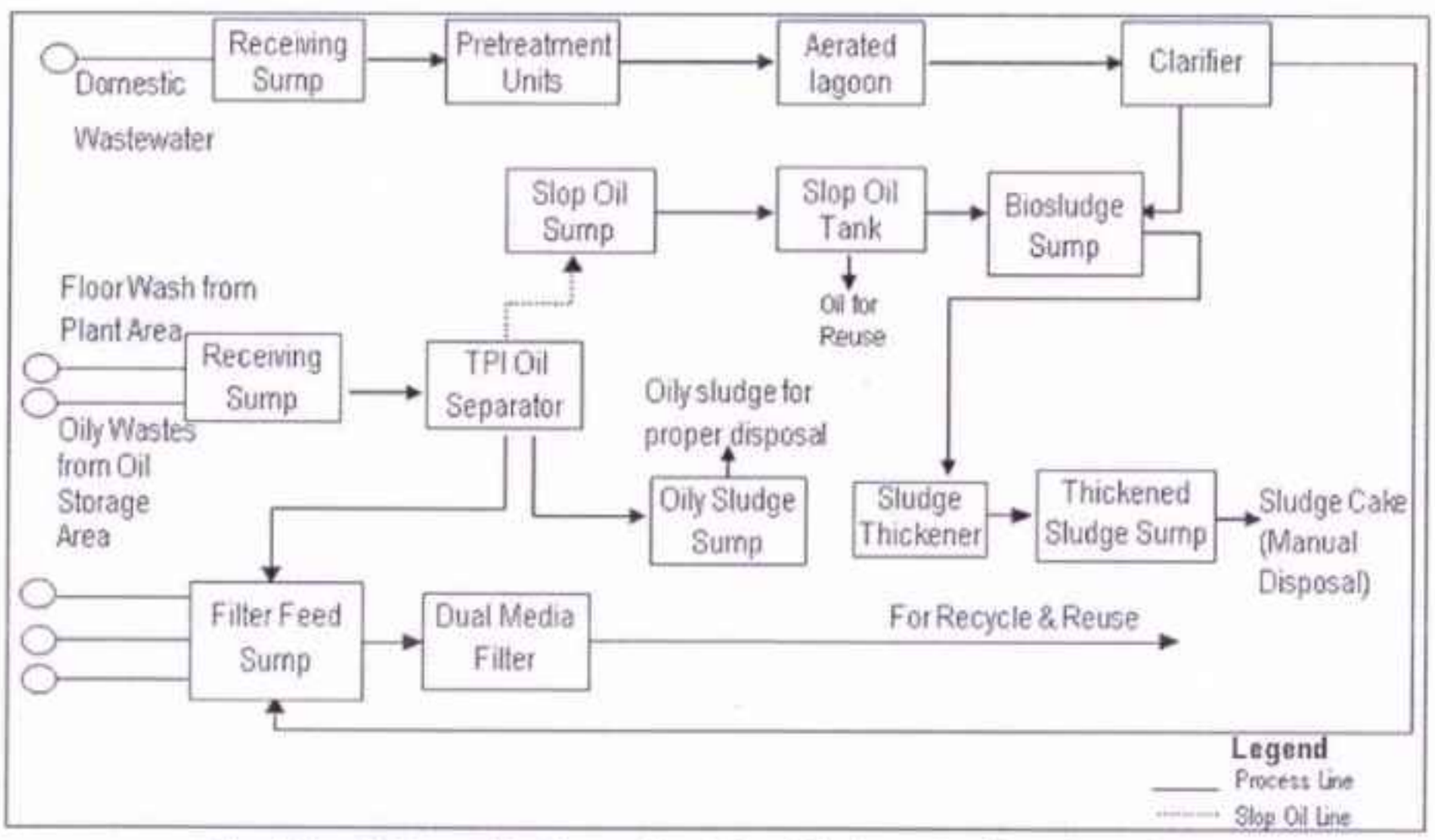

Fig. 5.2 : Schematic Flow sheet for Wastewater Treatment

The oily sludge from the separator is to be disposed at identified locations as per OSPCB requirements. The backwash water from dual media filter can be reused after settling for secondary purposes such as floor washing etc.

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c) *Coal* Waste Water Treatment Plant
shall be re used in the dust suppression etc.

