Ref No. EOGEPL/CBM-RG (E)/E&F/2017/182

Date: 29th November, 2017

Essar Oil and Gas Exploration and Production Ltd.
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To,
The Director
Ministry of Environment and Forests
Eastern Regional Office
A/3 Chandrasekharpur
Bhubaneswar-751 023
Orissa

**Sub: Submission Half-yearly Compliance Report of the Environmental Clearance (Phase-I) by Essar Oil Limited (E&P Division) reg.**

**Ref: Environmental Clearance of Phase-I granted by MoEF vide letter no.J-11011/660/2007-IA II (I) dated 06th May, 2008**

**Dear Sir**

We are enclosing herewith the half-yearly compliance report in respect of the stipulated prior environmental clearance terms and conditions for the Phase-I CBM project activities for the period of April, 2017- September, 2017.

**Thanking you.**

**Yours faithfully**
**For Essar Oil and Gas Exploration and Production Limited**

C. D. Narayanswamy
*Chief Operating Officer*
Essar Oil and Gas Exploration and Production Limited
Raniganj East CBM Project-Durgapur

**Authorized Signatory**

**Encl: Phase-I Compliance Report**

**Copy to:**

**1. Member Secretary (Industry), MoEF, CGO Complex, Paryavan Bhavan, New Delhi-110003**

**2. The Environmental Engineer, Durgapur Regional Office, WBPCB, Durgapur-713216**

**Essar Oil and Gas Exploration and Production Limited**

**RG (East)-CBM-2001/1 (Phase-I) Half Yearly Environment Clearance Compliance Report – April'17- September'17**

**Ref: Environment Clearance no. F. No. J-11011/660/2007- IA II (I) dated 06.05.2008**

| Sr. No. | EC Conditions | Compliance Status |
|---|---|---|
| **Specific Conditions** | | |
| 1. | The Company shall comply with the guidelines for disposal of solid waste, drill cuttings and drilling fluids for onshore drilling operation notified vide GSR 546(E) dated 30th August, 2005. | Drill cuttings have been collected and stored in HDPE lined pits.<br>Drilling of Phase-I activities (15 test wells and 12 core holes) has been completed. |
| 2. | The Company shall pay Compensation for acquisition of private land as per the Central Government/State Govt Norms. The compensation to be paid to the land losers shall not be less than the norms/package as per the policy on National resettlement and rehabilitation Rules, 2007. | The acquisition has been done directly with the concerned land owners and the compensation is paid to the above as per the prevailing market rate. There is no involvement of Rehabilitation and Resettlement. |
| 3. | The Company shall monitor data on methane and non-methane hydrocarbon and data submitted to ministry. | Methane hydrocarbon data is being monitored as a part of ambient air quality monitoring.<br>AAQM report is attached as ***Annexure I.*** |
| 4. | The drilling shall be restricted to the mines free area. The company shall use (Water Based Mud) WBM. | Drilling has been carried out in mine free area within the block area granted by the Ministry of Petroleum and Natural Gas (MoPNG). Water based mud has been used for drilling |
| 5. | The surface facilities shall be installed as per applicable codes and standards, international practices and applicable local regulations. | All the surface facilities have been installed as per OISD and API guidelines |
| 6. | The Top soil removed wherever suitable shall be stacked separately for reuse during restoration process. | The top soil is spread in the designated Green Belt area of the major facility. |

| Sr. No. | EC Conditions | Compliance Status |
|---|---|---|
| 7. | Drilling waste water including drill cutting wash water shall be collected in disposal pit lined with HDPE lining evaporated or treated and shall comply with the notified standards for on-shore disposal. | Drilling wastewater including drill cutting and wash water has been collected and stored in HDPE lined pit for solar evaporation. |
| 8. | The company shall take necessary measures to prevent fire hazards and soil remediation as needed. At place of ground flaring the flare pit shall be lined with refractory bricks and efficient burning systems shall be provided. In case of overhead flare stacks the stack height shall be provided as per the norms to minimize the gaseous emissions and heating load during flaring. | We do not have any ground flaring on our project. Proper stack is provided with as per the norms at central GGS for overhead flaring.<br>The following facilities have been provided for fire prevention & control.<br>▪ Installation of electrical equipment as per approved hazardous zone classification as communicated to DGMS<br>▪ Provided dry chemical fire extinguishers |
| 9. | The produced water during drilling operations shall be collected in the lined waste pits to prevent ground water contamination. The water shall be treated to the prescribed standards before disposal. The treated produced water shall be used for irrigation, pisci-culture and ground water recharge etc. | The produced water has been collected in HDPE lined pits to prevent any ground water contamination. Analysis reports of produced water are attached as ***Annexure II***.<br>Centralized Reverse Osmosis Treatment Plant with total capacity of 5100 $m^3$/day has been installed at Gas Gathering Station-1 and three well pads (EDD-050, EDH-044 & EDN-099) to cater the produced water generated from Ph-I, II & III wells. The treated produced water is reused in our own operations (HF, green belt development, Domestic purpose). Analysis reports of water treated through Reverse Osmosis plant are attached as ***Annexure III***. Excess water is discharged to the nearby stream after confirming to the discharge standards. Analysis reports of Surface water are attached as ***Annexure III A***. |
| 10. | To prevent underground coal fire, preventive measures shall be taken for ingress of ambient air during water withdrawal inside the coal seams by adopting technologies including vacuum suction. Gas detectors for detection of $CH_4$ and $H_2S$ shall be installed | As the CBM well is a closed system and do not have any contact with underground environment, there will not be any possibility of ingress of ambient air during water withdrawal.<br>Multi-gas detectors (for $CH_4$, CO, $O_2$ & $H_2S$) are used to detect the concentrations of the gases at the well head. The gas composition analysis, which |

| Sr. No. | EC Conditions | Compliance Status |
|---|---|---|
| | | is being done periodically, does not show any presence of $H_2S$. Gas presence is tested every time before work permit is issued for all hot works at the site. |
| 11. | The company shall take necessary measures to reduce noise levels at the drill site by providing mitigation measures such as proper acoustic enclosures to the DG Set and meet the norms notified by the MoEF. Height of all stacks/vents shall be provided as per the CPCB guidelines. | The company has taken following measures to reduce noise levels;<br>▪ DG sets with acoustic enclosures<br>▪ provision of silencers, rubber claddings & noise isolators<br>▪ regular maintenance & inspection of machinery & equipment<br>Adequate stack height is provided for all the DG sets. |
| 12. | Proper Infrastructure and sanitation facilities shall be provided for the construction workers during construction. All the construction waste shall be managed so that there is no impact on the surrounding environment | The sanitation facilities are provided at all drill sites. Construction, Inert & domestic waste e.g., food wastes, papers etc., generated during the activities have been collected in bins and disposed through the Durgapur Municipal Corporation. |
| 13. | The company shall take necessary measures to prevent fire hazards, containing oil spill and soil remediation as needed | Adequate nos. and type of fire extinguishers have been provided and maintained at each well site.<br>Emergency Response Plan is in place and third party audit has been carried out to ensure its appropriateness and efficiency.<br>Impervious surfaces, Secondary containment and proper spill kits are provided whenever there is possibility of land contamination. |
| 14. | The project proponent shall also comply with the Environmental protection measures and safeguards recommended in the EIA/EMP/risk analysis report as well as the recommendations of public hearing | All the recommendations of the public hearing & the environmental protection measures & safeguards as mentioned in the EIA report have been implemented. |
| 15. | To prevent well blowouts during drilling operations, Blow Out Preventer (BOP) system shall be installed. Blow out prevention measures during drilling shall | CBM well hydrostatic pressures are normally less than 2psi. However depending upon the hydrostatic pressures and sensitivity of well, Blow Out Preventer was installed wherever required. |

| Sr. No. | EC Conditions | Compliance Status |
|---|---|---|
| | focus on maintaining well bore hydrostatic pressure by proper pre-well planning and drill rig fluid | Drilling has been completed & no further drilling was carried out in the compliance period. |
| 16. | Occupational health surveillance of workers shall be carried out as per the prevailing acts and rules | All employees have undergone Pre-employment Medical Examination. |
| 17. | The Company shall take measures after completion of drilling process by well plugging and secured enclosures, decommissioning of rig upon abandonment of the well and drilling site shall be restored to near original condition. In the event that no economic quantity of hydrocarbon is found a full abandonment plan shall be implemented for the drilling site in accordance with the applicable Indian Petroleum Regulations. | Commercially viable test wells have been converted to production wells.<br>Coreholes have been abandoned and restored as per the well closure plan. |
| 18. | In case the commercial viability of the project is established, the company will prepare a detailed plan for the development of CBM block to obtain a fresh clearance from Ministry. | We have prepared the detailed plan for the development of CBM block. EC has been obtained for phase II on 29th Sep, 2011 and environmental clearance for Phase III for 650 Development cum Production wells is also granted by MoEF on 28th February, 2013. |
| **General Condition** | | |
| 1. | No further expansion or modification in the project shall be carried out without prior approval of the Ministry of Environment and Forests. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any. | For any further expansion and modification in project configuration, we would approach MoEF for the prior Environmental Clearance. |

| Sr. No. | EC Conditions | Compliance Status |
|---|---|---|
| 2. | The Project authorities must strictly comply with the rules and regulations under Manufacture, storage and import of hazardous chemical rules, 1989 as amended in 2000. Prior approval from chief inspector of factories, Chief controller of explosives, Fire Safety Inspectorate etc must be obtained, wherever applicable. | Hazardous chemicals are not used in CBM Raniganj Project. However prior approvals have been obtained from DGMS, Chief Controller of Explosives, Fire Safety Inspectorate & West Bengal Pollution Control Board. |
| 3. | The Project authorities must strictly comply with the rules and regulations with regarding to handling and disposal of Hazardous Wastes (Management and Handling) Rules, 1989/2003 wherever applicable. Authorization from the state pollution control board must be obtained for collection/treatment/storage/disposal of hazardous wastes. | Obtained Extension of Authorization for handling, storage, and disposal of HW from West Bengal Pollution Control Board for on 8th November 2016. The authorization is valid till 31th Oct 2018. Hazardous Wastes (Management and Handling) Rules, 2008 are complied. |
| 4. | The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers, enclosure etc on all sources of noise generation. The Ambient noise levels shall conform to the standards prescribed under EPA Rules, 1989 viz. 75 dBA(Daytime) and 70 dBA(Night). | Noise control measures are taken by providing acoustic enclosures & silencer for DG sets.<br>Regular noise monitoring is being carried out in the Plant area and report is attached as ***Annexure- IV.*** |
| 5. | A separate Environmental Management Cell equipped with full fledged laboratory facilities must be set up to carry out the environmental management and monitoring function | A dedicated environment management Cell is currently in operation and functioning for implementation of environment management plan at large.<br>The sampling and analysis of environmental parameters is carried out by Scientific Research laboratory (MoEF recognized). |
| 6. | The Project Authorities will provide adequate funds both recurring and non-recurring to implement the conditions stipulated by the MoEF as well as state Government along with the | Adequate funds have been provided for the CBM project as a whole (All phases together) to meet recurring and non-recurring expenses for pollution control as per stipulation of MoEF and WBPCB. |

| Sr. No. | EC Conditions | Compliance Status |
|---|---|---|
| | implementation schedule for all the conditions stipulated herein. The fund so provided shall not be diverted for any other purposes. | Details are given in ***Annexure V.*** |
| 7. | The Regional Office of the Ministry of Bhubaneswar/CPCB/SPCB will monitor the stipulated conditions. A six monthly compliance report and the monitored data along with statistical interpretation shall be submitted to them regularly. | All the required supports have been extended and will be continued to extend the support to the Regional office of this Ministry/Central Pollution Control Board/West Bengal Pollution Control Board.<br>Half Yearly Environmental Compliance Report is being submitted with Environment Monitoring Data. |
| 8. | The Project proponent shall inform the public that the project has been accorded environmental clearance by the ministry and copies of letter are available with the SPCB/Committee and may also be seen at website of the Ministry and Forest at http:/www.envfor.nic.in. This shall be advertised within seven days of issue of this letter in at least two local news papers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned. | The notice has been published news papers (vernacular & English languages) regarding the grant environmental clearance. The supporting documents have been submitted in the first compliance report (submitted on 31/12/2008). |
| 9. | The Project Authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of commencing the land development work. | The project was funded internally without any external funding. Project was commenced on 20th June, 2008 after obtaining consent to establish from WBPCB. |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | GGS 1 (GOPALPUR) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 32.66 | 24.51 | 23.54 | 28.22 | 34.46 | 33.36 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 68.85 | 55.92 | 54.21 | 59.75 | 57.18 | 78.61 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 27.37 | 29.91 | 34.82 | 33.04 | 33.04 | 36.38 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.31 | 6.18 | 5.27 | 5.94 | 4.83 | 6.18 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.468 | 0.472 | 0.432 | 0.386 | 0.392 | 0.374 |
| 6 | THC as Methane | mg/m3 | - | 1.84 | 1.72 | 1.48 | 1.79 | 1.56 | 2.31 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 2.43 | | | 3.23 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.64 | | | 0.68 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 21.34 | | | 19.39 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 32.31 | | | 40.16 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.09 | | | 0.12 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 9.38 | | | 12.61 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.31 | | | 1.55 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.51 | | | 20.20 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | JATGORIA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 50.28 | 37.87 | 27.45 | 26.47 | 30.41 | 34.56 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 101.53 | 74.08 | 59.46 | 51.39 | 52.85 | 62.16 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 30.03 | 29.81 | 31.69 | 36.03 | 34.62 | 33.51 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.29 | 5.88 | 5.80 | 6.84 | 5.63 | 5.37 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.346 | 0.386 | 0.440 | 0.418 | 0.344 | 0.342 |
| 6 | THC as Methane | mg/m3 | - | 1.92 | 1.99 | 1.68 | 1.61 | 1.78 | 2.08 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 2.95 | | | 3.17 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.84 | | | 0.42 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 18.86 | | | 17.28 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 31.42 | | | 34.16 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.12 | | | 0.11 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 11.25 | | | 11.29 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.31 | | | 1.48 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 2.04 | | | 1.88 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | MCS (MALANDIGHI) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 36.73 | 23.17 | 24.44 | 31.22 | 36.85 | 24.47 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 80.29 | 43.52 | 50.68 | 57.43 | 58.54 | 53.83 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 32.32 | 33.04 | 35.33 | 36.74 | 34.40 | 36.31 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.38 | 5.81 | 5.56 | 6.65 | 5.27 | 6.72 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.464 | 0.482 | 0.398 | 0.382 | 0.342 | 0.362 |
| 6 | THC as Methane | mg/m3 | - | 1.71 | 1.48 | 1.52 | 1.66 | 1.84 | 1.54 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 2.82 | | | 3.13 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.88 | | | 0.78 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 18.12 | | | 20.48 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 42.26 | | | 35.77 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.09 | | | 0.13 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 10.57 | | | 10.53 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.16 | | | 1.45 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.95 | | | 1.88 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | KULDIHA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 44.24 | 30.63 | 40.65 | 36.84 | 24.05 | 34.68 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 89.39 | 57.61 | 84.79 | 66.45 | 43.26 | 61.03 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 30.37 | 32.66 | 34.94 | 36.91 | 33.76 | 33.73 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.63 | 5.75 | 6.03 | 6.71 | 5.94 | 5.51 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.302 | 0.328 | 0.438 | 0.384 | 0.342 | 0.392 |
| 6 | THC as Methane | mg/m3 | - | 1.41 | 1.57 | 1.52 | 2.13 | 1.48 | 1.97 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 3.14 | | | 4.17 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.83 | | | 0.85 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 20.45 | | | 22.07 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 42.11 | | | 49.54 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.11 | | | 0.17 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 10.75 | | | 14.71 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.2 | | | 1.68 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.93 | | | 2.47 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | GOPALPUR | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 33.82 | 39.98 | 29.71 | 26.45 | 26.12 | 25.95 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 66.34 | 74.40 | 57.42 | 49.94 | 48.30 | 59.56 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 29.96 | 31.17 | 32.63 | 32.81 | 34.65 | 36.59 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 6.41 | 5.78 | 4.81 | 5.71 | 5.58 | 5.89 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.386 | 0.368 | 0.478 | 0.394 | 0.374 | 0.342 |
| 6 | THC as Methane | mg/m3 | - | 1.57 | 1.91 | 1.48 | 1.57 | 1.51 | 1.92 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 2.76 | | | 2.93 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.68 | | | 0.69 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 23.16 | | | 17.66 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 40.64 | | | 31.42 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.09 | | | 0.09 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 9.47 | | | 9.14 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.24 | | | 1.36 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.43 | | | 1.74 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited** **ANNEXURE I**

**Compliance Period: Apr'17 to Sep'17**

| S. NO. | Parameter | Unit | NAAQS Limit | GGS 2 ( AKANDARA) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 50.11 | 23.93 | 32.24 | 30.08 | 24.30 | 24.07 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 116.90 | 46.76 | 69.16 | 62.64 | 49.17 | 53.63 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 27.76 | 31.99 | 34.18 | 31.24 | 34.44 | 31.09 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.53 | 6.18 | 5.30 | 6.24 | 5.66 | 5.36 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.502 | 0.524 | 0.438 | 0.364 | 0.347 | 0.368 |
| 6 | THC as Methane | mg/m3 | - | 1.98 | 1.55 | 1.48 | 1.91 | 1.68 | 1.57 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 4.17 | | | 3.41 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.95 | | | 0.76 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 22.18 | | | 20.55 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 31.11 | | | 43.24 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.12 | | | 0.16 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 10.69 | | | 13.84 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.26 | | | 1.58 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 2.98 | | | 2.06 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited** **ANNEXURE I**

