BEFORE THE NATIONAL GREEN TRIBUNAL, NEW DELHI

APPLICATION NO.276/2013

M.A. No. 59 of 2014
IN
ORIGINAL APPLICATION No. 20 of 2014

ASHWANI KUMAR DUBEY **PETITIONER**

VS

UNION OF INDIA & ORS. **RESPONDENTS**

AND

JAGAT NARAYAN VISWAKARMA & ORS. **PETITIONER**

Vs.

UNION OF INDIA & ORS **RESPONDENTS**

AFFIDAVIT ON BEHALF OF THE RESPONDENT NO.02, THE CENTRAL POLLUTION CONOTRL BOARD, PARIVESH BHAWAN, CBD CUM OFFICE COMPLEX, EAST ARJUN NAGAR, DELHI – 110032 IN COMPLIANCE OF THE ORDER OF HON'BLE NATIONAL GREEN TRIBUNAL DATED 21.07.2015

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1. I, Sib SankarBala, s/o Late Shri HarendraNathBala, working as Director (Scientist F) in Central Pollution Control Board, PariveshBhawan, East Arjun Nagar, Delhi – 110032 do hereby solemnly affirm and declare as under:

2. That I, in the capacity of theDirector (Scientist F) of the Central Pollution Control Board (CPCB), am fully conversant with the facts of the case and hence competent to swear this affidavit.

3. The Hon'ble Tribunal vide its order dated 25.08.2014 constituted a Core Committee for Monitoring of potential hazards of Industrial development in Singrauli area. Besides, five Sub-Committees were also constituted by the Hon,ble NGT forQuantification of Industrial Impact and for assessment of Impact of pollution on Water resources, Land resources, Air quality and Health.

4. That the Interim Reports I & II of the Core committee were submitted to the Tribunal on 10.11.2014 and 08.03.2015 for consideration and passing orders as deemed appropriate by the Hon'ble Tribunal.

4. The Hon'ble Tribunal vide its order dated 21.07.2015has directed Central Pollution Control Board to submit the final report of the Core Committee within two weeks and upload on the website of the Central Pollution Control Board.

5. That the final report of the Core Committee is enclosed at **Annexure I**. Based on the interaction with the people and the observations and findings during the field visit, the Core Committee made following observations:

5.1 Fluorosis appears to be highly prevalent especially in the two blocks of Chopan and Myorpure. Ground water in certain areas has been observed with high fluoride concentration, particularly in villagesGovindpur, Kusmaha, Kakri, Harrahwa, Khairi, Naktu, Sirsoti, Chilkadand, Pasavar raja, and Dibulgang. As such fluoride, in groundwater is attributed to the ferro-alluminious soil prevailing in the area.

5.2 The level of mercury concentration in ground waterwas found to be exceeding the limit of 0.001 mg/liter in the samples collected from Kirwani, Parasi, Harrahwa, Naktu, Sirsoti, Chilkadand, Parsavar-raja, Govindpur, Kusmaha, Khairahi, Jayant Colony, Jaitpur, MPCC colony, and Dibulganj villages.

5.3 The high pH (10.9) of the effluent being discharged in DongiaNallah (UP) by M/s Aditya Birla Chemicals indicates improper treatment of effluent by the industries in the area.

5.4 Mercury-bearing brine sludge is stored in the secured land fill having proper lining and monitoring facility in the premises of M/s Aditya Chemicals Ltd. (formerly M/s Kanoriya chemicals Ltd., UP). However, it was not possible to estimate the total generation of brine sludge since the inception of the industry till the process change from mercury cell to membrane cell, due to non availability of authentic records.

5.5 Flyash and bottom ash of Anpara (A&B) Thermal Power Plant of Uttar Pradesh RajyaVidyutUtpadan Nigam Ltd. (UPRVUNL) and Anpara C Thermal Power Plant of M/s Lanco Power are disposed off in ash dyke located in Belvadah village situated on the bank of Rihand Reservoir. The overflow from the ash pond, after settling, is discharged into the

Reservoir. The discharge of the overflow from ash pond is proposed to be stopped, once the Ash Water Recirculation systems (AWRS) at both the Plants are commissioned. AWRS at Anpara C has been constructed, while it is under advanced stage of completion at A&B Plants of UPRVUNL. The commissioning of the AWRS and the stoppage of effluent into Rihand reservoir have to be continuously monitored by the Power Plants and UPPCB.