Schematic Flow diagram

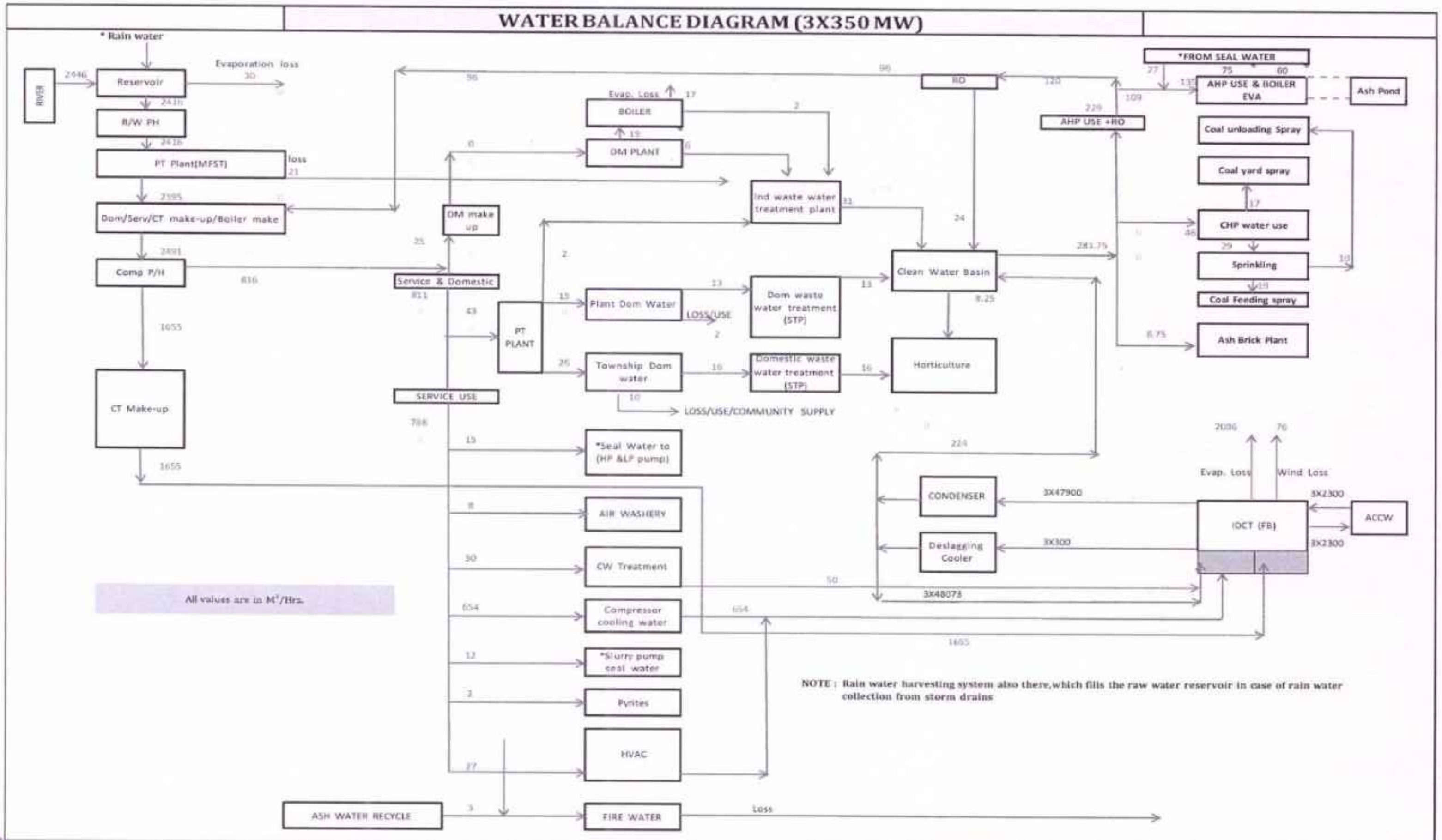
d) Sewage treatment plant:

The average quantity of domestic sewage is 576 m^3/d. Domestic sewage from the plant is conveyed through closed drains to the sewage regulating pond, and then pumped into the complete sets of equipment for sewage treatment conducting biological contact oxidation treatment. The treated water is disinfected before discharging into the central effluent monitoring basin. Two sets of domestic sewage pumps of capacity 20 m^3/h have been provided.

Another one set of STP having capacity of 211KLD is provided for township sewage.

e) Ash Pond decanted water recovery system:-

Figure 1 Water Balance Diagram of GKEL



CONSERVATION AND CONTROL MEASURES:

- Water and Wastewater are to be analyzed regularly for the following listed parameters as per the general and specific standards for the thermal power plant and specific discharge standards stipulated by the Orissa State Pollution Control Board.
    - pH
    - Suspended solids
    - Total dissolved solids (TDS)
    - Dissolved oxygen (DO)
    - Chemical oxygen demand (COD)
    - Biochemical oxygen demand (BOD)
    - Sulphide
    - Residual free chlorine
    - Oil and grease
    - Total ammonical nitrogen (NH_3-N)
    - Bacteriological contamination

- The Brahmani River, which serves as the source of raw water for the project, has been identified to have sufficient supportive capacity at present for the plant. However, in order to prevent any shortages in raw water supply, a rain water harvesting system is in place to be maintained as an integral part of the project.
- In addition to reuse and recycle of effluent water on site, conservation of raw water will be practiced throughout the lifetime of the plant, thus mitigating waste water generation.
- The large scale water reservoir will be properly fenced with controlled entry points (for purely maintenance/recreation purposes) to prevent accidental hazards.
  As per the design, 5 CoC has been considered for estimation of raw water requirement and evaluation of water balance. However as per the baseline quality of the raw water, there is possibility of higher CoC.