**Compliance Period: Apr'17 to Sep'17**

| S. NO. | Parameter | Unit | NAAQS Limit | SARENGA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 35.64 | 38.23 | 22.89 | 34.22 | 29.06 | 24.55 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 70.77 | 69.49 | 47.30 | 59.19 | 52.87 | 54.05 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 32.14 | 32.80 | 33.13 | 34.98 | 35.78 | 32.82 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.14 | 6.03 | 4.97 | 5.49 | 5.56 | 5.24 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.394 | 0.408 | 0.457 | 0.394 | 0.368 | 0.302 |
| 6 | THC as Methane | mg/m3 | - | 1.49 | 1.66 | 1.71 | 1.98 | 1.62 | 1.71 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 2.86 | | | 3.58 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.62 | | | 0.74 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 21.16 | | | 20.88 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 47.36 | | | 46.73 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.1 | | | 0.13 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 9.28 | | | 13.51 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.26 | | | 1.53 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.73 | | | 2.07 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | DHABANI | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 37.94 | 30.13 | 26.36 | 28.22 | 28.54 | 23.26 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 69.13 | 60.52 | 58.33 | 53.42 | 58.94 | 45.30 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 28.95 | 33.93 | 32.29 | 32.92 | 27.89 | 36.08 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.70 | 6.26 | 5.06 | 5.79 | 5.78 | 6.91 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.438 | 0.465 | 0.412 | 0.368 | 0.328 | 0.314 |
| 6 | THC as Methane | mg/m3 | - | 1.67 | 1.61 | 1.72 | 1.63 | 1.72 | 1.55 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 2.75 | | | 3.05 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.81 | | | 0.67 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 20.16 | | | 18.78 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 31.21 | | | 35.27 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.12 | | | 0.14 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 9.44 | | | 12.47 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.36 | | | 1.41 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.83 | | | 1.68 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | NACHAN | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 40.80 | 26.72 | 25.22 | 20.39 | 24.10 | 31.33 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 76.12 | 56.84 | 54.49 | 47.37 | 49.39 | 56.25 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 28.10 | 33.70 | 32.20 | 32.79 | 34.28 | 38.20 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.53 | 6.06 | 5.45 | 6.94 | 5.48 | 6.38 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.474 | 0.484 | 0.462 | 0.402 | 0.368 | 0.347 |
| 6 | THC as Methane | mg/m3 | - | 1.73 | 1.68 | 1.57 | 1.5 | 1.65 | 1.89 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 3.02 | | | 3.09 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.74 | | | 0.46 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 13.89 | | | 15.23 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 33.16 | | | 33.12 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.11 | | | 0.10 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 10.29 | | | 10.36 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.45 | | | 1.39 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.69 | | | 1.71 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited** **ANNEXURE I**

**Compliance Period: Apr'17 to Sep'17**

| S. NO. | Parameter | Unit | NAAQS Limit | GHATAKDANGA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 53.97 | 26.19 | 23.56 | 29.65 | 35.49 | 21.23 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 128.05 | 52.61 | 51.93 | 55.73 | 61.68 | 43.10 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 28.17 | 30.67 | 34.90 | 35.89 | 33.44 | 34.62 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.05 | 5.77 | 5.58 | 6.75 | 4.80 | 6.46 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.322 | 0.364 | 0.368 | 0.344 | 0.302 | 0.328 |
| 6 | THC as Methane | mg/m3 | - | 1.89 | 1.67 | 1.34 | 1.84 | 1.97 | 1.43 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 4.09 | | | 3.48 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.97 | | | 0.71 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 17.06 | | | 19.74 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 38.14 | | | 40.81 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.15 | | | 0.15 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 12.89 | | | 12.23 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.17 | | | 1.49 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 2.67 | | | 1.95 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | KANTABERIA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 35.62 | 37.85 | 33.67 | 25.38 | 34.50 | 21.21 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 75.53 | 72.33 | 63.29 | 41.19 | 55.59 | 56.41 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 32.03 | 30.02 | 32.30 | 32.32 | 38.85 | 36.49 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 6.17 | 6.35 | 5.64 | 6.11 | 5.89 | 5.70 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.462 | 0.482 | 0.408 | 0.382 | 0.362 | 0.368 |
| 6 | THC as Methane | mg/m3 | - | 1.29 | 1.84 | 1.64 | 1.33 | 1.6 | 1.86 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 2.88 | | | 2.78 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.75 | | | 0.38 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 17.36 | | | 14.71 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 32.16 | | | 30.11 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.1 | | | 0.08 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 9.82 | | | 9.02 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.3 | | | 1.27 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.77 | | | 1.54 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | PRATAPPUR | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 31.36 | 43.98 | 23.40 | 26.84 | 23.77 | 20.95 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 66.60 | 95.80 | 48.37 | 64.45 | 48.48 | 49.59 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 32.07 | 33.05 | 33.87 | 36.03 | 34.04 | 35.11 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 6.55 | 6.40 | 4.97 | 6.84 | 6.33 | 5.96 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.408 | 0.422 | 0.438 | 0.398 | 0.314 | 0.344 |
| 6 | THC as Methane | mg/m3 | - | 1.34 | 1.77 | 1.38 | 2.04 | 1.61 | 1.66 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 2.53 | | | 3.72 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.62 | | | 0.81 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 15.36 | | | 21.09 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 32.31 | | | 45.64 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.08 | | | 0.16 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 9.25 | | | 14.34 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.42 | | | 1.62 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.66 | | | 2.33 | | |

**Ambient Air Quality of Surrounding Villages of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE I**

| S. NO. | Parameter | Unit | NAAQS Limit | PARULIA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Apr'17 | May'18 | Jun'19 | Jul'17 | Aug'17 | Sep'17 |
| 1 | Particulate Matter (PM2.5) | µg/m3 | 60 (24 hrs) | 33.84 | 39.46 | 20.19 | 31.12 | 39.06 | 31.25 |
| 2 | Particulate Matter 10 (PM10) | µg/m3 | 100 (24 hrs) | 69.50 | 82.49 | 46.26 | 58.98 | 67.99 | 58.18 |
| 3 | Nitrogen Dioxide (NO2) | µg/m3 | 80 (24 hrs) | 30.66 | 31.86 | 34.16 | 31.96 | 33.67 | 35.84 |
| 4 | Sulphur Dioxide (SO2) | µg/m3 | 80 (24 hrs) | 5.80 | 6.66 | 5.18 | 5.63 | 5.59 | 5.92 |
| 5 | Carbon Monoxide (CO) | mg/m3 | 2 (8 hrs) | 0.462 | 0.432 | 0.468 | 0.416 | 0.374 | 0.374 |
| 6 | THC as Methane | mg/m3 | - | 1.47 | 1.85 | 1.56 | 1.81 | 2.06 | 1.74 |
| 7 | Mercury | µg/m3 | - | < 0.002 | | | < 0.002 | | |
| 8 | Hydrocarbon as Non Methane | mg/m3 | - | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| 9 | VOCs | µg/m3 | - | 2.77 | | | 3.65 | | |
| 10 | Benzo(a)Pyrene | $ng/m^3$ | 1 | 0.57 | | | 0.72 | | |
| 11 | Ammonia ($NH_3$) | $\mu g/m^3$ | 400 | 21.2 | | | 18.62 | | |
| 12 | Ozone ($O_3$) | $\mu g/m^3$ | 100 | 37.15 | | | 42.33 | | |
| 13 | Lead (Pb) | $\mu g/m^3$ | 1 | 0.08 | | | 0.12 | | |
| 14 | Nickel (Ni) | $ng/m^3$ | 20 | 8.85 | | | 12.17 | | |
| 15 | Arsenic | $ng/m^3$ | 6 | 1.3 | | | 1.51 | | |
| 16 | Benzene | $\mu g/m^3$ | 5 | 1.72 | | | 2.12 | | |

**Produced Water Analysis Report of CBM Raniganj Project of Essar Oil and Gas Exploration and Production Limited**
**(Compliance Period: Apr'17 - Sep'17)**

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDI-040 D-3 | EDI-038 D-2 | EDE-018 V-1 | EDD-003 D-6 | EDD-011 D-2 | EDD-404 D-1 | EDD-401 V-1 | EDD-429 D-2 | ED-411 D-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 07.04.2017 | 07.04.2017 | 07.04.2017 | 07.04.2017 | 07.04.2017 | 07.04.2017 | 07.04.2017 | 07.04.2017 | 07.04.2017 |
| 1 | pH | | 5.5 to 9.0 | 8.11 | 8.16 | 8.62 | 8.81 | 8.32 | 8.45 | 8.51 | 8.37 | 8.05 |
| 2 | Total Suspended Solids | mg/l | 100 | 41 | 17 | 3 | <2 | 8 | <2 | <2 | 4 | 16 |
| 3 | Total Dissolved Solids | mg/l | --- | 1532 | 3078 | 1618 | 1928 | 1276 | 1386 | 1092 | 794 | 2026 |
| 4 | Turbidity | NTU | --- | 70.3 | 42.6 | 6.3 | 5.2 | 24.2 | 2.8 | 3.2 | 11.3 | 4.3 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | 2.8 | 2.8 | Nil | Nil | Nil | Nil | Nil | Nil | 3.2 |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 180.50 | 441.6 | 280.6 | 304 | 190.2 | 218.4 | 165.3 | 134.2 | 411.4 |
| 7 | Chloride | mg/l | --- | 428.5 | 730.1 | 440 | 630.2 | 317.1 | 379.2 | 280.5 | 239 | 612 |
| 8 | Total Hardness | mg/l | --- | 64.00 | 124 | 76 | 88 | 56 | 60 | 44 | 40 | 92 |
| 9 | Sulphate | mg/l | --- | 15.3 | 27.6 | 14.2 | 11.7 | 10.3 | 9.6 | <2.5 | <2.5 | 14.2 |
| 10 | Calcium | mg/l | | 14.4 | 32.1 | 16 | 17.6 | 16 | 14.4 | 12.8 | 11.2 | 27.3 |
| 11 | Magnesium | mg/l | --- | 6.8 | 10.7 | 8.7 | 10.7 | 3.9 | 5.8 | 2.9 | 2.9 | 5.8 |
| 12 | Dissolved Oxygen | mg/l | --- | 5.9 | 6.1 | 6.4 | 4.1 | 2.8 | 4.6 | 5.1 | 2.5 | 3.3 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 3 | <2 | <2 | 2 | 7 | 2 | <2 | <2 | 6 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | 14.0 | <8 | <8 | 9 | 28 | 8 | <8 | <8 | 19 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5.0 | <5.0 | <5 | <5.0 | 6 | 6 | <5.0 | <5.0 | <5.0 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 2.8 | 1.35 | 1.15 | 0.83 | 1.3 | 0.98 | 3.2 | 4.1 | 2.1 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 5.20 | 2.3 | 1.9 | 1.9 | 4.7 | 3.3 | 5.7 | 2.8 | 4.3 |
| 20 | Iron | mg/l | --- | 21.40 | 11.2 | 2.8 | 0.96 | 3.8 | 0.48 | 0.72 | 1.85 | 9.62 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | 0.158 | 0.086 | 0.097 | 0.049 | 0.025 | <0.01 | 0.025 | 0.039 | <0.01 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDI-040 D-3 | EDI-038 D-2 | EDE-018 V-1 | EDD-003 D-6 | EDD-011 D-2 | EDD-404 D-1 | EDD-401 V-1 | EDD-429 D-2 | ED-411 D-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 15.3 | 16.8 | 5.4 | 19.2 | 11.8 | 12.7 | 12.4 | 11.4 | 23 |
| 30 | Phosphorus | mg/l | --- | 0.43 | 0.29 | 0.18 | 0.14 | 0.28 | 0.19 | 0.079 | 0.18 | 0.11 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | 0.081 | <0.05 | <0.05 | <0.05 | 0.073 | <0.05 | <0.05 | 0.093 | <0.05 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 220.2 | 538.8 | 332.3 | 312.3 | 232 | 266.4 | 201.7 | 163.7 | 501.9 |
| 41 | Electrical Conductivity | µmhos/c | --- | 2311 | 4792 | 2426 | 3017 | 2025 | 2148 | 1732 | 1280 | 3112 |
| 42 | Sodium | mg/l | --- | 280.1 | 430 | 245.1 | 414 | 202.5 | 225.3 | 188 | 165 | 508 |
| 43 | Potassium | mg/l | --- | 10.5 | 14.3 | 8.6 | 9.3 | 6.4 | 7.3 | 14.1 | 8.9 | 10.2 |

**Produced Water Analysis Report of CBM Raniganj Project of Essar Oil and Gas Exploration and Production Limited**
**(Compliance Period: Apr'17 - Sep'17)**

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDP-406 D-3 | EDH-65 D-3 | EDN-162 D-6 | EDN-179 V-1 | EDN-184 V-1 | EDN-184 D-5 | EDI-70 D-2 | EDD-26 D-2 | EDD-26 D-4 | EDI-32 V-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 07.04.2017 | 07.04.2017 | 07.04.2017 | 07.04.2017 | 07.04.2017 | 07.04.2017 | 10.04.2017 | 10.04.2017 | 10.04.2017 | 10.04.2017 |
| 1 | pH | | 5.5 to 9.0 | 8.92 | 8.24 | 6.52 | 8.71 | 7.78 | 7.31 | 7.85 | 7.98 | 8.69 | 8.22 |
| 2 | Total Suspended Solids | mg/l | 100 | <2 | 7 | 97 | 14 | 12 | 23 | 38 | 11 | 2 | <2 |
| 3 | Total Dissolved Solids | mg/l | --- | 786 | 2846 | 2924 | 2164 | 1984 | 2496 | 6248 | 2342 | 1038 | 3234 |
| 4 | Turbidity | NTU | --- | 5.8 | 14.7 | 180 | 48.5 | 37.2 | 61.3 | 81.2 | 23.5 | 6.9 | <1 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | Nil | Nil | 20.8 | Nil | 11.8 | 15.3 | 9.3 | 6.8 | Nil | 1.1 |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 157.8 | 382 | 407.2 | 247 | 211.5 | 379.5 | 626 | 282.5 | 170.3 | 426.5 |
| 7 | Chloride | mg/l | --- | 303.1 | 812 | 926 | 770 | 668.1 | 745.3 | 1420 | 812 | 336.5 | 928 |
| 8 | Total Hardness | mg/l | --- | 40 | 112 | 120 | 84 | 76 | 100 | 188 | 88 | 72 | 172 |
| 9 | Sulphate | mg/l | --- | 6.9 | 18.7 | 16.3 | 17.4 | 12.2 | 21.5 | 22.4 | 14.7 | 11.3 | 14.7 |
| 10 | Calcium | mg/l | | 9.6 | 27.3 | 30.5 | 24 | 16 | 28.9 | 46.5 | 20.8 | 17.6 | 43.3 |
| 11 | Magnesium | mg/l | --- | 3.9 | 10.7 | 10.7 | 5.8 | 8.7 | 6.8 | 17.5 | 8.7 | 6.8 | 15.6 |
| 12 | Dissolved Oxygen | mg/l | --- | 5.8 | 5.5 | 4.3 | 5.1 | 5.3 | 3.9 | 5.9 | 6 | 6.2 | 6.2 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | <2 | <2 | 4 | 2 | 2 | 3 | 2 | <2 | <2 | <2 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | <8 | <8 | 14 | 11 | 8 | 14 | 8 | <8 | <8 | <8 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 3.7 | 5.7 | 6.8 | 3.8 | 6.2 | 4.9 | 2.85 | 1.8 | 1.16 | 3.8 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 1.7 | 2.8 | 3.9 | 5.5 | 3.1 | 7.2 | 4.3 | 2.1 | 2.7 | 2.9 |
| 20 | Iron | mg/l | --- | 1.8 | 2.45 | 32.4 | 9.65 | 7.8 | 11.6 | 49.6 | 12.2 | 4.2 | 0.18 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | <0.01 | 0.019 | 0.156 | 0.109 | 0.075 | 0.117 | 0.109 | <0.01 | <0.01 | <0.01 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDP-406 D-3 | EDH-65 D-3 | EDN-162 D-6 | EDN-179 V-1 | EDN-184 V-1 | EDN-184 D-5 | EDI-70 D-2 | EDD-26 D-2 | EDD-26 D-4 | EDI-32 V-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 14.5 | 21.9 | 26.8 | 25.7 | 21.3 | 22 | 31.1 | 26.4 | 9 | 20.5 |
| 30 | Phosphorus | mg/l | --- | 0.12 | 0.21 | 0.49 | 0.33 | 0.23 | 0.45 | 0.33 | 0.19 | 0.14 | 0.29 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | <0.05 | <0.05 | 0.108 | 0.081 | 0.065 | 0.092 | 0.143 | 0.088 | <0.05 | <0.05 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 95.2 | 466 | 496.5 | 285 | 258 | 463 | 763.7 | 344.7 | 207.8 | 520.3 |
| 41 | Electrical Conductivity | µmhos/c | --- | 1224 | 4516 | 469 | 3382 | 3070 | 3892 | 9588 | 3682 | 1662 | 4897 |
| 42 | Sodium | mg/l | --- | 212.2 | 533.6 | 676.5 | 543 | 428 | 506 | 980.3 | 570 | 174 | 618 |
| 43 | Potassium | mg/l | --- | 9.2 | 7.4 | 11.6 | 10 | 12.6 | 14.5 | 16.5 | 9.8 | 6.5 | 8.6 |

**Produced Water Analysis Report of CBM Raniganj Project of Essar Oil and Gas Exploration and Production Limited**
**(Compliance Period: Apr'17 - Sep'17)**