5.6 Belt Pipe conveyor system for transportation of coal from Krishanshila Coal Mine of NCL to Renusagar Power Company is in advanced stage of completion. The Committee was informed that the commissioning of the same is delayed due to delay in granting of NOC by the Railways. After commissioning of pipe conveying system, about 700 trucks transporting coal will be phased out. This will help in preventing fugitive coal dust emission, noise pollution and transport pressure on the road. Railways and the concerned Mine/Power Company need to take immediate measures to complete the conveying system.

5.7 BalliaNallah flowing in between Shaktinagar (UP) and Vindhyachal Super Thermal Plants (MP) of NTPC still carries sewage as well as the effluent from the coal mine. The committee was informed that the discharge of sewage into Nallah from NTPC Shaktinagar plant has been stopped, however, monitoring of the drains from the NTPC Plant/colonies (Shaktinagar) and the Municipal areas/villages is required.

5.8 Ash from NTPC Shaktinagar and Vindhyachal Super Thermal Plants is discharged in slurry form into the ash ponds having a total area of about 1700 acres and located in MP. Both Vindhyachal&Shaktinagr Super Thermal Plant have AWRS in place.

5.9 The committee observed that huge area (more than 3000 acres) along the Rihand Reservoir has been occupied for disposal of flyash by thermal power plants of NTPC Ltd, UPRVUNL, M/s Lanco Power and M/s Hindalco Industries Ltd. (UP) in the Singrauli region. Most of the ash ponds have attained their maximum height and reached their saturation, and therefore, have no further augmentation capacity for disposal of ash slurry. The situation will be worse in the next five

years, unless proper measures are taken to augment and accelerate the utilization of flyash as per the Notification of 2009. The disposal of ash in the ash ponds along the Rihand Reservoir leads to silting of the Reservoir, in case of non-compliance of ash pond over flow discharge limit or any breach in ash dyke of the ash pond/s. Concerned industries are required to follow the existing guidelines and cap the ponds. Phyto-restoration of such sites should be carried out with immediate effect.

5.10 Overall environment management including Over Burden disposal, ash water recycling and eco-restoration at Nigahi coal mine area carried out so far was found to be satisfactory.

5.11 The committee was informed that out of 83 RO systems proposed to be installed, 55 RO systems have been installed in UP side of the Singrauli area and another 28 RO systems are under the advanced stage of installation. All 14 RO systems have been installed in MP side of the Singrauli area. The committee was of the opinion that these RO systems need to be maintained properly and concerned SPCBs are advised to inspect periodically in order to ensure proper functioning of RO systems and the disposal of RO reject waste in an environmentally sound manner. Failure to dispose off RO reject will pose another environmental threat in the area in the near future.

5.12 The treated water from Reverse Osmosis plants installed in Bajrang Nagar, Dibulganj and Parsavar-raja was found to be exceeding the permissible limits prescribed by BIS (2012) for aluminium, iron, mercury, cadmium and nickel. This indicates that the reverse osmosis plants installed are not suitable/capable of removing the trace metals from water.

5.13 In the area around Dala JP Cement Factory, people with signs of lung manifestations were found, probably suggestive of silicosis. It was also found in people residing near the coal transport roads.

5.14 The levels of heavy metals (Cr, Cu, Ni, Pb and Zn) in the soils of the agricultural land in the impact zone are not likely to have any adverse impact to soil microorganisms / plant / animals and human beings. The values indicate that there is no significant difference in the heavy

metal contents (except Cd) between soils of impact zone and reference area.

6.0 Based on the conclusions drawn by the respective Sub–Committeesfor restoration of the environment and the prevention of pollution in the Singrauli area (both Uttar Pradesh & Madhya Pradesh), the recommendations of the Core Committeeare given as under for the consideration and issuance of appropriate directions:

6.1 **Thermal Power Plants**

6.1.1 That all Thermal Power Plants in Sonebhadra and Singrauli Districts shall submit a road map and make all out efforts to achieve target of flyash utilization as per the Notification of 2009. If needed, the plants shall install their own brick and block manufacturing units at suitable sites and these bricks/blocks shall be made mandatory to be used in the buildings and other construction activities as per the notification issued by MoEF&CC time to time. The state Government may declare a utilization zone for such purpose. The plants shall submit quarterly compliance report to the concerned Sate Pollution Control Boards.

6.1.2 That as per the provisions of the Notification of 2009, 25% percent of flyash should be utilized along with Over Burden (OB). Therefore, all Thermal Power Plants and Coal Mines in Sonebhadra and Singrauli Districts should be asked to study the feasibility of disposal of flyash in coal mines along with (OB)under the guidance of the Directorate General of Mine Safety (DGMS). An action plan in this regard shall be prepared including the mode of transportation of flyash from power plants to coal mine sites.