- Specific water consumption should be limited within 3.5m3/mw as per the MoEF &CC, New Delhi vide notification dated 07.12.2015

MONITORING OF WATER QUALITY

Following locations for sampling are recommended:

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- Inlet and outlet of water treatment plant
- Influent to wastewater treatment plant
- Treated effluent before disposal
- Inlets and outlets of individual stages of treatment
- Outlet of tertiary treatment units

Daily analysis of influent and effluent of wastewater treatment plant is recommended. Sampling and analysis of wastewater from individual treatment unit for relevant parameters depending on type of treatment facility provided be carried out once a week.

Methods of sample collection and preservation should be as per prescribed methods of OSPCB, CPCB and MoEF.

Methods prescribed in "Standard Methods for Examination of Water and Wastewater" prepared and published jointly by American Public Health Association (APHA), American Water Works Association (AWWA) and Water Pollution Control Federation (WPCF).

An independent laboratory with facilities for chemical analysis should be set up within the premises for each stage of proposed project. The laboratory should have a provision for fume-hood and a cold room. A separate air conditioned dust-proof room will be required for installing analytical instruments. Following instruments may be procured:

Analytical precision balances	2
pH meters	2
Conductivity meter	1
Turbidity meter	1
Ion analyzer for nitrate, sulphate and chloride	1
D.O. analyzer	1
B.O.D. incubator	1
COD analyser	1
Total organic carbon analyzer	1
UV/VIS Spectro-photometer	1

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Flame photometer	1

Table 1.1 Wastewater Sources at GKEL-TPP

Sources of Wastewater	Significant Parameters	Treatment Proposed
Condenser Cooling	Total Dissolved Solids (1000-1600mg/l)	This effluent will be routed to plant drain tank for diluting with other effluents before reuse and discharge to effluent channel
Demineralization Plant	pH (4 to 10) TDS (2000 mg/l)	pH neutralization and mixing with other effluents for onward disposal to effluent channel
Filter Backwash	Suspended Solids	This will be routed to settlers. The overflow after settling will be routed through drain for disposal to effluent channel
Plant Service Water System	Oil and Grease Suspended Solids	The waste containing Oil and Grease will be treated in oil separator and the treated wastewater will be routed through drain for further treatment The waste containing high suspended solids will be routed to settlers for removal of suspended solids and the treated wastewater will be pumped to plant drain tank for reuse
Domestic Wastewater from Colony	BOD (200-250 mg/l) TSS (300-450 mg/l)	The waste will be treated in STP along with power plant wastewater

Table 1.2 Wastewater Characteristics at GKEL-TPP

Sr. No.	Parameter	Before Treatment	After Treatment
1.	pH	5.5-9.0	6.5-8.5
2.	Temp*	--	--
3.	Free Available Chlorine (mg/l)	--	0.5
4.	Suspended Solids (mg/l)	100-450	<100
5.	Oil and Grease (mg/l)	50-500	<10
6.	Copper (Total) (mg/l)	1-3	<1
7.	Iron (Total) (mg/l)	1-3	<1
8.	Zinc (mg/l)	1-5	<1
9.	Chromium (Total)# (mg/l)	--	--
10.	Phosphate (mg/l)	5-10	2-3
11.	Other corrosion inhibiting material(+)(mg/l)	--	--
12.	BOD (mg/l)	250-350	<30
13.	COD (mg/l)	450-600	200
14.	TDS (mg/l)	500-2,000	1400-1600

* Not applicable in view of proposed closed/recirculating cooling system and no discharge envisaged from proposed project

\# Not envisaged in view of proposed non-chromate based proprietary chemicals as antiscaling/anticorrosion purpose (polyphosphatic based chemicals)

(+) OSPCB prescribed standards will be complied

Effect from: 08-Mar-2013

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Annexure-XXIII

Capital and recurring investment on environmental management plans

Sl. No	Particulars	Capital Investment till September' 2024 (Rs. In Lakhs)	Recurring Investment for the year 2024-25 till September'2024 (Rs. In Lakhs)
1	Water Pollution Control System	6328.86	15.27
2	Air Pollution Control System	25501.1	263.65
3	Waste Management System (Fly Ash, Solid waste, Hazard waste etc. & Installation of Ash Brick making plant)	7511.79	3415.72
4	Green Belt development	508.76	95.34
5	Environmental Monitoring (Online & Manual)	195.84	43.05
6	Plant Housekeeping & Water sprinkling on Plant Roads	82.13	235.87
7	Environmental Studies /Consultancy Charges	-	1.65
8	Statutory Fee (CTO/CTE etc.)	-	0.00
9	Environmental Awareness Activities - WED, WWD, Earth Day etc.	-	1.07
10	Others (OHS & Fire management)	58.00	5.29
	Total (Amount in Lakh Rs.) =	**40186.48**	**4076.91**

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