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDI-032 D-2 | EDI-032 D-3 | EDI-032 D-4 | EDI-30 D-1 | EDI-30 D-2 | EDI-30 D-3 | EDN-170 D1 | EDN-099 D2 | EDI-042 D1 | EDI-068 D2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 10.04.2017 | 10.04.2017 | 10.04.2017 | 10.04.2017 | 10.04.2017 | 10.04.2017 | 12.05.2017 | 12.05.2017 | 12.05.2017 | 12.05.2017 |
| 1 | pH | | 5.5 to 9.0 | 7.97 | 8.28 | 8.11 | 8.45 | 7.58 | 8.36 | 7.38 | 7.32 | 7.7 | 7.76 |
| 2 | Total Suspended Solids | mg/l | 100 | <2 | <2 | 12 | 84 | 96 | 8 | 6 | 5.5 | 3.2 | 7.5 |
| 3 | Total Dissolved Solids | mg/l | --- | 4326 | 4168 | 4126 | 452 | 4786 | 3648 | 16388 | 13192 | 18276 | 10216 |
| 4 | Turbidity | NTU | --- | <1 | <1 | 31.7 | 140 | 162 | 12.5 | 43.6 | 52 | 23.5 | 19.4 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | 2.1 | 1.1 | 2.4 | Nil | 11.3 | Nil | 12.1 | 13.2 | 8.4 | 12.4 |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 712 | 640.3 | 511 | 603.4 | 711.5 | 522.1 | 584.10 | 287.1 | 300.8 | 1212.6 |
| 7 | Chloride | mg/l | --- | 1012 | 1142 | 1186 | 1091 | 1207.5 | 943 | 8628.2 | 7638 | 12400 | 6459 |
| 8 | Total Hardness | mg/l | --- | 152 | 164 | 148 | 156 | 144 | 140 | 1080.00 | 620 | 412 | 76 |
| 9 | Sulphate | mg/l | --- | 15.3 | 11.4 | 18.6 | 21.3 | 24.5 | 11.6 | <2.5 | <2.5 | <2.5 | <2.5 |
| 10 | Calcium | mg/l | | 33.7 | 36.9 | 30.5 | 36.9 | 33.7 | 35.3 | 312.6 | 168.3 | 80.2 | 11.2 |
| 11 | Magnesium | mg/l | --- | 16.5 | 17.5 | 17.5 | 15.6 | 14.6 | 12.6 | 73.0 | 48.6 | 51.5 | 11.7 |
| 12 | Dissolved Oxygen | mg/l | --- | 5.9 | 6.1 | 5.2 | 3.9 | 3.1 | 3.3 | 5.7 | 5.1 | 4.9 | 5.4 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | <2 | <2 | 2 | 3 | 4 | 4 | <2 | <2 | 2.5 | <2 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | <8 | <8 | 9 | 14 | 16 | 15 | <8 | <8 | 14 | 11 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5 | <5.0 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.002 | <0.002 | <0.002 | <0.002 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 4.2 | 4.7 | 4.6 | 3.9 | 3.7 | 2.4 | 3.85 | 2.72 | 2.46 | 2.8 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 3.7 | 3.3 | 1.9 | 3.2 | 2.1 | 3.6 | 1.90 | 2.1 | 2.5 | 2.1 |
| 20 | Iron | mg/l | --- | 0.12 | 0.14 | 7.6 | 8.3 | 18.5 | 1.33 | 18.96 | 19.67 | 5.99 | 13.41 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | <0.01 | <0.01 | 0.019 | 0.076 | 0.053 | 0.043 | 0.018 | <0.01 | <0.01 | 0.042 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

| S. No. | Parameter | Unit | CPCB Standard | EDI-032 D-2 | EDI-032 D-3 | EDI-032 D-4 | EDI-30 D-1 | EDI-30 D-2 | EDI-30 D-3 | EDN-170 D1 | EDN-099 D2 | EDI-042 D1 | EDI-068 D2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 24.8 | 26.2 | 28.9 | 25.9 | 29.8 | 26.2 | 75 | 89.39 | 136.66 | 201.69 |
| 30 | Phosphorus | mg/l | --- | 0.33 | 0.17 | 0.21 | 0.17 | 0.24 | 0.17 | 0.14 | 0.18 | 0.21 | 0.29 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | <0.05 | <0.05 | 0.114 | 0.163 | 0.083 | 0.076 | <0.05 | <0.05 | <0.05 | 0.086 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 868.6 | 780.8 | 623.4 | 736.1 | 868 | 637 | 712.6 | 350.2 | 3669 | 1479.4 |
| 41 | Electrical Conductivity | µmhos/c | --- | 6724 | 6496 | 6348 | 6518 | 7285 | 5704 | 21800 | 16440 | 24800 | 11830 |
| 42 | Sodium | mg/l | --- | 702 | 770.4 | 810 | 742 | 822 | 712 | 5669.8 | 5019.3 | 6380 | 4044 |
| 43 | Potassium | mg/l | --- | 15.7 | 10.8 | 7.6 | 12.4 | 16.4 | 12.3 | 16.3 | 7.5 | 5.3 | 9.4 |

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDI-037 D6 | EDH-035 V1 | EDD-022 D3 | EDD-008 V1 | EDD-403 D1 | EDC-409 D1 | EDC-072 D8 | EDC-411 V | EDG-075 D6 | EDC-413 D3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 12.05.2017 | 12.05.2017 | 12.05.2017 | 12.05.2017 | 12.05.2017 | 12.05.2017 | 12.05.2017 | 12.05.2017 | 12.05.2017 | 12.05.2017 |
| 1 | pH | | 5.5 to 9.0 | 7.6 | 7.92 | 8.15 | 8.25 | 8.42 | 8.05 | 7.92 | 7.67 | 8.2 | 7.56 |
| 2 | Total Suspended Solids | mg/l | 100 | 4.2 | 6.8 | 3 | <2 | <2 | 2 | <2 | 7.5 | <2 | 5.4 |
| 3 | Total Dissolved Solids | mg/l | --- | 14514 | 6344 | 2010 | 2584 | 1108 | 2579.3 | 3440 | 3250 | 1964 | 3236 |
| 4 | Turbidity | NTU | --- | 22.7 | 38.9 | 6.2 | <1 | 3.5 | 10.7 | 2.4 | 76.5 | <1 | 87.5 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | 13.5 | 7.8 | 3.2 | Nil | Nil | 2.8 | 7.8 | 10.9 | 1.8 | 14.8 |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 714.4 | 1344.2 | 1410 | 1729.6 | 780.2 | 1616.8 | 1842.4 | 1983.4 | 1052.8 | 1052.8 |
| 7 | Chloride | mg/l | --- | 8439.6 | 3819 | 155.4 | 291.4 | 111.7 | 344.8 | 626.5 | 519.7 | 349.7 | 1107.3 |
| 8 | Total Hardness | mg/l | --- | 212 | 220 | 28 | 20 | 24 | 40 | 40 | 100 | 28 | 120 |
| 9 | Sulphate | mg/l | --- | <2.5 | 17.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | 13 |
| 10 | Calcium | mg/l | | 51.3 | 24 | 3.2 | 4.8 | 3.2 | 8 | 9.6 | 24 | 4.8 | 40.1 |
| 11 | Magnesium | mg/l | --- | 20.4 | 38.9 | 4.8 | 1.9 | 3.9 | 4.8 | 3.9 | 9.7 | 3.9 | 4.8 |
| 12 | Dissolved Oxygen | mg/l | --- | 5.2 | 5.9 | 5.3 | 4.9 | 5.1 | 5.4 | 5.3 | 4.9 | 5.8 | 4.6 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | <2 | 2.5 | <2 | <2 | <2 | <2 | <2 | 2.9 | <2 | 3 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | <8 | 14 | <8 | <8 | 11 | <8 | <8 | 17 | <8 | 14 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5 | <5 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 3.92 | 1.76 | 1.3 | 1.95 | 1.82 | 2.36 | 2.57 | 2.42 | 1.87 | 2.16 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 3.8 | 2.7 | 2.4 | 3.2 | 1.8 | 1.8 | 2.1 | 1.5 | 3.5 | 2.8 |
| 20 | Iron | mg/l | --- | 10.33 | 14.64 | 2.16 | 0.25 | 1.11 | 1.68 | 0.68 | 14.67 | 0.52 | 14.41 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | 0.067 | 0.102 | 0.087 | <0.01 | 0.066 | 0.069 | <0.01 | 0.104 | 0.072 | 0.108 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

| S. No. | Parameter | Unit | CPCB Standard | EDI-037 D6 | EDH-035 V1 | EDD-022 D3 | EDD-008 V1 | EDD-403 D1 | EDC-409 D1 | EDC-072 D8 | EDC-411 V | EDG-075 D6 | EDC-413 D3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 153.67 | 63.02 | 8.37 | 18.4 | 6.51 | 15.23 | 28.19 | 14.93 | 18.41 | 29.28 |
| 30 | Phosphorus | mg/l | --- | 0.42 | 0.21 | 0.094 | 0.16 | 0.22 | 0.27 | 0.17 | 0.21 | 0.19 | 0.27 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | 0.083 | <0.05 | <0.05 | 0.124 | <0.05 | 0.084 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 871.1 | 1639.9 | 1720.2 | 2110.1 | 951.8 | 1971.5 | 2247.7 | 2419.7 | 1284.4 | 1350.9 |
| 41 | Electrical Conductivity | µmhos/c | --- | 18570 | 10400 | 3370 | 4330 | 1877 | 4160 | 5660 | 5310 | 3330 | 5650 |
| 42 | Sodium | mg/l | --- | 5146 | 2150 | 102 | 189.4 | 73.4 | 221.5 | 408.5 | 343.4 | 224 | 737.5 |
| 43 | Potassium | mg/l | --- | 6 | 5.3 | 6 | 8 | 11.4 | 3.2 | 4.6 | 4.5 | 11.9 | 14.2 |

**Produced Water Analysis Report of CBM Raniganj Project of Essar Oil and Gas Exploration and Production Limited**
**(Compliance Period: Apr'17 - Sep'17)**

| S. No. | Parameter | Unit | CPCB Standard | EDN-98 D-3 | EDN-99 D-3 | EDI-40 V-1 | EDI-39 D-1 | EDI-37 D-2 | EDE-024 D-1 | EDE-001 D-1 | EDI-123 V-1 | EDH-44 D-4 | EDH-58 D-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 09.06.2017 | 09.06.2017 | 09.06.2017 | 09.06.2017 | 09.06.2017 | 09.06.2017 | 09.06.2017 | 09.06.2017 | 09.06.2017 | 09.06.2017 |
| 1 | pH | | 5.5 to 9.0 | 7.81 | 8.39 | 7.58 | 7.32 | 7.51 | 8.15 | 8.67 | 8.05 | 7.64 | 8.38 |
| 2 | Total Suspended Solids | mg/l | 100 | 19 | 14 | 3 | 21 | 9 | 11 | 2 | 11 | 9 | 3 |
| 3 | Total Dissolved Solids | mg/l | --- | 11662 | 5842 | 4638 | 4866 | 13650 | 5864 | 2864 | 20734 | 4436 | 4612 |
| 4 | Turbidity | NTU | --- | 72.5 | 61.4 | 10.6 | 69.2 | 21.3 | 30.4 | 9.7 | 51.2 | 43.5 | 11.2 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | 19.3 | Nil | 11.6 | 21.4 | 15.4 | 7.7 | Nil | 4.9 | 15.4 | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 1089.00 | 1524.6 | 772.2 | 1287 | 722.7 | 425.7 | 1950.3 | 5049 | 196 | 1072 |
| 7 | Chloride | mg/l | --- | 6412.2 | 2310.2 | 2498.9 | 2593.2 | 7826.6 | 3206.1 | 612.9 | 10042.6 | 1603 | 1933.1 |
| 8 | Total Hardness | mg/l | --- | 428.00 | 64 | 220 | 96 | 380 | 252 | 44 | 664 | 92 | 80 |
| 9 | Sulphate | mg/l | --- | <2.5 | <2.5 | <2.5 | <2.5 | 9.6 | <2.5 | <2.5 | 8.8 | <2.5 | <2.5 |
| 10 | Calcium | mg/l | | 85 | 8 | 53 | 20.8 | 75.3 | 86.6 | 16 | 227.6 | 20.8 | 19.2 |
| 11 | Magnesium | mg/l | --- | 52.5 | 10.7 | 21.4 | 10.7 | 46.6 | 8.7 | 1 | 23.3 | 9.7 | 7.8 |
| 12 | Dissolved Oxygen | mg/l | --- | 3.4 | 2.9 | 3.9 | 2 | 2.7 | 2.1 | 5.4 | 5.6 | 5.1 | 2.7 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 4 | 8 | 4 | 8 | 5 | 6 | 2 | <2 | 2 | 3 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | 14.0 | 28 | 12 | 27 | 19 | 20 | 10 | 8 | 13 | 13 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5.0 | <5.0 | <5 | <5.0 | <5 | <5 | <5.0 | <5.0 | <5.0 | <5.0 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 3.22 | 1.86 | 2.45 | 1.9 | 2.4 | 1.55 | 0.85 | 3.5 | 1.45 | 2.45 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 6.80 | 4.2 | 3.9 | 4.3 | 7.2 | 3.2 | 2.4 | 5.9 | 4.1 | 3.15 |
| 20 | Iron | mg/l | --- | 13.77 | 12.79 | 1.87 | 13.36 | 2.76 | 6.38 | 1.49 | 14.99 | 13.75 | 4.52 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | 0.044 | 0.143 | 0.019 | 0.069 | 0.042 | 0.011 | 0.017 | 0.053 | 0.041 | <0.01 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDN-98 D-3 | EDN-99 D-3 | EDI-40 V-1 | EDI-39 D-1 | EDI-37 D-2 | EDE-024 D-1 | EDE-001 D-1 | EDI-123 V-1 | EDH-44 D-4 | EDH-58 D-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 88.6 | 81 | 52.2 | 81 | 117.1 | 61.9 | 39.5 | 112.1 | 53.2 | 64.5 |
| 30 | Phosphorus | mg/l | --- | 0.41 | 0.36 | 0.29 | 0.33 | 0.41 | 0.38 | 0.21 | 0.44 | 0.3 | 0.24 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | 0.211 | 0.134 | 0.062 | 0.214 | 0.092 | <0.05 | <0.05 | 0.082 | 0.095 | <0.05 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 1328.6 | 7127.2 | 5658.4 | 1570 | 880.8 | 519.4 | 1860.1 | 6159.1 | 239.1 | 1307.8 |
| 41 | Electrical Conductivity | µmhos/c | --- | 18508 | 9738 | 7730 | 8117 | 22751 | 9746 | 4619 | 33894 | 7272 | 7460 |
| 42 | Sodium | mg/l | --- | 4214.0 | 1470 | 1780 | 1827 | 5249 | 2248.5 | 602.5 | 6649 | 1172 | 1326 |
| 43 | Potassium | mg/l | --- | 14.5 | 10.2 | 11.9 | 16.5 | 11.4 | 6.9 | 9.3 | 18.2 | 15.7 | 8.9 |

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDH-29 D-6 | EDH-29 D-1 | EDH-29 D-3 | EDD-004 D-4 | EDD-003 D-4 | EDG-74 V-1 | EDD-53 D-2 | EDD-54 V-1 | EDD-49 D-4 | EDD-405 D-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 09.06.2017 | 09.06.2017 | 09.06.2017 | 09.06.2017 | 09.06.2017 | 10.07.2017 | 10.07.2017 | 10.07.2017 | 10.07.2017 | 10.07.2017 |
| 1 | pH | | 5.5 to 9.0 | 8.17 | 8.28 | 8.14 | 8.65 | 8.93 | 8.72 | 8.81 | 8.64 | 8.86 | 9.21 |
| 2 | Total Suspended Solids | mg/l | 100 | 5 | <2 | 12 | 6 | <2 | <2 | 4 | 7 | 11 | 8 |
| 3 | Total Dissolved Solids | mg/l | --- | 7048 | 4554 | 5298 | 1948 | 2466 | 1786 | 2758 | 2642 | 6382 | 2462 |
| 4 | Turbidity | NTU | --- | 13.7 | 2.1 | 39.3 | 14.5 | 3.3 | 5.5 | 11.3 | 20.4 | 23.5 | 20.9 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | 7.7 | Nil | 4.9 | Nil | Nil | Nil | Nil | Nil | Nil | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 1463.5 | 1148.5 | 1470.3 | 580.1 | 672 | 1405.80 | 2148.3 | 1415.7 | 1989.9 | 1980 |
| 7 | Chloride | mg/l | --- | 3866.2 | 2404.6 | 2498.9 | 660.1 | 565.8 | 335.5 | 650.7 | 1075 | 3960.5 | 348.9 |
| 8 | Total Hardness | mg/l | --- | 144 | 68 | 116 | 40 | 24 | 66.60 | 31.4 | 62.7 | 43.1 | 43.1 |
| 9 | Sulphate | mg/l | --- | 7.5 | <2.5 | <2.5 | <2.5 | <2.5 | 7.8 | 9.2 | 8.5 | 12.5 | 8.8 |
| 10 | Calcium | mg/l | | 40.1 | 9.6 | 40.1 | 9.6 | 6.4 | 7.8 | 7.8 | 6.3 | 11 | 9.4 |
| 11 | Magnesium | mg/l | --- | 10.7 | 10.7 | 3.9 | 3.9 | 1.9 | 11.4 | 2.8 | 11.4 | 3.8 | 4.8 |
| 12 | Dissolved Oxygen | mg/l | --- | 4.3 | 6.3 | 2.6 | 2.5 | 6 | 5.3 | 4.9 | 5.1 | 5.6 | 4.9 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 3 | <2 | 5 | 8 | <2 | <2 | <2 | <2 | <2 | <2 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | 11 | <8 | 21 | 27 | <8 | <8 | <8 | <8 | <8 | <8 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5 | <5.0 | <5 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 1.8 | 2.6 | 2.6 | 0.91 | 1 | 1.2 | 1.9 | 1.65 | 2.8 | 2.25 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 4.85 | 3.49 | 4.2 | 2.9 | 3.4 | 3.30 | 4.28 | 2.92 | 2.62 | 2.15 |
| 20 | Iron | mg/l | --- | 6.81 | 0.64 | 12.05 | 3.99 | 0.65 | 1.20 | 3.64 | 7.23 | 4.43 | 3.99 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | 0.018 | 0.021 | 0.023 | 0.017 | 0.011 | 0.021 | 0.026 | 0.024 | 0.039 | 0.017 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

| S. No. | Parameter | Unit | CPCB Standard | EDH-29 D-6 | EDH-29 D-1 | EDH-29 D-3 | EDD-004 D-4 | EDD-003 D-4 | EDG-74 V-1 | EDD-53 D-2 | EDD-54 V-1 | EDD-49 D-4 | EDD-405 D-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 38.8 | 75.3 | 65.9 | 27.7 | 32.7 | 8.69 | 19.2 | 34.2 | 71.6 | 8 |
| 30 | Phosphorus | mg/l | --- | 0.19 | 0.15 | 0.26 | 0.19 | 0.11 | 0.29 | 0.43 | 0.32 | 0.49 | 0.35 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | <0.05 | <0.05 | 0.071 | 0.059 | <0.05 | <0.05 | 0.082 | 0.107 | 0.057 | 0.059 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 1784.9 | 1400.6 | 1793.7 | 567.6 | 640.5 | 1702.2 | 2620.9 | 1727.2 | 2127.6 | 2326 |
| 41 | Electrical Conductivity | µmhos/c | --- | 11543 | 7466 | 8849 | 3044 | 4042 | 2876 | 4297 | 3844 | 9578 | 4106 |
| 42 | Sodium | mg/l | --- | 1070 | 1428 | 1632 | 402 | 368 | 163.0 | 248 | 620 | 1079.5 | 122 |
| 43 | Potassium | mg/l | --- | 19.2 | 14.7 | 12.2 | 9.1 | 7.3 | 4.0 | 6 | 10 | 14 | <1 |

**Produced Water Analysis Report of CBM Raniganj Project of Essar Oil and Gas Exploration and Production Limited**
**(Compliance Period: Apr'17 - Sep'17)**

| S. No. | Parameter | Unit | CPCB Standard | EDD-10 V-1 | EDD-12 V-1 | EDD-04 D-3 | EDE-019 V-1 | EDI-36 D-1 | EDI-40 D-1 | EDI-68 D-5 | EDI-71 D-3 | EDN-171 D-1 | EDN-184 D-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 10.07.2017 | 10.07.2017 | 10.07.2017 | 10.07.2017 | 10.07.2017 | 10.07.2017 | 10.07.2017 | 10.07.2017 | 14.07.2017 | 14.07.2017 |
| 1 | pH | | 5.5 to 9.0 | 9.07 | 9.18 | 8.71 | 9.25 | 8.78 | 8.38 | 8.17 | 7.84 | 8.38 | 8.32 |
| 2 | Total Suspended Solids | mg/l | 100 | <2 | <2 | 17 | 8 | 38 | 18 | 22 | 58 | 24 | <2 |
| 3 | Total Dissolved Solids | mg/l | --- | 2164 | 1636 | 2714 | 2436 | 14280 | 3842 | 4964 | 16328 | 2514 | 1434 |
| 4 | Turbidity | NTU | --- | 3.2 | 3.9 | 40.7 | 13.4 | 95.5 | 34 | 38.5 | 125.5 | 57.6 | 3.7 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | Nil | Nil | Nil | Nil | Nil | Nil | 4.6 | 8.8 | Nil | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 1534.5 | 950.4 | 702.9 | 1683 | 900.9 | 841.5 | 1277.1 | 673.2 | 310.4 | 368.6 |
| 7 | Chloride | mg/l | --- | 688.4 | 132 | 1537 | 264 | 7732.4 | 2348 | 3017.5 | 10419.8 | 1367.3 | 660.1 |
| 8 | Total Hardness | mg/l | --- | 27.4 | 23.5 | 86.2 | 27.4 | 303.8 | 321.4 | 156.8 | 548.8 | 2744 | 105.8 |
| 9 | Sulphate | mg/l | --- | 6.9 | 9.5 | 11.5 | 10.3 | 46.3 | 12.5 | 10.5 | 15.7 | 9.2 | <2.5 |
| 10 | Calcium | mg/l | | 6.3 | 4.7 | 20.4 | 6.3 | 82.5 | 66 | 50.3 | 113.9 | 92.7 | 10.5 |
| 11 | Magnesium | mg/l | --- | 2.8 | 2.8 | 8.6 | 2.8 | 23.8 | 38.1 | 7.6 | 64.3 | 26.7 | 9.5 |
| 12 | Dissolved Oxygen | mg/l | --- | 5.4 | 5.3 | 4.5 | 5.1 | 3.8 | 4.6 | 4.1 | 3.1 | 4.5 | 5.8 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | <2 | <2 | 2 | <2 | 3 | <2 | 2 | 5 | 3 | <2 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | <8 | <8 | 9 | <8 | 14 | 9 | 10 | 24 | 10 | <8 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 1.4 | 2.8 | 2.4 | 1.95 | 3.4 | 2.9 | 2.65 | 3.3 | 1.8 | 0.65 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 1.98 | 4.35 | 2.65 | 3.24 | 6.2 | 3.92 | 4.45 | 5.36 | 3.35 | 1.52 |
| 20 | Iron | mg/l | --- | 0.1 | 0.1 | 11.22 | 2.2 | 18 | 22.6 | 20.5 | 27 | 0.74 | 13.72 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | 0.023 | 0.018 | 0.042 | 0.039 | 0.082 | 0.053 | 0.061 | 0.089 | 0.071 | <0.01 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDD-10 V-1 | EDD-12 V-1 | EDD-04 D-3 | EDE-019 V-1 | EDI-36 D-1 | EDI-40 D-1 | EDI-68 D-5 | EDI-71 D-3 | EDN-171 D-1 | EDN-184 D-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 22.4 | 5 | 25.1 | 7.3 | 98.1 | 23.8 | 42.1 | 63.4 | 1.9 | 7.7 |
| 30 | Phosphorus | mg/l | --- | 0.26 | 0.21 | 0.47 | 0.38 | 0.51 | 0.34 | 0.29 | 0.54 | 0.42 | 0.14 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | <0.05 | <0.05 | 0.173 | 0.059 | 0.183 | <0.05 | <0.05 | 0.153 | <0.05 | <0.05 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 1632.5 | 1048.2 | 826.5 | 1826.3 | 1099 | 1026.6 | 1558.1 | 821.3 | 378.7 | 449.7 |
| 41 | Electrical Conductivity | µmhos/c | --- | 3548 | 2357 | 4242 | 3548 | 18780 | 5780 | 6429 | 23248 | 3842.1 | 2142 |
| 42 | Sodium | mg/l | --- | 270.5 | 56 | 535 | 88 | 3935.5 | 980.3 | 1214 | 3422 | 728 | 182 |
| 43 | Potassium | mg/l | --- | 2 | <1 | 9 | 7 | 18 | 7 | 11 | 14 | 8 | <1 |

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDI-42 D-2 | EDI-40 V-1 | EDI-70 D-1 | EDI-38 D-1 | EDI-39 V-1 | EDI-68 D-3 | EDI-34 D-1 | EDH-44 V-1 | EDD-003 D-1 | EDD-17 D-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 10.08.2017 | 10.08.2017 | 10.08.2017 | 10.08.2017 | 10.08.2017 | 10.08.2017 | 10.08.2017 | 10.08.2017 | 10.08.2017 | 10.08.2017 |
| 1 | pH | | 5.5 to 9.0 | 8.19 | 6.21 | 8.04 | 8.83 | 8.76 | 9.21 | 8.34 | 8.29 | 9.15 | 9.45 |
| 2 | Total Suspended Solids | mg/l | 100 | 48 | 37 | 29 | 12 | 10 | 13 | 24 | 47 | <2 | 18 |
| 3 | Total Dissolved Solids | mg/l | --- | 8632 | 4278 | 11722 | 5752 | 4466 | 6892 | 5742 | 4246 | 2276 | 3184 |
| 4 | Turbidity | NTU | --- | 171.5 | 154 | 83.5 | 29.3 | 19.4 | 27 | 55.5 | 111 | <1 | 41.4 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | 4.9 | 32 | 5.8 | Nil | Nil | Nil | Nil | Nil | Nil | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 824.50 | 632.4 | 461.7 | 1251.3 | 746.9 | 1804.2 | 1028.2 | 1503.5 | 1843 | 1901.2 |
| 7 | Chloride | mg/l | --- | 5563.5 | 2781.8 | 8581 | 3064.7 | 2593.2 | 3583.3 | 233.5 | 2178.3 | 216.9 | 650.7 |
| 8 | Total Hardness | mg/l | --- | 232.80 | 120.3 | 613 | 147.4 | 205.6 | 147.4 | 275.5 | 116.4 | 19.4 | 38.8 |
| 9 | Sulphate | mg/l | --- | 8.8 | 10.2 | 7.5 | 6.5 | 7.3 | 5.8 | 7.4 | <2.5 | <2.5 | 4.5 |
| 10 | Calcium | mg/l | | 77.7 | 31.1 | 205.3 | 42 | 46.6 | 38.9 | 85.5 | 29.5 | 4.7 | 7.8 |
| 11 | Magnesium | mg/l | --- | 9.4 | 10.4 | 24.5 | 10.4 | 21.7 | 12.2 | 15.1 | 10.4 | 1.9 | 4.7 |
| 12 | Dissolved Oxygen | mg/l | --- | 5.1 | 4.8 | 3.5 | 5.9 | 5.3 | 4.9 | 4.7 | 5.8 | 5.1 | 6.2 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 2 | <2 | 5 | <2 | <2 | 2 | 2 | <2 | <2 | <2 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | 10.0 | 8 | 24 | <8 | <8 | 10 | 9 | <8 | <8 | <8 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5.0 | <5.0 | <5 | <5.0 | <5 | <5 | <5.0 | <5.0 | <5.0 | <5.0 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 3.8 | 2.9 | 2.1 | 2.45 | 3.25 | 2.85 | 2.35 | 3.65 | 2.2 | 2.85 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 4.21 | 6.42 | 3.96 | 5.2 | 7.28 | 6.42 | 4.3 | 5.7 | 3.8 | 4.6 |
| 20 | Iron | mg/l | --- | 27.90 | 36.4 | 18.4 | 16.8 | 14.7 | 10.7 | 15.8 | 35 | 0.28 | 8.1 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | 0.014 | 0.037 | 0.021 | 0.042 | 0.033 | 0.028 | 0.011 | 0.039 | <0.01 | 0.044 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

| S. No. | Parameter | Unit | CPCB Standard | EDI-42 D-2 | EDI-40 V-1 | EDI-70 D-1 | EDI-38 D-1 | EDI-39 V-1 | EDI-68 D-3 | EDI-34 D-1 | EDH-44 V-1 | EDD-003 D-1 | EDD-17 D-4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 56.3 | 32.5 | 45.2 | 29.6 | 15.8 | 78.9 | 18.2 | 19.9 | 41.2 | 33.8 |
| 30 | Phosphorus | mg/l | --- | 0.24 | 0.19 | 0.15 | 0.27 | 0.18 | 0.22 | 0.33 | 0.21 | 0.37 | 0.18 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | 0.082 | 0.073 | 0.058 | <0.05 | <0.05 | <0.05 | 0.068 | 0.078 | <0.05 | 0.082 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 1005.9 | 771.5 | 563.3 | 1085.8 | 669.2 | 1293 | 1254 | 1834.3 | 1342 | 1415.2 |
| 41 | Electrical Conductivity | µmhos/c | --- | 10583 | 6102 | 14622 | 8201 | 5982 | 8846 | 8431 | 5522 | 3348 | 4582 |
| 42 | Sodium | mg/l | --- | 1978.0 | 822 | 2576 | 1632 | 1136 | 2204 | 1512 | 1074 | 912 | 1054 |
| 43 | Potassium | mg/l | --- | 7.3 | 5.9 | 10.2 | 8.2 | 6.8 | 5.4 | 5.2 | 6.5 | 4.2 | 8.8 |

**Produced Water Analysis Report of CBM Raniganj Project of Essar Oil and Gas Exploration and Production Limited**
**(Compliance Period: Apr'17 - Sep'17)**

| S. No. | Parameter | Unit | CPCB Standard | EDD-17 D-5 | EDD-15 D-3 | EDD-13 V-1 | EDI-42 D-4 | EDI-40 D-2 | EDI-39 D-1 | EDI-34 D-2 | EDI-36 V-1 | EDH-64 D-1 | EDH-33 V-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 10.08.2017 | 10.08.2017 | 10.08.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 |
| 1 | pH | | 5.5 to 9.0 | 9.51 | 9.22 | 9.83 | 8.42 | 8.15 | 8.47 | 8.16 | 7.93 | 8.75 | 8.31 |
| 2 | Total Suspended Solids | mg/l | 100 | <2 | <2 | <2 | 24 | 49 | 17 | 149 | 41 | 7 | 11 |
| 3 | Total Dissolved Solids | mg/l | --- | 3622 | 3248 | 2488 | 6482 | 6588 | 5182 | 7696 | 9062 | 3692 | 5498 |
| 4 | Turbidity | NTU | --- | 2.5 | 2 | <1 | 60.5 | 97.5 | 48.8 | 679 | 95.5 | 18 | 26.2 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | Nil | Nil | Nil | Nil | 3.8 | Nil | 4.1 | 11.8 | Nil | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 2124.3 | 2172.8 | 1474.4 | 336.00 | 787.2 | 1257.6 | 873.6 | 710.4 | 2217.6 | 1833.6 |
| 7 | Chloride | mg/l | --- | 669.5 | 367.7 | 273.5 | 5516.4 | 4054.8 | 2596.2 | 4092 | 4978 | 877 | 2027.4 |
| 8 | Total Hardness | mg/l | --- | 27.2 | 19.4 | 23.3 | 333.20 | 176.4 | 188.2 | 160.7 | 313.6 | 54.9 | 94.1 |
| 9 | Sulphate | mg/l | --- | 7.1 | 5.5 | 8.3 | 6.8 | 7.6 | 6.2 | 5.9 | 8.3 | 5.2 | <2.5 |
| 10 | Calcium | mg/l | | 6.2 | 6.2 | 7.8 | 110 | 47.1 | 50.3 | 34.6 | 102.1 | 12.6 | 22 |
| 11 | Magnesium | mg/l | --- | 2.8 | <1 | <1 | 14.3 | 14.3 | 15.2 | 18.1 | 14.3 | 5.7 | 9.5 |
| 12 | Dissolved Oxygen | mg/l | --- | 5.9 | 5.5 | 6.3 | 5.3 | 5 | 5.1 | 5.1 | 5 | 5.9 | 4.8 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 2 | <2 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | <8 | <8 | <8 | <8 | <8 | <8 | 8 | 8 | <8 | <8 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5 | <5.0 | <5 | <5 | <5.0 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 3.15 | 1.9 | 4.25 | 1.98 | 2.4 | 1.36 | 3.11 | 3.65 | 2.92 | 1.96 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 5.95 | 6.2 | 3.9 | 5.21 | 4.96 | 4.22 | 6.24 | 6.81 | 5.17 | 3.28 |
| 20 | Iron | mg/l | --- | 0.33 | 0.26 | 0.2 | 12.10 | 24.4 | 23.6 | 61.5 | 25.9 | 3.73 | 2.84 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | 0.017 | <0.01 | <0.01 | 0.021 | 0.033 | 0.026 | 0.017 | 0.025 | 0.022 | 0.027 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDD-17 D-5 | EDD-15 D-3 | EDD-13 V-1 | EDI-42 D-4 | EDI-40 D-2 | EDI-39 D-1 | EDI-34 D-2 | EDI-36 V-1 | EDH-64 D-1 | EDH-33 V-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 44.3 | 96.7 | 68.9 | 50.7 | 78.8 | 62.8 | 92 | 68.3 | 97.9 | 94.6 |
| 30 | Phosphorus | mg/l | --- | 0.29 | 0.24 | 0.15 | 0.29 | 0.32 | 0.17 | 0.28 | 0.34 | 0.21 | 0.25 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | 0.072 | 0.061 | 0.850 | <0.05 | <0.05 | <0.05 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 1573.8 | 1464 | 634.4 | 410.0 | 960.4 | 1534.3 | 1065.8 | 866.7 | 1952 | 2237 |
| 41 | Electrical Conductivity | µmhos/c | --- | 4926 | 4481 | 3622 | 8249 | 8536 | 6847 | 9782 | 10190 | 5199 | 6391 |
| 42 | Sodium | mg/l | --- | 1148 | 982 | 768 | 2130.0 | 2408 | 1980 | 2680 | 2782 | 1670 | 2108 |
| 43 | Potassium | mg/l | --- | 9.2 | 7.8 | 6.1 | 9.7 | 10.8 | 8.2 | 8.1 | 10.6 | 7.3 | 7.8 |

**Produced Water Analysis Report of CBM Raniganj Project of Essar Oil and Gas Exploration and Production Limited**
**(Compliance Period: Apr'17 - Sep'17)**

**ANNEXURE II**

| S. No. | Parameter | Unit | CPCB Standard | EDH-58 D-2 | EDH-31 D-1 | EDD-50 D-1 | EDD-50 D-4 | EDD-005 D-1 | EDD-12 D-1 | EDE-09 D-1 | EDD-49 V-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | 04.09.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 | 04.09.2017 |
| 1 | pH | | 5.5 to 9.0 | 9.11 | 8.6 | 8.55 | 9.1 | 9.18 | 8.95 | 8.85 | 9.22 |
| 2 | Total Suspended Solids | mg/l | 100 | 7 | 23 | 41 | 5 | <2 | 3 | 4 | <2 |
| 3 | Total Dissolved Solids | mg/l | --- | 5106 | 5540 | 4208 | 2582 | 2896 | 2964 | 2822 | 2592 |
| 4 | Turbidity | NTU | --- | 16.5 | 53.5 | 107 | 12.5 | 1.2 | 6.6 | 10 | 1 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | 1555.2 | 1286.4 | 1267.2 | 1324.8 | 2035.2 | 1708.8 | 1536 | 1651.2 |
| 7 | Chloride | mg/l | --- | 1895.4 | 2357.4 | 1612.5 | 414.9 | 386.6 | 490.3 | 245.2 | 358.3 |
| 8 | Total Hardness | mg/l | --- | 78.4 | 160.7 | 121.5 | 43.1 | 35.3 | 43.1 | 39.2 | 39.2 |
| 9 | Sulphate | mg/l | --- | 5.3 | 4.5 | 5.8 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| 10 | Calcium | mg/l | | 23.6 | 33 | 26.7 | 7.9 | 7.9 | 9.4 | 7.9 | 7.9 |
| 11 | Magnesium | mg/l | --- | 4.8 | 19 | 13.3 | 5.7 | 3.8 | 4.8 | 4.8 | 4.8 |
| 12 | Dissolved Oxygen | mg/l | --- | 4.9 | 5.1 | 5.2 | 6.1 | 5.9 | 6.3 | 6.5 | 6.1 |
| 13 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| 14 | Chemical Oxygen Demand | mg/l | 250 | <8 | <8 | 8 | <8 | <8 | <8 | <8 | <8 |
| 15 | Oil & Grease(Hexane Extract) | mg/l | 10 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| 16 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 17 | Sulphide | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 18 | Fluoride | mg/l | 2 | 1.52 | 2.5 | 2.45 | 1.1 | 0.62 | 0.92 | 0.75 | 0.95 |
| 19 | Ammoniacal Nitrogen | mg/l | --- | 2.4 | 3.65 | 2.79 | 1.86 | 1.7 | 1.08 | 0.95 | 1.15 |
| 20 | Iron | mg/l | --- | 2.97 | 7.84 | 51.5 | 2.81 | 0.31 | 0.89 | 1.61 | 0.51 |
| 21 | Total Chromium | mg/l | 2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 22 | Zinc | mg/l | --- | 0.036 | 0.041 | 0.015 | <0.01 | <0.01 | 0.012 | <0.01 | 0.017 |
| 23 | Copper | mg/l | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Nickel | mg/l | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Total Arsenic | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 26 | Lead | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 27 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 28 | Boron | mg/l | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

**Produced Water Analysis Report of CBM Raniganj Project of Essar Oil and Gas Exploration and Production Limited**
**(Compliance Period: Apr'17 - Sep'17)**

| S. No. | Parameter | Unit | CPCB Standard | EDH-58 D-2 | EDH-31 D-1 | EDD-50 D-1 | EDD-50 D-4 | EDD-005 D-1 | EDD-12 D-1 | EDE-09 D-1 | EDD-49 V-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | SAR | | --- | 94.4 | 71.7 | 61.9 | 60.8 | 84.1 | 72.4 | 110.2 | 81 |
| 30 | Phosphorus | mg/l | --- | 0.17 | 0.19 | 0.21 | 0.11 | 0.09 | 0.15 | 0.12 | 0.18 |
| 31 | Aluminium | mg/l | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 33 | Manganese | mg/l | | <0.05 | 0.065 | 0.081 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 34 | Molybdenum | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Palladium | mg/l | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 36 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Vanadium | mg/l | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 39 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 40 | Bicarbonate | mg/l | --- | 1220 | 1098 | 1545.7 | 878.4 | 1342 | 1426 | 1260.4 | 1340.2 |
| 41 | Electrical Conductivity | µmhos/c | --- | 6168 | 6682 | 5163 | 3492 | 3244 | 3844 | 2908 | 3492 |
| 42 | Sodium | mg/l | --- | 1922 | 2088 | 1568 | 918 | 1152 | 1092 | 1582 | 1164 |
| 43 | Potassium | mg/l | --- | 8.1 | 6.9 | 5.2 | 4.1 | 5.6 | 6.8 | 7.2 | 7.9 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 |
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | GGS-1 (R.O-Inlet) | GGS-1 (R.O-Outlet) | GGS-1 (R.O-Reject) | EDD-50 (R.O-Inlet) | EDD-50 (R.O-outlet) | EDD-50 (R.O-Reject) | EDH-44 (R.O Inlet) | EDH-44 (R.O Outlet) |
| 1 | pH | | 5.5 to 9.0 | 5.5-9.0 | 8.53 | 8.15 | 7.75 | 8.31 | 8.7 | 8.85 | 8.53 | 8.45 |
| 2 | Total Suspended Solids | mg/l | 100 | 100 | <2 | <2 | 4 | 6 | <2 | 5 | 4 | 3 |
| 3 | Total Dissolved Solids | mg/l | --- | 2100 | 1422 | 218 | 7848 | 2078 | 792 | 2428 | 2784 | 1418 |
| 4 | Turbidity | NTU | --- | --- | 8.4 | 3.1 | 12.3 | 17.1 | 1.8 | 12.2 | 10.9 | 8.6 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | --- | Nil | 3.5 | 14.5 | Nil | Nil | Nil | Nil | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | --- | 242.3 | 58.5 | 770.5 | 356.1 | 139.5 | 410 | 470.5 | 198.2 |
| 7 | Chloride | mg/l | --- | 600 | 658 | 86 | 1826 | 414 | 248.5 | 526 | 937.5 | 843 |
| 8 | Total Hardness | mg/l | --- | --- | 64 | 32 | 368 | 92 | 44 | 108 | 132 | 80 |
| 9 | Sulphate | mg/l | --- | 1000 | 9.8 | <2.5 | 25.7 | 14.5 | 7.5 | 18.7 | 24.7 | 16.5 |
| 10 | Calcium | mg/l | | | 14.4 | 9.6 | 115.4 | 28.9 | 11.2 | 24 | 33.7 | 25.7 |
| 11 | Magnesium | mg/l | --- | --- | 6.8 | 1.9 | 19.4 | 4.9 | 3.9 | 11.7 | 11.7 | 3.9 |
| 12 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 30 | <2 | <2 | 7 | <2 | <2 | <2 | <2 | <2 |
| 13 | Chemical Oxygen Demand | mg/l | 250 | 100 | <8 | <8 | 28 | <8 | <8 | <8 | <8 | <8 |
| 14 | Oil & Grease (Hexane Extract) | mg/l | 10 | 10 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| 15 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | 1.2 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 16 | Sulphide (as $H_2S$) | mg/l | 2 | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 17 | Fluoride | mg/l | 2 | 1.5 | 1.89 | 1.65 | 2.5 | 3.75 | 1.3 | 2.9 | 0.86 | 0.95 |
| 18 | Ammoniacal Nitrogen | mg/l | --- | --- | 2.4 | 1.8 | 2.9 | 2.4 | 1.7 | 1.9 | 2.7 | 2.1 |
| 19 | Iron | mg/l | --- | --- | 1.15 | 0.85 | 1.75 | 1.72 | 0.48 | 1.53 | 0.86 | 0.39 |
| 20 | Total Chromium | mg/l | 2 | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 21 | Zinc | mg/l | --- | --- | <0.01 | <0.01 | 0.028 | <0.01 | <0.01 | <0.01 | 0.019 | 0.017 |
| 22 | Copper | mg/l | --- | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 |
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | GGS-1 (R.O-Inlet) | GGS-1 (R.O-Outlet) | GGS-1 (R.O-Reject) | EDD-50 (R.O-Inlet) | EDD-50 (R.O-outlet) | EDD-50 (R.O-Reject) | EDH-44 (R.O Inlet) | EDH-44 (R.O Outlet) |
| 23 | Nickel | mg/l | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Total Arsenic | mg/l | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 25 | Lead | mg/l | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 26 | Mercury | mg/l | 0.01 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 27 | Boron | mg/l | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 28 | SAR | | --- | --- | 24.4 | 4.6 | 27.6 | 12.8 | 11.5 | 7.8 | 23.7 | 13.1 |
| 29 | Phosphorus | mg/l | --- | --- | 0.11 | 0.15 | 0.24 | 0.14 | 0.1 | 0.19 | 0.088 | 0.072 |
| 30 | Aluminium | mg/l | --- | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 31 | Lithium | mg/l | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 32 | Manganese | mg/l | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 33 | Molybdenum | mg/l | --- | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 34 | Palladium | mg/l | --- | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Selenium | mg/l | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 36 | Vanadium | mg/l | --- | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 37 | Cadmium | mg/l | | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 38 | Cobalt | mg/l | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 39 | Bicarbonate | mg/l | --- | --- | 285.6 | 71.4 | 940 | 434.4 | 170.2 | 500.2 | 574 | 241.8 |
| 40 | Conductivity | µmhos/cm | --- | --- | 2256 | 354 | 10970 | 3248 | 1298 | 3916 | 4416 | 2178 |
| 41 | Sodium | mg/l | --- | --- | 448 | 59 | 1220 | 282 | 174 | 356 | 625 | 270 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | Date | 08.04.2017 | 10.04.2017 | 10.04.2017 | 10.04.2017 | 11.05.2017 | 11.05.2017 | 11.05.2017 | 11.05.2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | | EDH-44 (R.O Reject) | EDN-99 (R.O Inlet) | EDN-99 (R.O Outlet) | EDN-99 (R.O Reject) | R.O Treated at EDD-050 | R.O Raw Water at EDD-050 | R.O Reject Water at EDD-050 | R.O Permit Water at EDN-099 |
| 1 | pH | | 5.5 to 9.0 | 5.5-9.0 | | 7.93 | 8.17 | 8.07 | 7.71 | 8.46 | 8.4 | 8.66 | 7.88 |
| 2 | Total Suspended Solids | mg/l | 100 | 100 | | 3 | <2 | <2 | <2 | <2 | 2 | <2 | <2 |
| 3 | Total Dissolved Solids | mg/l | --- | 2100 | | 3612 | 4512 | 1124 | 8478 | 952 | 2988 | 3562 | 1550 |
| 4 | Turbidity | NTU | --- | --- | | 11.3 | 7.8 | <1 | 1.3 | <1 | 2.5 | 2 | <1 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | --- | | 11.5 | 3.2 | 4.8 | 9.6 | Nil | Nil | Nil | 9.4 |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | --- | | 580.3 | 658 | 186 | 823 | 445.5 | 1514.7 | 1732.5 | 89.1 |
| 7 | Chloride | mg/l | --- | 600 | | 1132 | 1173 | 484 | 1482 | 165.01 | 589.4 | 589.4 | 702.5 |
| 8 | Total Hardness | mg/l | --- | --- | | 140 | 144 | 68 | 408 | 16 | 48 | 52 | 40 |
| 9 | Sulphate | mg/l | --- | 1000 | | 28.3 | 19.8 | 12.3 | 28.1 | <2.5 | 22.25 | <2.5 | 20 |
| 10 | Calcium | mg/l | | | | 30.5 | 32.1 | 16 | 131.5 | 4.8 | 9.6 | 11.2 | 11.2 |
| 11 | Magnesium | mg/l | --- | --- | | 15.6 | 15.6 | 6.8 | 19.4 | 0.97 | 5.8 | 5.8 | 2.9 |
| 12 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 30 | | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 4.2 |
| 13 | Chemical Oxygen Demand | mg/l | 250 | 100 | | <8 | <8 | <8 | <8 | <8 | 10 | <8 | 16 |
| 14 | Oil & Grease (Hexane Extract) | mg/l | 10 | 10 | | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| 15 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | 1.2 | | <0.001 | <0.001 | <0.001 | <0.001 | <0.002 | <0.002 | <0.002 | <0.002 |
| 16 | Sulphide (as $H_2S$) | mg/l | 2 | 2 | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 17 | Fluoride | mg/l | 2 | 1.5 | | 1.1 | 1.45 | 0.75 | 0.62 | 1.85 | 2.1 | 3.56 | 1.26 |
| 18 | Ammoniacal Nitrogen | mg/l | --- | --- | | 3.2 | 3.2 | 2.8 | 2.5 | 2.1 | 3.2 | 1.8 | 1.4 |
| 19 | Iron | mg/l | --- | --- | | 0.97 | 0.81 | 0.12 | 0.16 | 0.173 | 1.28 | 0.519 | 0.11 |
| 20 | Total Chromium | mg/l | 2 | 1 | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 21 | Zinc | mg/l | --- | --- | | 0.024 | <0.01 | <0.01 | 0.015 | 0.061 | 0.087 | 0.056 | <0.01 |
| 22 | Copper | mg/l | --- | --- | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | Date | 08.04.2017 | 10.04.2017 | 10.04.2017 | 10.04.2017 | 11.05.2017 | 11.05.2017 | 11.05.2017 | 11.05.2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | | EDH-44 (R.O Reject) | EDN-99 (R.O Inlet) | EDN-99 (R.O Outlet) | EDN-99 (R.O Reject) | R.O Treated at EDD-050 | R.O Raw Water at EDD-050 | R.O Reject Water at EDD-050 | R.O Permit Water at EDN-099 |
| 23 | Nickel | mg/l | | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Total Arsenic | mg/l | | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 25 | Lead | mg/l | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 26 | Mercury | mg/l | 0.01 | 0.01 | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 27 | Boron | mg/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 28 | SAR | | --- | --- | | 17.1 | 26.8 | 16.9 | 21 | 11.75 | 23.84 | 23.35 | 31.62 |
| 29 | Phosphorus | mg/l | --- | --- | | 0.11 | 0.18 | 0.25 | 0.14 | 0.23 | 0.32 | 0.17 | 0.11 |
| 30 | Aluminium | mg/l | --- | --- | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 31 | Lithium | mg/l | | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 32 | Manganese | mg/l | | | | 0.128 | <0.05 | <0.05 | 0.128 | <0.05 | 0.069 | <0.05 | <0.05 |
| 33 | Molybdenum | mg/l | --- | --- | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 34 | Palladium | mg/l | --- | --- | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Selenium | mg/l | | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 36 | Vanadium | mg/l | --- | --- | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 37 | Cadmium | mg/l | | | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 38 | Cobalt | mg/l | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 39 | Bicarbonate | mg/l | --- | --- | | 708 | 802.8 | 226.9 | 1004.6 | 543.5 | 1847.9 | 2113.6 | 108.7 |
| 40 | Conductivity | µmhos/ cm | --- | --- | | 5619 | 7243 | 1796 | 12470 | 1584 | 4820 | 5840 | 2630 |
| 41 | Sodium | mg/l | --- | --- | | 465 | 740 | 322 | 976 | 108 | 380 | 387.3 | 460 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | Date | 11.05.2017 | 11.05.2017 | 11.05.2017 | 11.05.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | R.O Raw Water at EDN-099 | R.O Reject Water at EDN-099 | R.O Product at GGS-1 | R.O Reject at GGS-1 | GGS-1 (R.O-Inlet) | EDN-99 (R.O Inlet) | EDN-99 (R.O Outlet) | EDN-99 (R.O Outlet) |
| 1 | pH | | 5.5 to 9.0 | 5.5-9.0 | 7.76 | 7.58 | 8.15 | 7.79 | 8.52 | 8.09 | 7.73 | 7.56 |
| 2 | Total Suspended Solids | mg/l | 100 | 100 | <2 | 2.5 | <2 | 3 | 4 | 6 | <2 | <2 |
| 3 | Total Dissolved Solids | mg/l | --- | 2100 | 9384 | 11760 | 270 | 5636 | 2244 | 8012 | 572 | 1012 |
| 4 | Turbidity | NTU | --- | --- | 2.0 | 2 | <1 | 5 | 2.8 | 14.2 | 1.8 | <1 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | --- | 8.7 | 15.2 | 3.9 | 8.4 | Nil | 9.3 | 17.7 | 25.4 |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | --- | 435.6 | 574.2 | 158.4 | 3694.2 | 1494.9 | 623.7 | 89.1 | 89.1 |
| 7 | Chloride | mg/l | --- | 600 | 5044.9 | 6317.9 | 42 | 825.1 | 306.5 | 3866.2 | 222.5 | 565.8 |
| 8 | Total Hardness | mg/l | --- | --- | 344 | 520 | 12 | 76 | 28 | 376 | 20 | 52 |
| 9 | Sulphate | mg/l | --- | 1000 | 19.25 | <2.5 | 19 | <2.5 | <2.5 | 8 | 5 | 6.5 |
| 10 | Calcium | mg/l | | | 43.3 | 160.32 | 3.2 | 3.2 | 6.4 | 73.7 | 4.8 | 9.6 |
| 11 | Magnesium | mg/l | --- | --- | 57.3 | 29.2 | 0.97 | 16.5 | 2.9 | 46.6 | 1.9 | 6.8 |
| 12 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 30 | <2 | <2 | <2 | 4.5 | 3.9 | 3 | <2 | <2 |
| 13 | Chemical Oxygen Demand | mg/l | 250 | 100 | 10 | 12 | <8 | 20 | 17 | 14 | <8 | 10 |
| 14 | Oil & Grease (Hexane Extract) | mg/l | 10 | 10 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| 15 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | 1.2 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 16 | Sulphide (as $H_2S$) | mg/l | 2 | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 17 | Fluoride | mg/l | 2 | 1.5 | 2.85 | 1.79 | 0.85 | 1.42 | 2.97 | 1.83 | 0.97 | 0.81 |
| 18 | Ammoniacal Nitrogen | mg/l | --- | --- | 2.9 | 4.8 | 1.24 | 2.8 | 3.2 | 6.8 | 2.2 | 2.7 |
| 19 | Iron | mg/l | --- | --- | 0.42 | 1..52 | 0.54 | 2.27 | 0.55 | 2.87 | 0.37 | <0.1 |
| 20 | Total Chromium | mg/l | 2 | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 21 | Zinc | mg/l | --- | --- | 0.35 | 0.107 | <0.01 | 0.092 | 0.037 | 0.024 | <0.01 | <0.01 |
| 22 | Copper | mg/l | --- | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | Date | 11.05.2017 | 11.05.2017 | 11.05.2017 | 11.05.2017 | 11.05.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | R.O Raw Water at EDN-099 | R.O Reject Water at EDN-099 | R.O Product at GGS-1 | R.O Reject at GGS-1 | GGS-1 (R.O-Inlet) | EDN-99 (R.O Inlet) | EDN-99 (R.O Outlet) | EDN-99 (R.O Outlet) |
| 23 | Nickel | mg/l | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Total Arsenic | mg/l | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 25 | Lead | mg/l | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 26 | Mercury | mg/l | 0.01 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 27 | Boron | mg/l | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 28 | SAR | | --- | --- | 77.69 | 79.14 | 3.46 | 50.21 | 16.63 | 50.3 | 13.6 | 22.2 |
| 29 | Phosphorus | mg/l | --- | --- | 0.21 | 0.53 | 0.18 | 0.44 | 0.38 | 0.23 | 0.14 | 0.19 |
| 30 | Aluminium | mg/l | --- | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 31 | Lithium | mg/l | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 32 | Manganese | mg/l | | | 0.087 | 0.089 | <0.05 | 0.092 | 0.077 | <0.05 | 0.069 | <0.05 |
| 33 | Molybdenum | mg/l | --- | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 34 | Palladium | mg/l | --- | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Selenium | mg/l | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 36 | Vanadium | mg/l | --- | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 37 | Cadmium | mg/l | | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 38 | Cobalt | mg/l | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 39 | Bicarbonate | mg/l | --- | --- | 531.4 | 700.5 | 193.2 | 4506.9 | 1823.7 | 760.9 | 108.7 | 108.7 |
| 40 | Conductivity | µmhos/cm | --- | --- | 15630 | 18960 | 471 | 9240 | 3870 | 11780 | 922 | 1630 |
| 41 | Sodium | mg/l | --- | --- | 3314.6 | 4151.2 | 27.6 | 1006.6 | 202.4 | 2241 | 140 | 368.5 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 11.07.2017 |
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | EDN-99 (R.O Reject) | EDD-50 (R.O-Inlet) | EDD-50 (R.O-outlet) | EDD-50 (R.O-Reject) | GGS-1 (R.O-Inlet) | GGS-1 (R.O-Outlet) | GGS-1 (R.O-Reject) | GGS-1 (R.O-Inlet) |
| 1 | pH | | 5.5 to 9.0 | 5.5-9.0 | 7.24 | 8.07 | 8.64 | 9.11 | 8.37 | 7.38 | 8.71 | 9.1 |
| 2 | Total Suspended Solids | mg/l | 100 | 100 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | 2 |
| 3 | Total Dissolved Solids | mg/l | --- | 2100 | 23212 | 2916 | 884 | 3402 | 1920 | 334 | 7296 | 1562 |
| 4 | Turbidity | NTU | --- | --- | <1 | 1.4 | <1 | 2.1 | 3.2 | <1 | 1.8 | 6.8 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | --- | 57.4 | 11.6 | Nil | Nil | Nil | 19.3 | Nil | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | --- | 1663.2 | 1920.6 | 563.3 | 2217.6 | 1801.8 | 267.3 | 2494.4 | 1197.9 |
| 7 | Chloride | mg/l | --- | 600 | 12447.2 | 518.6 | 282.8 | 848.7 | 330 | 41.5 | 1367.3 | 221.6 |
| 8 | Total Hardness | mg/l | --- | --- | 860 | 48 | 8 | 52 | 24 | 8 | 96 | 35.3 |
| 9 | Sulphate | mg/l | --- | 1000 | 12.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | 6.9 |
| 10 | Calcium | mg/l | | | 166.7 | 11.2 | 1.6 | 8 | 8 | 1.6 | 22.4 | 6.3 |
| 11 | Magnesium | mg/l | --- | --- | 108 | 4.9 | 1 | 7.8 | 1 | 1 | 9.7 | 4.8 |
| 12 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 30 | 4 | <2 | 2 | 3 | 6 | 4 | <2 | 3 |
| 13 | Chemical Oxygen Demand | mg/l | 250 | 100 | 18 | <8 | 12 | 15 | 18 | 12 | 9 | 14 |
| 14 | Oil & Grease (Hexane Extract) | mg/l | 10 | 10 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| 15 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | 1.2 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 16 | Sulphide (as $H_2S$) | mg/l | 2 | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 17 | Fluoride | mg/l | 2 | 1.5 | 3.65 | 1.4 | 0.62 | 0.81 | 0.98 | 0.48 | 2.8 | 1.7 |
| 18 | Ammoniacal Nitrogen | mg/l | --- | --- | 4.7 | 1.9 | 1.1 | 2.6 | 1.9 | 1.5 | 4.8 | 2.1 |
| 19 | Iron | mg/l | --- | --- | 0.11 | 0.53 | 0.11 | 0.36 | 0.93 | <0.1 | 0.95 | 1.37 |
| 20 | Total Chromium | mg/l | 2 | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 21 | Zinc | mg/l | --- | --- | 0.017 | <0.01 | <0.01 | 0.021 | 0.033 | <0.01 | 0.018 | 0.037 |
| 22 | Copper | mg/l | --- | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | Date | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 11.07.2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | | EDN-99 (R.O Reject) | EDD-50 (R.O-Inlet) | EDD-50 (R.O-outlet) | EDD-50 (R.O-Reject) | GGS-1 (R.O-Inlet) | GGS-1 (R.O-Outlet) | GGS-1 (R.O-Reject) | GGS-1 (R.O-Inlet) |
| 23 | Nickel | mg/l | | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Total Arsenic | mg/l | | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 25 | Lead | mg/l | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 26 | Mercury | mg/l | 0.01 | 0.01 | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 27 | Boron | mg/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 28 | SAR | | --- | --- | | 120.8 | 21.1 | 27.6 | 34.1 | 24.6 | 3.9 | 70.9 | 22.3 |
| 29 | Phosphorus | mg/l | --- | --- | | 0.33 | 0.28 | 0.15 | 0.23 | 0.14 | 0.11 | 0.29 | 0.37 |
| 30 | Aluminium | mg/l | --- | --- | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 31 | Lithium | mg/l | | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 32 | Manganese | mg/l | | | | <0.05 | <0.05 | <0.05 | <0.05 | 0.054 | <0.05 | <0.05 | <0.05 |
| 33 | Molybdenum | mg/l | --- | --- | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 34 | Palladium | mg/l | --- | --- | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Selenium | mg/l | | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 36 | Vanadium | mg/l | --- | --- | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 37 | Cadmium | mg/l | | | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 38 | Cobalt | mg/l | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 39 | Bicarbonate | mg/l | --- | --- | | 2029.1 | 2342.4 | 585.6 | 2117.9 | 2198.2 | 326.1 | 2793.8 | 1220 |
| 40 | Conductivity | µmhos/cm | --- | --- | | 38388 | 4861 | 1473 | 5416 | 3194 | 576 | 12160 | 2518 |
| 41 | Sodium | mg/l | --- | --- | | 8148 | 336 | 179 | 557.7 | 210 | 25.5 | 1598 | 306 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | 11.07.2017 | 11.07.2017 | 11.07.2017 | 11.07.2017 | 11.07.2017 | 11.07.2017 | 11.07.2017 | 11.07.2017 |
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | GGS-1 (R.O-Outlet) | GGS-1 (R.O-Reject) | EDD-50 (R.O-Inlet) | EDD-50 (R.O-outlet) | EDD-50 (R.O-Reject) | EDN-99(R.O Inlet) | EDN-99(R.O Outlet) | EDN-99(R.O Reject) |
| 1 | pH | | 5.5 to 9.0 | 5.5-9.0 | 8.62 | 8.39 | 8.68 | 9.59 | 9.24 | 8.45 | 8.58 | 7.82 |
| 2 | Total Suspended Solids | mg/l | 100 | 100 | <2 | <2 | 3 | <2 | 15 | <2 | <2 | <2 |
| 3 | Total Dissolved Solids | mg/l | --- | 2100 | 342 | 7014 | 2344 | 872 | 2716 | 4182 | 402 | 4872 |
| 4 | Turbidity | NTU | --- | --- | <1 | 4.8 | 8.3 | <1 | 51.8 | 1.3 | 0.6 | 0.9 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | --- | Nil | Nil | Nil | Nil | Nil | Nil | Nil | 10.3 |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | --- | 207.9 | 2841 | 1524.6 | 514.8 | 1663.2 | 504.9 | 27.7 | 702.9 |
| 7 | Chloride | mg/l | --- | 600 | 86.8 | 1603.1 | 429.1 | 173.5 | 612.9 | 2819 | 162.2 | 2771.9 |
| 8 | Total Hardness | mg/l | --- | --- | 19.6 | 101.9 | 43.1 | 15.7 | 47 | 172.5 | 23.5 | 443 |
| 9 | Sulphate | mg/l | --- | 1000 | <2.5 | 11.6 | 10.2 | <2.5 | 7.8 | 14.3 | <2.5 | 11.2 |
| 10 | Calcium | mg/l | | | 4.7 | 26.7 | 12.6 | 3.9 | 12.6 | 47.1 | 6.3 | 94.3 |
| 11 | Magnesium | mg/l | --- | --- | 1.9 | 8.6 | 2.8 | 1.4 | 3.8 | 13.3 | 1.9 | 50.5 |
| 12 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 30 | <2 | 4 | 4 | <2 | 11 | 2 | <2 | 4 |
| 13 | Chemical Oxygen Demand | mg/l | 250 | 100 | <8 | 18 | 12 | <8 | 36 | 11 | <8 | 13 |
| 14 | Oil & Grease (Hexane Extract) | mg/l | 10 | 10 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| 15 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | 1.2 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 16 | Sulphide (as $H_2S$) | mg/l | 2 | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 17 | Fluoride | mg/l | 2 | 1.5 | 0.55 | 2.4 | 1.45 | 0.85 | 1.75 | 1.85 | 0.64 | 2.35 |
| 18 | Ammoniacal Nitrogen | mg/l | --- | --- | 1.4 | 3.95 | 2.52 | 1.95 | 3.85 | 4.25 | 1.35 | 3.95 |
| 19 | Iron | mg/l | --- | --- | <0.1 | 0.84 | 1.43 | 0.1 | 0.32 | 0.25 | <0.1 | 0.11 |
| 20 | Total Chromium | mg/l | 2 | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 21 | Zinc | mg/l | --- | --- | <0.01 | 0.066 | 0.021 | <0.01 | 0.034 | 0.019 | <0.01 | 0.024 |
| 22 | Copper | mg/l | --- | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Date** | **11.07.2017** | **11.07.2017** | **11.07.2017** | **11.07.2017** | **11.07.2017** | **11.07.2017** | **11.07.2017** | **11.07.2017** |
| **S. No.** | **Parameter** | **Unit** | **General Discharge Standards** | **O & G Discharge Standards** | **GGS-1 (R.O-Outlet)** | **GGS-1 (R.O-Reject)** | **EDD-50 (R.O-Inlet)** | **EDD-50 (R.O-outlet)** | **EDD-50 (R.O-Reject)** | **EDN-99(R.O Inlet)** | **EDN-99(R.O Outlet)** | **EDN-99(R.O Reject)** |
| **23** | **Nickel** | **mg/l** | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| **24** | **Total Arsenic** | **mg/l** | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **25** | **Lead** | **mg/l** | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| **26** | **Mercury** | **mg/l** | **0.01** | **0.01** | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| **27** | **Boron** | **mg/l** | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| **28** | **SAR** | | **---** | **---** | 5.1 | 92.4 | 33.3 | 23.4 | 46.2 | 36.5 | 3.6 | 25.7 |
| **29** | **Phosphorus** | **mg/l** | **---** | **---** | 0.24 | 0.49 | 0.24 | 0.19 | 0.37 | 0.11 | 0.16 | 0.45 |
| **30** | **Aluminium** | **mg/l** | **---** | **---** | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **31** | **Lithium** | **mg/l** | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **32** | **Manganese** | **mg/l** | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| **33** | **Molybdenum** | **mg/l** | **---** | **---** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **34** | **Palladium** | **mg/l** | **---** | **---** | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **35** | **Selenium** | **mg/l** | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **36** | **Vanadium** | **mg/l** | **---** | **---** | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| **37** | **Cadmium** | **mg/l** | | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| **38** | **Cobalt** | **mg/l** | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| **39** | **Bicarbonate** | **mg/l** | **---** | **---** | 356 | 3466 | 1852 | 378.2 | 1708 | 614.9 | 33.8 | 857.5 |
| **40** | **Conductivity** | **µmhos/ cm** | **---** | **---** | 580 | 10470 | 3722 | 1426 | 4245 | 6814 | 645 | 7342 |
| **41** | **Sodium** | **mg/l** | **---** | **---** | 52 | 2147 | 502 | 212 | 728.4 | 1104 | 40 | 1245 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 |
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | GGS-1(R.O-Inlet) | GGS-1(R.O-Outlet) | GGS-1(R.O-Reject) | EDD-50(R.O-Inlet) | EDD-50(R.O-outlet) | EDD-50(R.O-Reject) | EDN-99(R.O Inlet) | EDN-99(R.O Outlet) |
| 1 | pH | | 5.5 to 9.0 | 5.5-9.0 | 9.31 | 9.17 | 8.71 | 9.18 | 9.56 | 9.65 | 8.42 | 9.48 |
| 2 | Total Suspended Solids | mg/l | 100 | 100 | 5 | <2 | <2 | <2 | <2 | 14 | <2 | <2 |
| 3 | Total Dissolved Solids | mg/l | --- | 2100 | 2258 | 494 | 7982 | 2578 | 966 | 2892 | 4758 | 682 |
| 4 | Turbidity | NTU | --- | --- | 9.8 | 1.2 | 3.2 | 3.9 | <1 | 39.2 | <1 | 2.1 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | --- | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | --- | 1503.5 | 349.2 | 785.7 | 1406.5 | 591.7 | 1639.3 | 582 | 97 |
| 7 | Chloride | mg/l | --- | 600 | 198 | 45.3 | 1131.6 | 556.4 | 173.5 | 528.1 | 3064.7 | 277.2 |
| 8 | Total Hardness | mg/l | --- | --- | 15.5 | 89.2 | 15.5 | 38.8 | 23.3 | 46.6 | 287.1 | 23.3 |
| 9 | Sulphate | mg/l | --- | 1000 | 9.3 | <2.5 | 10.5 | 6.8 | <2.5 | 4.7 | 6.9 | <2.5 |
| 10 | Calcium | mg/l | | | 4.7 | 21.8 | 4.7 | 9.3 | 6.2 | 10.9 | 96.4 | 6.2 |
| 11 | Magnesium | mg/l | --- | --- | <1 | 8.5 | <1 | 3.8 | 1.9 | 4.7 | 11.3 | 1.9 |
| 12 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 30 | 2 | <2 | 4 | 2 | <2 | <2 | <2 | <2 |
| 13 | Chemical Oxygen Demand | mg/l | 250 | 100 | 11 | <8 | 18 | 9 | <8 | 8 | 8 | <8 |
| 14 | Oil & Grease (Hexane Extract) | mg/l | 10 | 10 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| 15 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | 1.2 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 16 | Sulphide (as $H_2S$) | mg/l | 2 | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 17 | Fluoride | mg/l | 2 | 1.5 | 2.55 | 3.1 | 3.35 | 2.7 | 2.15 | 3.25 | 2.55 | 1.2 |
| 18 | Ammoniacal Nitrogen | mg/l | --- | --- | 3.86 | 4.92 | 6.45 | 4.11 | 3.82 | 4.65 | 4.31 | 3.85 |
| 19 | Iron | mg/l | --- | --- | 0.11 | 0.5 | 0.26 | 0.66 | 1.22 | 0.77 | 0.19 | <0.1 |
| 20 | Total Chromium | mg/l | 2 | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 21 | Zinc | mg/l | --- | --- | 0.031 | <0.01 | 0.018 | 0.019 | 0.011 | 0.042 | <0.01 | 0.012 |
| 22 | Copper | mg/l | --- | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 | 11.08.2017 |
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | GGS-1(R.O-Inlet) | GGS-1(R.O-Outlet) | GGS-1(R.O-Reject) | EDD-50(R.O-Inlet) | EDD-50(R.O-outlet) | EDD-50(R.O-Reject) | EDN-99(R.O Inlet) | EDN-99(R.O Outlet) |
| 23 | Nickel | mg/l | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Total Arsenic | mg/l | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 25 | Lead | mg/l | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 26 | Mercury | mg/l | 0.01 | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 27 | Boron | mg/l | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 28 | SAR | | --- | --- | 82.2 | 9.5 | 113.8 | 78.5 | 27.4 | 84.8 | 49.1 | 9.3 |
| 29 | Phosphorus | mg/l | --- | --- | 0.13 | 0.24 | 0.37 | 0.23 | 0.14 | 0.27 | 0.18 | 0.11 |
| 30 | Aluminium | mg/l | --- | --- | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 31 | Lithium | mg/l | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 32 | Manganese | mg/l | | | <0.05 | <0.05 | <0.05 | <0.05 | 0.056 | <0.05 | <0.05 | <0.05 |
| 33 | Molybdenum | mg/l | --- | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 34 | Palladium | mg/l | --- | --- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Selenium | mg/l | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 36 | Vanadium | mg/l | --- | --- | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 37 | Cadmium | mg/l | | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 38 | Cobalt | mg/l | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 39 | Bicarbonate | mg/l | --- | --- | 1159 | 195.2 | 744.2 | 1037 | 378.2 | 1207.8 | 610 | 85.4 |
| 40 | Conductivity | µmhos/cm | --- | --- | 3318 | 884 | 11242 | 3648 | 1670 | 4022 | 6581 | 1108 |
| 41 | Sodium | mg/l | --- | --- | 749 | 208 | 1030 | 1128 | 306 | 1214 | 1912 | 103 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | 11.08.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 |
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | EDN-99(R.O Reject) | GGS-1(R.O-Inlet) | GGS-1(R.O-Outlet) | GGS-1(R.O-Reject) | EDD-50(R.O-Inlet) | EDD-50(R.O-outlet) | EDD-50(R.O-Reject) | EDN-99(R.O Inlet) |
| 1 | pH | | 5.5 to 9.0 | 5.5-9.0 | 8.88 | 9.11 | 8.82 | 8.88 | 9.07 | 9.27 | 9.82 | 8.45 |
| 2 | Total Suspended Solids | mg/l | 100 | 100 | <2 | <2 | <2 | <2 | 12 | <2 | 3 | 10 |
| 3 | Total Dissolved Solids | mg/l | --- | 2100 | 5022 | 2246 | 558 | 8882 | 2738 | 868 | 2876 | 3648 |
| 4 | Turbidity | NTU | --- | --- | <1 | 4 | <1 | 3.8 | 27.7 | <1 | 9.4 | 22 |
| 5 | Acidity as $CaCO_3$ | mg/l | --- | --- | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil |
| 6 | Total Alkalinity as Calcium Carbonate | mg/l | --- | --- | 455.9 | 1632 | 403.2 | 5721.6 | 1440 | 499.2 | 1593.6 | 480 |
| 7 | Chloride | mg/l | --- | 600 | 3489 | 207.5 | 43.4 | 1367.3 | 612.9 | 226.3 | 471.5 | 2076.1 |
| 8 | Total Hardness | mg/l | --- | --- | 329.8 | 39.2 | 15.7 | 86.2 | 164.6 | 19.6 | 47 | 227.4 |
| 9 | Sulphate | mg/l | --- | 1000 | 10.2 | <2.5 | <2.5 | 6.5 | 5.5 | <2.5 | 6.9 | 6.8 |
| 10 | Calcium | mg/l | | | 74.6 | 9.4 | 4.7 | 26.7 | 47.1 | 4.7 | 9.4 | 70.7 |
| 11 | Magnesium | mg/l | --- | --- | 34.9 | 7.7 | 1.9 | 9.6 | 11.4 | 1.9 | 5.7 | 12.4 |
| 12 | Biological Oxygen Demand, 3 Days at 27ºC | mg/l | 30 | 30 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| 13 | Chemical Oxygen Demand | mg/l | 250 | 100 | 8 | <8 | <8 | 8 | 8 | <8 | 9 | <8 |
| 14 | Oil & Grease (Hexane Extract) | mg/l | 10 | 10 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| 15 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1 | 1.2 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 16 | Sulphide (as $H_2S$) | mg/l | 2 | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 17 | Fluoride | mg/l | 2 | 1.5 | 3.1 | 0.96 | 0.62 | 1.4 | 1.9 | 0.7 | 2.25 | 2.4 |
| 18 | Ammoniacal Nitrogen | mg/l | --- | --- | 4.65 | 1.92 | 1.3 | 2.85 | 3.4 | 2.55 | 4.12 | 2.68 |
| 19 | Iron | mg/l | --- | --- | 0.52 | 0.21 | 0.1 | 0.41 | 1.98 | 0.94 | 0.98 | 1.75 |
| 20 | Total Chromium | mg/l | 2 | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 21 | Zinc | mg/l | --- | --- | 0.024 | <0.01 | <0.01 | 0.027 | 0.013 | 0.011 | 0.017 | 0.015 |
| 22 | Copper | mg/l | --- | --- | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | | Date | 11.08.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Parameter | Unit | General Discharge Standards | O & G Discharge Standards | | EDN-99(R.O Reject) | GGS-1(R.O-Inlet) | GGS-1(R.O-Outlet) | GGS-1(R.O-Reject) | EDD-50(R.O-Inlet) | EDD-50(R.O-outlet) | EDD-50(R.O-Reject) | EDN-99(R.O Inlet) |
| 23 | Nickel | mg/l | | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 24 | Total Arsenic | mg/l | | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 25 | Lead | mg/l | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 26 | Mercury | mg/l | 0.01 | 0.01 | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 27 | Boron | mg/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 28 | SAR | | --- | --- | | 27 | 65 | 26.2 | 182.8 | 35.2 | 30.8 | 71.2 | 30.4 |
| 29 | Phosphorus | mg/l | --- | --- | | 0.23 | 0.18 | 0.1 | 0.29 | 0.21 | 0.15 | 0.24 | 0.18 |
| 30 | Aluminium | mg/l | --- | --- | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 31 | Lithium | mg/l | | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 32 | Manganese | mg/l | | | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 33 | Molybdenum | mg/l | --- | --- | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 34 | Palladium | mg/l | --- | --- | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 35 | Selenium | mg/l | | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 36 | Vanadium | mg/l | --- | --- | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 37 | Cadmium | mg/l | | | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 38 | Cobalt | mg/l | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 39 | Bicarbonate | mg/l | --- | --- | | 329.4 | 1452 | 292.8 | 4514 | 1024 | 290.5 | 1287.4 | 341 |
| 40 | Conductivity | µmhos/cm | --- | --- | | 7342 | 2864 | 645 | 10200 | 3648 | 1170 | 3686 | 4682 |
| 41 | Sodium | mg/l | --- | --- | | 1128 | 934 | 238 | 3898 | 1014 | 312 | 1122 | 1055 |

**Analysis of R.O. Water of CBM Raniganj Project by Essar Oil and gas Exploration and Production Limited**

**Compliance Period: Apr'17 to Sep'17**

**ANNEXURE III**

| | | | | Date | 05.09.2017 | 05.09.2017 |
|---|---|---|---|---|---|---|
| **S. No.** | **Parameter** | **Unit** | **General Discharge Standards** | **O & G Discharge Standards** | **EDN-99(R.O Outlet)** | **EDN-99(R.O Reject)** |
| **1** | **pH** | | **5.5 to 9.0** | **5.5-9.0** | 8.61 | 8.25 |
| **2** | **Total Suspended Solids** | **mg/l** | **100** | **100** | <2 | <2 |
| **3** | **Total Dissolved Solids** | **mg/l** | **---** | **2100** | 652 | 7012 |
| **4** | **Turbidity** | **NTU** | **---** | **---** | <1 | <1 |
| **5** | **Acidity as $CaCO_3$** | **mg/l** | **---** | **---** | Nil | Nil |
| **6** | **Total Alkalinity as Calcium Carbonate** | **mg/l** | **---** | **---** | 230.4 | 825.6 |
| **7** | **Chloride** | **mg/l** | **---** | **600** | 245.2 | 3799.3 |
| **8** | **Total Hardness** | **mg/l** | **---** | **---** | 86.2 | 31.4 |
| **9** | **Sulphate** | **mg/l** | **---** | **1000** | 4.5 | 7.5 |
| **10** | **Calcium** | **mg/l** | | | 26.7 | 7.9 |
| **11** | **Magnesium** | **mg/l** | **---** | **---** | 4.8 | 2.9 |
| **12** | **Biological Oxygen Demand, 3 Days at 27ºC** | **mg/l** | **30** | **30** | <2 | <2 |
| **13** | **Chemical Oxygen Demand** | **mg/l** | **250** | **100** | <8 | 8 |
| **14** | **Oil & Grease (Hexane Extract)** | **mg/l** | **10** | **10** | <5 | <5 |
| **15** | **Phenolic Compounds (as $C_6H_5OH$)** | **mg/l** | **1** | **1.2** | <0.002 | <0.002 |
| **16** | **Sulphide (as $H_2S$)** | **mg/l** | **2** | **2** | <0.5 | <0.5 |
| **17** | **Fluoride** | **mg/l** | **2** | **1.5** | 1.25 | 2.85 |
| **18** | **Ammoniacal Nitrogen** | **mg/l** | **---** | **---** | 1.98 | 3.75 |
| **19** | **Iron** | **mg/l** | **---** | **---** | 0.12 | <0.1 |
| **20** | **Total Chromium** | **mg/l** | **2** | **1** | <0.05 | <0.05 |
| **21** | **Zinc** | **mg/l** | **---** | **---** | <0.01 | 0.019 |
| **22** | **Copper** | **mg/l** | **---** | **---** | <0.05 | <0.05 |

**ANNEXURE III**

| | | | | | Date | 05.09.2017 | 05.09.2017 |
|---|---|---|---|---|---|---|---|
| **S. No.** | **Parameter** | **Unit** | **General Discharge Standards** | **O & G Discharge Standards** | **EDN-99(R.O Outlet)** | **EDN-99(R.O Reject)** |
| **23** | **Nickel** | **mg/l** | | | <0.05 | <0.05 |
| **24** | **Total Arsenic** | **mg/l** | | | <0.01 | <0.01 |
| **25** | **Lead** | **mg/l** | | | <0.1 | <0.1 |
| **26** | **Mercury** | **mg/l** | **0.01** | **0.01** | <0.001 | <0.001 |
| **27** | **Boron** | **mg/l** | | | <1 | <1 |
| **28** | **SAR** | | **---** | **---** | 8.4 | 208.8 |
| **29** | **Phosphorus** | **mg/l** | **---** | **---** | 0.11 | 0.24 |
| **30** | **Aluminium** | **mg/l** | **---** | **---** | <0.01 | <0.01 |
| **31** | **Lithium** | **mg/l** | | | <0.5 | <0.5 |
| **32** | **Manganese** | **mg/l** | | | <0.05 | <0.05 |
| **33** | **Molybdenum** | **mg/l** | **---** | **---** | <0.5 | <0.5 |
| **34** | **Palladium** | **mg/l** | **---** | **---** | <0.5 | <0.5 |
| **35** | **Selenium** | **mg/l** | | | <0.01 | <0.01 |
| **36** | **Vanadium** | **mg/l** | **---** | **---** | <0.2 | <0.2 |
| **37** | **Cadmium** | **mg/l** | | | <0.02 | <0.02 |
| **38** | **Cobalt** | **mg/l** | | | <0.1 | <0.1 |
| **39** | **Bicarbonate** | **mg/l** | **---** | **---** | 224.5 | 1007.2 |
| **40** | **Conductivity** | **µmhos/ cm** | **---** | **---** | 835 | 10826 |
| **41** | **Sodium** | **mg/l** | **---** | **---** | 180 | 2696 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | GGS-1 (R.O Discharge) | Kunur Nala Upstream Near GGS-1 | EDD-50 (R.O-Discharge) | Kunur Nala Downstream Between EDH-58 & 63 | Kunur Nala Downstream Near Kuldiha Bridge | Kunur Nala Downstream Near Kuldiha Bridge |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 11.05.2017 |
| 1 | pH at $27^0$C | | 5.5-9.0 | 8.57 | 8.62 | 8.71 | 8.75 | 8.55 | 8.42 |
| 2 | Colour in hazen | | | <5 | <5 | <5 | <5 | <5 | <5 |
| 3 | Total Suspended Solids | mg/l | 100 | 3 | 13 | <2 | 7 | 3 | <2 |
| 4 | Total Dissolved Solids | mg/l | 2100 | 1254 | 132 | 1142 | 1962 | 526 | 830 |
| 5 | Turbidity | NTU | | 10.3 | 27.4 | 6.5 | 18.7 | 9.1 | <1.0 |
| 6 | Acidity as $CaCO_3$ | mg/l | | Nil | Nil | Nil | Nil | Nil | Nil |
| 7 | Total Alkalinity as $CaCO_3$ | mg/l | | 192 | 28.4 | 153.5 | 307.5 | 102.1 | 306.9 |
| 8 | Chloride as Chlorine | mg/l | 600 | 510 | 38 | 438.5 | 458 | 214 | 198 |
| 9 | Total Hardness | mg/l | | 68 | 32 | 56 | 88 | 40 | 104 |
| 10 | Sulphate | mg/l | 1000 | 10.5 | <2.5 | 8.8 | 15.3 | 5.5 | 34.25 |
| 11 | Calcium | mg/l | | 16 | 8 | 12.8 | 17.6 | 11.2 | 32.1 |
| 12 | Magnesium | mg/l | | 6.8 | 2.9 | 5.8 | 10.7 | 2.9 | 5.8 |
| 13 | Dissolved Oxygen | mg/l | | 5.4 | 5.9 | 5.1 | 4.9 | 5.5 | 5 |
| 14 | Biochemical Oxygen Demand | mg/l | 30 | <2 | <2 | <2 | <2 | <2 | <2 |
| 15 | Chemical Oxygen Demand | mg/l | 100 | <8 | <8 | <8 | 8 | <8 | <8 |
| 16 | Oil & Grease | mg/l | 10 | <5 | <5 | <5 | <5 | <5 | <5 |
| 17 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1.2 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.002 |
| 18 | Sulphides (as $S_2$) | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 19 | Fluoride | mg/l | 1.5 | 2.16 | 2.75 | 3.3 | 1.96 | 1.05 | 3.1 |
| 20 | Residual free chlorine | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 21 | Iron | mg/l | 3 | 1.25 | 3.45 | 0.96 | 2.75 | 1.21 | 0.32 |
| 22 | Sodium | mg/l | | 348 | 18 | 288 | 328.1 | 140 | 130.7 |
| 23 | Total Chromium | mg/l | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | GGS-1 (R.O Discharge) | Kunur Nala Upstream Near GGS-1 | EDD-50 (R.O-Discharge) | Kunur Nala Downstream Between EDH-58 & 63 | Kunur Nala Downstream Near Kuldiha Bridge | Kunur Nala Downstream Near Kuldiha Bridge |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 08.04.2017 | 11.05.2017 |
| 24 | Zinc | mg/l | 2 | <0.01 | <0.01 | <0.01 | 0.049 | 0.028 | 0.034 |
| 25 | Copper | mg/l | 0.2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 26 | Nickel | mg/l | 3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 27 | Arsenic | mg/l | 0.2 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 28 | Lead | mg/l | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 29 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 30 | Boron | mg/l | | <1 | <1 | <1 | <1 | <1 | <1 |
| 31 | Phosphate | mg/l | | 0.36 | 0.48 | 0.29 | 0.33 | 0.14 | 0.34 |
| 32 | Potassium | mg/l | | 8.2 | 1.7 | 9.1 | 11.2 | 15.3 | 4.4 |
| 33 | Aluminium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 34 | EC at 25° C | µmhos/cm | | 1862 | 202 | 1682 | 2918 | 830 | 1385 |
| 35 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 36 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 37 | Vanadium | mg/l | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Palladium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 39 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 40 | Manganese | mg/l | | <0.05 | 0.059 | 0.101 | <0.05 | <0.05 | <0.05 |
| 41 | Molybednum | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 42 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 43 | Berylium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 44 | Cyanide | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 45 | Bicarbonate (as $HCO_3$) | mg/l | | 212 | 31.3 | 175.3 | 368.2 | 118.5 | 374.4 |
| 46 | Free Ammonia as Nitrogen | mg/l | 5 | 0.1 | 47 | 0.16 | 0.17 | 0.11 | 0.14 |
| 47 | Total coliform bacteria | MPN/100ml | | 41 | 33 | 63 | 94 | 84 | 84 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | GGS-1 (R.O Discharge) | Kunur Nala Unstream | Kunur Nala Downstream Near Kuldiha Bridge | EDD-50 (R.O-Discharge) | Kunur Nala Upstream Near GGS-1 | GGS-1(R.O Discharge) |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | 11.05.2017 | 12.05.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 |
| 1 | pH at $27^0$C | | 5.5-9.0 | 8.38 | 8.39 | 8.51 | 8.78 | 8.83 | 8.47 |
| 2 | Colour in hazen | | | <5 | <5 | <5 | <5 | <5 | <5 |
| 3 | Total Suspended Solids | mg/l | 100 | <2 | 2 | 4 | <2 | 3 | 2 |
| 4 | Total Dissolved Solids | mg/l | 2100 | 988 | 104 | 862 | 926 | 392 | 1526 |
| 5 | Turbidity | NTU | | 2.8 | 4.5 | 11.7 | <1 | 7.6 | 6.2 |
| 6 | Acidity as $CaCO_3$ | mg/l | | Nil | Nil | Nil | Nil | Nil | Nil |
| 7 | Total Alkalinity as $CaCO_3$ | mg/l | | 613.8 | 89.1 | 425.7 | 663.3 | 168.3 | 1386 |
| 8 | Chloride as Chlorine | mg/l | 600 | 122.6 | 84.9 | 330 | 235.7 | 192.4 | 282.8 |
| 9 | Total Hardness | mg/l | | 24 | 56 | 124 | 20 | 60.6 | 20 |
| 10 | Sulphate | mg/l | 1000 | 18.75 | <2.5 | <2.5 | <2.5 | 4.8 | <2.5 |
| 11 | Calcium | mg/l | | 4.8 | 12.8 | 32.1 | 11.2 | 12.8 | 6.4 |
| 12 | Magnesium | mg/l | | 2.9 | 5.8 | 10.7 | 4.9 | 6.8 | 1 |
| 13 | Dissolved Oxygen | mg/l | | 5.1 | 5 | 2.2 | 2.9 | 1.7 | 2.3 |
| 14 | Biochemical Oxygen Demand | mg/l | 30 | <2 | 2.9 | 7 | 8 | 10 | 9 |
| 15 | Chemical Oxygen Demand | mg/l | 100 | 10 | 14 | 31 | 32 | 41 | 37 |
| 16 | Oil & Grease | mg/l | 10 | <5 | <5 | <5 | <5 | <5 | <5 |
| 17 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1.2 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 18 | Sulphides (as $S_2$) | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 19 | Fluoride | mg/l | 1.5 | 1.97 | 2.85 | 1.65 | 1.15 | 0.54 | 1.65 |
| 20 | Residual free chlorine | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 21 | Iron | mg/l | 3 | 0.35 | 0.56 | 1.33 | 0.11 | 1.17 | 0.93 |
| 22 | Sodium | mg/l | | 80.5 | 58.5 | 225 | 254 | 136 | 312.8 |
| 23 | Total Chromium | mg/l | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | GGS-1 (R.O Discharge) | Kunur Nala Unstream | Kunur Nala Downstream Near Kuldiha Bridge | EDD-50 (R.O-Discharge) | Kunur Nala Upstream Near GGS-1 | GGS-1(R.O Discharge) |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | 11.05.2017 | 12.05.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 | 08.06.2017 |
| 24 | Zinc | mg/l | 2 | 0.087 | <0.01 | 0.028 | 0.014 | <0.01 | <0.01 |
| 25 | Copper | mg/l | 0.2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 26 | Nickel | mg/l | 3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 27 | Arsenic | mg/l | 0.2 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 28 | Lead | mg/l | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 29 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 30 | Boron | mg/l | | <1 | <1 | <1 | <1 | <1 | <1 |
| 31 | Phosphate | mg/l | | 0.46 | 0.15 | 0.26 | 0.1 | 0.13 | 0.11 |
| 32 | Potassium | mg/l | | 5.6 | 2.4 | 8.5 | 6.5 | 4.3 | 8.2 |
| 33 | Aluminium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 34 | EC at 25° C | µmhos/cm | | 1688 | 180 | 1480 | 1596 | 653 | 2358 |
| 35 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 36 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 37 | Vanadium | mg/l | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Palladium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 39 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 40 | Manganese | mg/l | | 0.062 | <0.05 | 0.061 | <0.05 | <0.05 | <0.05 |
| 41 | Molybednum | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 42 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 43 | Berylium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 44 | Cyanide | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 45 | Bicarbonate (as $HCO_3$) | mg/l | | 748.8 | 108.7 | 418.5 | 585.6 | 151.8 | 1460.4 |
| 46 | Free Ammonia as Nitrogen | mg/l | 5 | 0.15 | 0.12 | 0.82 | 0.52 | 0.63 | 0.41 |
| 47 | Total coliform bacteria | MPN/100ml | | 84 | 58 | 63 | 49 | 22 | 49 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | EDD-50 (R.O-Discharge) | Kunur Nala Downstream Between EDH-58 & 63 | Kunur Nala Downstream Near Akandara | Kunur Nala Downstream Near Kuldiha Bridge | GGS-1(R.O Discharge) | Kunur Nala Upstream Near GGS-1 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | 11.07.2017 | 11.07.2017 | 11.07.2017 | 11.07.2017 | 11.08.2017 | 11.08.2017 |
| 1 | pH at $27^0$C | | 5.5-9.0 | 9.43 | 7.82 | 8.71 | 8.41 | 9.44 | 8.92 |
| 2 | Colour in hazen | | | <5 | 5 | <5 | <5 | <5 | 5 |
| 3 | Total Suspended Solids | mg/l | 100 | <2 | 62 | 28 | 19 | <2 | 18 |
| 4 | Total Dissolved Solids | mg/l | 2100 | 958 | 164 | 242 | 232 | 896 | 172 |
| 5 | Turbidity | NTU | | 3.8 | 106.3 | 62.6 | 45.9 | <1 | 46.8 |
| 6 | Acidity as $CaCO_3$ | mg/l | | Nil | 9.8 | Nil | Nil | Nil | Nil |
| 7 | Total Alkalinity as $CaCO_3$ | mg/l | | 465.3 | 99 | 158.4 | 108.9 | 688.7 | 164.9 |
| 8 | Chloride as Chlorine | mg/l | 600 | 164.1 | 24.5 | 43.4 | 41.2 | 96.2 | 19.8 |
| 9 | Total Hardness | mg/l | | 21.6 | 50.9 | 78.4 | 78.4 | 73.7 | 34.9 |
| 10 | Sulphate | mg/l | 1000 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| 11 | Calcium | mg/l | | 7 | 17.3 | 17.3 | 20.4 | 12.4 | 7.8 |
| 12 | Magnesium | mg/l | | <1.0 | 1.9 | 8.6 | 6.7 | 10.4 | 3.8 |
| 13 | Dissolved Oxygen | mg/l | | 3.1 | 4.6 | 3.8 | 3.8 | 4.8 | 5.4 |
| 14 | Biochemical Oxygen Demand | mg/l | 30 | <2 | <2 | <2 | <2 | 2 | <2 |
| 15 | Chemical Oxygen Demand | mg/l | 100 | <8 | <8 | <8 | <8 | 10 | <8 |
| 16 | Oil & Grease | mg/l | 10 | <5 | <5 | <5 | <5 | <5 | <5 |
| 17 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1.2 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 18 | Sulphides (as $S_2$) | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 19 | Fluoride | mg/l | 1.5 | 0.82 | 0.82 | 0.37 | 0.89 | 2.75 | 2.36 |
| 20 | Residual free chlorine | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 21 | Iron | mg/l | 3 | 0.81 | 31.81 | 12.64 | 7.49 | 0.32 | 2.97 |
| 22 | Sodium | mg/l | | 301 | 18.5 | 14.3 | 34.5 | 226 | 32 |
| 23 | Total Chromium | mg/l | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | EDD-50 (R.O-Discharge) | Kunur Nala Downstream Between EDH-58 & 63 | Kunur Nala Downstream Near Akandara | Kunur Nala Downstream Near Kuldiha Bridge | GGS-1(R.O Discharge) | Kunur Nala Upstream Near GGS-1 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | 11.07.2017 | 11.07.2017 | 11.07.2017 | 11.07.2017 | 11.08.2017 | 11.08.2017 |
| 24 | Zinc | mg/l | 2 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.036 |
| 25 | Copper | mg/l | 0.2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 26 | Nickel | mg/l | 3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 27 | Arsenic | mg/l | 0.2 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 28 | Lead | mg/l | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 29 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 30 | Boron | mg/l | | <1 | <1 | <1 | <1 | <1 | <1 |
| 31 | Phosphate | mg/l | | 0.17 | 0.15 | 0.11 | 0.12 | 0.19 | 0.26 |
| 32 | Potassium | mg/l | | 4 | 2 | 2 | 3 | 7.3 | 2.9 |
| 33 | Aluminium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 34 | EC at 25° C | µmhos/cm | | 1520 | 278 | 392 | 379 | 1412 | 269 |
| 35 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 36 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 37 | Vanadium | mg/l | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Palladium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 39 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 40 | Manganese | mg/l | | <0.05 | 0.143 | 0.162 | 0.092 | <0.05 | 0.063 |
| 41 | Molybednum | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 42 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 43 | Berylium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 44 | Cyanide | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 45 | Bicarbonate (as $HCO_3$) | mg/l | | 317.2 | 120.8 | 186.3 | 132.9 | 378.2 | 122 |
| 46 | Free Ammonia as Nitrogen | mg/l | 5 | 2.1 | 0.33 | 0.92 | 0.63 | 0.68 | 0.37 |
| 47 | Total coliform bacteria | MPN/100ml | | 51 | 36 | 48 | 63 | 63 | 58 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | EDD-50 (R.O-Discharge) | Kunur Nala Downstream Between EDH-58 & 63 | Kunur Nala Downstream at Kuldiha Bridge | GGS-1 (R.O Discharge) | Kunur Nala Upstream Near GGS-1 | Kunur Nala Downstream Between EDH-58 & 63 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | 11.08.2017 | 11.08.2017 | 11.08.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 |
| 1 | pH at $27^0$C | | 5.5-9.0 | 9.1 | 9.25 | 9.22 | 9.21 | 8.65 | 9.14 |
| 2 | Colour in hazen | | | <5 | <5 | 5 | <5 | 5 | <5 |
| 3 | Total Suspended Solids | mg/l | 100 | <2 | 4 | 38 | <2 | 14 | 19 |
| 4 | Total Dissolved Solids | mg/l | 2100 | 934 | 762 | 452 | 714 | 196 | 204 |
| 5 | Turbidity | NTU | | 2.3 | 11.7 | 87.8 | <1 | 33.5 | 47.5 |
| 6 | Acidity as $CaCO_3$ | mg/l | | Nil | Nil | Nil | Nil | Nil | Nil |
| 7 | Total Alkalinity as $CaCO_3$ | mg/l | | 543.2 | 572.3 | 213.4 | 576 | 107.2 | 118 |
| 8 | Chloride as Chlorine | mg/l | 600 | 154.7 | 100 | 60.4 | 84.9 | 11.3 | 32.1 |
| 9 | Total Hardness | mg/l | | 15.5 | 77.6 | 89.2 | 35.3 | 90.2 | 86.2 |
| 10 | Sulphate | mg/l | 1000 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| 11 | Calcium | mg/l | | 3.1 | 20.2 | 20.2 | 7.9 | 28.3 | 26.7 |
| 12 | Magnesium | mg/l | | 1.9 | 7 | 9.4 | 3.8 | 4.8 | 4.8 |
| 13 | Dissolved Oxygen | mg/l | | 3.7 | 6 | 6.2 | 4.8 | 4.3 | 5.3 |
| 14 | Biochemical Oxygen Demand | mg/l | 30 | 3 | <2 | <2 | <2 | 2 | <2 |
| 15 | Chemical Oxygen Demand | mg/l | 100 | 12 | <8 | <8 | 9 | 10 | <8 |
| 16 | Oil & Grease | mg/l | 10 | <5 | <5 | <5 | <5 | <5 | <5 |
| 17 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1.2 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| 18 | Sulphides (as $S_2$) | mg/l | 2 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 19 | Fluoride | mg/l | 1.5 | 1.75 | 1.78 | 2.86 | 0.68 | 0.33 | 0.72 |
| 20 | Residual free chlorine | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 21 | Iron | mg/l | 3 | 0.11 | 1.28 | 3.23 | 1.24 | 1.66 | 0.1 |
| 22 | Sodium | mg/l | | 208 | 182 | 73 | 242 | 26 | 21 |
| 23 | Total Chromium | mg/l | 1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | EDD-50 (R.O-Discharge) | Kunur Nala Downstream Between EDH-58 & 63 | Kunur Nala Downstream at Kuldiha Bridge | GGS-1 (R.O Discharge) | Kunur Nala Upstream Near GGS-1 | Kunur Nala Downstream Between EDH-58 & 63 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Date | 11.08.2017 | 11.08.2017 | 11.08.2017 | 05.09.2017 | 05.09.2017 | 05.09.2017 |
| 24 | Zinc | mg/l | 2 | <0.01 | 0.027 | 0.048 | <0.01 | <0.01 | <0.01 |
| 25 | Copper | mg/l | 0.2 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 26 | Nickel | mg/l | 3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 27 | Arsenic | mg/l | 0.2 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 28 | Lead | mg/l | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 29 | Mercury | mg/l | 0.01 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 30 | Boron | mg/l | | <1 | <1 | <1 | <1 | <1 | <1 |
| 31 | Phosphate | mg/l | | 0.2 | 0.22 | 0.13 | 0.29 | 0.21 | 0.25 |
| 32 | Potassium | mg/l | | 11.6 | 9.2 | 5.1 | 7.3 | 6.1 | 8.4 |
| 33 | Aluminium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 34 | EC at 25° C | µmhos/cm | | 1670 | 1482 | 545 | 1024 | 340 | 375 |
| 35 | Cadmium | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 36 | Cobalt | mg/l | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 37 | Vanadium | mg/l | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| 38 | Palladium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 39 | Selenium | mg/l | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 40 | Manganese | mg/l | | <0.05 | <0.05 | 0.072 | <0.05 | 0.063 | <0.05 |
| 41 | Molybednum | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 42 | Lithium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 43 | Berylium | mg/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| 44 | Cyanide | mg/l | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 45 | Bicarbonate (as $HCO_3$) | mg/l | | 390.4 | 353.8 | 122 | 434.2 | 89.4 | 154.5 |
| 46 | Free Ammonia as Nitrogen | mg/l | 5 | 0.46 | 0.51 | 0.49 | 1.6 | 0.7 | 1.1 |
| 47 | Total coliform bacteria | MPN/100ml | | 43 | 22 | 40 | 58 | 41 | 17 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | EDD-50 (R.O-Discharge) | Kunur Nala Downstream Near Kuldiha Bridge |
|---|---|---|---|---|---|
| | | | Date | 05.09.2017 | 05.09.2017 |
| 1 | pH at $27^0$C | | 5.5-9.0 | 9.81 | 9.05 |
| 2 | Colour in hazen | | | <5 | <5 |
| 3 | Total Suspended Solids | mg/l | 100 | <2 | 24 |
| 4 | Total Dissolved Solids | mg/l | 2100 | 832 | 172 |
| 5 | Turbidity | NTU | | 1.5 | 62.1 |
| 6 | Acidity as $CaCO_3$ | mg/l | | Nil | Nil |
| 7 | Total Alkalinity as $CaCO_3$ | mg/l | | 556.8 | 115.2 |
| 8 | Chloride as Chlorine | mg/l | 600 | 160.3 | 35.8 |
| 9 | Total Hardness | mg/l | | 27.4 | 109.8 |
| 10 | Sulphate | mg/l | 1000 | 6.3 | 6.9 |
| 11 | Calcium | mg/l | | 6.3 | 29.8 |
| 12 | Magnesium | mg/l | | 2.9 | 8.6 |
| 13 | Dissolved Oxygen | mg/l | | 4.8 | 4.9 |
| 14 | Biochemical Oxygen Demand | mg/l | 30 | 2 | <2 |
| 15 | Chemical Oxygen Demand | mg/l | 100 | 8 | 8 |
| 16 | Oil & Grease | mg/l | 10 | <5 | <5 |
| 17 | Phenolic Compounds (as $C_6H_5OH$) | mg/l | 1.2 | <0.002 | <0.002 |
| 18 | Sulphides (as $S_2$) | mg/l | 2 | <0.5 | <0.5 |
| 19 | Fluoride | mg/l | 1.5 | 0.58 | 1.45 |
| 20 | Residual free chlorine | mg/l | | <0.1 | <0.1 |
| 21 | Iron | mg/l | 3 | 0.1 | 2.95 |
| 22 | Sodium | mg/l | | 182 | 18 |
| 23 | Total Chromium | mg/l | 1 | <0.05 | <0.05 |

Surface water quality analysis of surrounding areas of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

**ANNEXURE III A**

Compliance Period:Apr'17 to Sep'17

| S. No. | Parameter | Unit | O & G Discharge Standards | EDD-50 (R.O-Discharge) | Kunur Nala Downstream Near Kuldiha Bridge |
|---|---|---|---|---|---|
| | | | Date | 05.09.2017 | 05.09.2017 |
| 24 | Zinc | mg/l | 2 | 0.011 | 0.013 |
| 25 | Copper | mg/l | 0.2 | <0.05 | <0.05 |
| 26 | Nickel | mg/l | 3 | <0.05 | <0.05 |
| 27 | Arsenic | mg/l | 0.2 | <0.01 | <0.01 |
| 28 | Lead | mg/l | 0.1 | <0.1 | <0.1 |
| 29 | Mercury | mg/l | 0.01 | <0.001 | <0.001 |
| 30 | Boron | mg/l | | <1 | <1 |
| 31 | Phosphate | mg/l | | 0.1 | 0.26 |
| 32 | Potassium | mg/l | | 2.2 | 8.2 |
| 33 | Aluminium | mg/l | | <0.01 | <0.01 |
| 34 | EC at 25° C | µmhos/cm | | 1282 | 280 |
| 35 | Cadmium | mg/l | | <0.02 | <0.02 |
| 36 | Cobalt | mg/l | | <0.1 | <0.1 |
| 37 | Vanadium | mg/l | | <0.2 | <0.2 |
| 38 | Palladium | mg/l | | <0.5 | <0.5 |
| 39 | Selenium | mg/l | | <0.01 | <0.01 |
| 40 | Manganese | mg/l | | <0.05 | <0.05 |
| 41 | Molybednum | mg/l | | <0.5 | <0.5 |
| 42 | Lithium | mg/l | | <0.5 | <0.5 |
| 43 | Berylium | mg/l | | <0.5 | <0.5 |
| 44 | Cyanide | mg/l | | <0.02 | <0.02 |
| 45 | Bicarbonate (as $HCO_3$) | mg/l | | 305 | 76.3 |
| 46 | Free Ammonia as Nitrogen | mg/l | 5 | 1.1 | 0.81 |
| 47 | Total coliform bacteria | MPN/100ml | | 47 | 94 |

**Noise Monitoring Report of CBM Raniganj Project, Essar Oil and Gas Exploration and Production Limited**

**Compliance Period Apr'17 -Sep'17**

**ANNEXURE IV**

| Noise in Surrounding Villages (Leq dB (A)) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Permissible Limit as per CPCB | Location | Dhabani | Kantabaria Crossing | Saraswatigunj | Kuldiha | Nachan | Pratappur |
| | Sampling Date | 08.06.17 to 09.06.17 | 10.06.17 to 11.06.17 | 13.06.17 to 14.06.17 | 15.06.17 to 16.06.17 | 16.06.17 to 17.06.17 | 17.06.17 to 18.06.17 |
| 75 | Day time | 64.15 | 88.50 | 67.70 | 50.30 | 69.45 | 69.05 |
| 70 | Night Time | 68.25 | 75.70 | 65.85 | 44.20 | 70.05 | 62.20 |

| Noise in Surrounding Villages (Leq dB (A)) | | | | |
|---|---|---|---|---|
| Permissible Limit as per CPCB | Location | Jatgoria | Saranga | Parulia |
| | Sampling Date | 19.06.17 to 20.06.17 | 20.07.17 to 21.07.17 | 21.07.17 to 22.07.17 |
| 75 | Day time | 70.30 | 45.88 | 54.08 |
| 70 | Night Time | 58.30 | 44.36 | 49.15 |

| Noise in Operational Areas (Leq dB (A)) | | | | | |
|---|---|---|---|---|---|
| Permissible Limit as per CPCB | Location | GGS-1 at Khatgoria | GGS-2 at Akandara | MCS at Malandighi | Warehous at Gopalpur |
| | Sampling Date | 09.06.17 to 10.06.17 | 12.06.17 to 13.06.17 | 14.06.17 to 15.06.17 | 19.07.17 to 20.07.17 |
| 75 | Day time | 66.95 | 67.20 | 71.80 | 62.71 |
| 70 | Night Time | 66.40 | 66.30 | 49.80 | 50.25 |

**Annexure V**

Environmental Expenditure of CBM Raniganj Project by Essar Oil and Gas Exploration and Production Limited

Compliance Period: Apr'17 to Sep'17

| **Expenditure towards Environmental Protection Measures at Raniganj CBM Project (Period April,2017 - Septembe, 2017)** | | |
|---|---|---|
| **Sl No** | **Particular** | **Expenses (in Rs)** |
| 1 | Installation of Reverse Osmosis Treatment System for Produced Water Treatment and METP unit for liquid waste treatment at Drill Site (Capital & Recurring) | 5,83,00,000.00 |
| 2 | Environmental Monitoring Activities (Recurring) | 7,96,077.00 |
| 3 | HDPE liners for drill cuttings storage & disposal (Capital) | 22,93,815.00 |
| 4 | Non Hazardous Waste Disposal (Recurring) | 5,88,266.00 |
| 5 | Hazardous Waste Disposal (Recurring) | 2,06,563.00 |
| 6 | CSR Activities (Recurring) | 20,85,036.00 |
| 7 | Third Party HSE Audit | 2,00,000.00 |
| **TOTAL** | | **6,44,69,757.00** |