6.1.3 That all Thermal Power Plants in Sonebhadra and Singrauli Districts shall be supplied with and use coal not containing ash content more than 34% on quarterly average basis as stipulated vide Notification No. GSR 02 (E) dated January 02, 2014.

6.1.4 That Anapara (A&B) and Obra Thermal Power Plants of Uttar Pradesh RajyaVidyutUtpadan Nigam Ltd. (UPRVUNL) &Anpara C Thermal Power Plant of M/s LancoPower shall complete their ash water

recirculation system and stop discharge of ash pond overflow in Rihand reservoir.

6.1.5That Shaktinagar, Rihand, Vindhyachal Thermal Power Plants of NTPC Ltd. and Anapara (A&B) and Obra Thermal Power Plants of UPRVUNL shall install and renovate Electrostatic Precipitators to achieve emission limit of 100 mg/Nm^3 as per the long-term action plan prepared under CEPI programme for improvement of air quality of Singrauli area.

6.1.6 ThatShaktinagar SuperThermal Power Plant of NTPC Ltd. shall stop discharge of sewage into BalliaNallah with immediate effect. The sewage from the plant should be treated to meet the statutory requirements for recycle and reuse, for gainful purposes such as gardening.

6.1.7 ThatCaptive Power Plant (Renusagar Power Company) of M/s Hindalco Industries Ltd.shall commission Belt Pipe Conveyor System for transportation of coal from Krishanshila Coal Mine of NCL to Renusagar Power Company within a month and shall immediately stop transportation of coal by trucks thereafter.

6.1.8 That the hazardous waste generated from the power plants shall be disposed off through either authorized Treatment, Storage & Disposal Facility (TSDF) or registered recyclers/users of the hazardous waste. The plants shall obtained authorization for the same from the concerned State Pollution Control Boards under the Hazardous Waste (management& handling) Rules, 2009.

6.2 **Aluminum Smelter: M/s Hindalco Industries, Renukoot**

6.2.1 That the industry shall achieve emission limit of 50 mg/Nm^3 for particulate matter in respect of Baking furnace No. 3 & 4. The emission from baking furnace No. 5 should also be limited to 50 mg/Nm^3.

6.2.2 That the industry shall ensure that no red mud is leached out to ground water during monsoon and post monsoon period. Besides, industry shall facilitate utilisation of Red Mud. The industry shall

also explore the possibility of extraction of titanium and other heavy metals from the Red Mud.

6.2.3 That the industry shall submit an action plan by October 31, 2015 to achieve zero discharge of waste water by December 31, 2016.

6.2.4 That the hazardous waste generated from the industry shall be disposed off through either TSDF or registered recyclers/users of the hazardous waste. The industry shall obtained authorization for the same from the concerned State Pollution Control Boards under the Hazardous Waste (Management& Handling) Rules, 2009.

6.3 **M/s Aditya Birla Chemicals, Renukoot**

6.3.1 That the industry shall ensure installation and proper operation of effluent treatment plant so as to ensure the compliance of the effluent discharge standard. The industry shall also insure that no untreated/improperly treated effluent finds its way in to the Nallah leading to the Rihand Reservoir.

6.3.2 That the industry shall submit an action plan within one month so as to achieve zero discharge of wastewater by July 31, 2016.

6.3.3 That the hazardous waste generated from the industry shall disposed off through either authorized Treatment, Storage & Disposal Facility (TSDF) or registered recyclers/users of the hazardous waste . The industry shall obtained authorization for the same from the concerned State Pollution Control Boards under the Hazardous Waste (Management & Handling) Rules, 2009.

6.4 **M/s Northern Coalfields Limited (NCL)**

6.4.1 That all the coal mines of NCL in Singrauli area shall ensure that their wastewater from different processes is integrated and subjected to treatment in the effluent treatment plant. Entire treated effluent shall be reused in the dust suppression on haul roads, irrigation on mine overburden and other associated operations which shall eventually result in zero discharge of wastewater from the coal mines.

6.4.2 That all coal mines of NCL should use 25% flyash from thermal power plants on volume to volume basis for external dump of overburden and also 25% of the over burden in the upper benches of backfilling of exhausted pits of all open cast mines of NCL under the guidance of DGMS as per Notification dated November 03, 2009. Further, the external dump and exhausted pits should be scientifically reclaimed using suitable biological and engineering measures.

6.4.3 that all coal mines of NCL shall ensure the compliance of the Notification of 2014 on the supply and use of beneficiated coal to thermal power plants in the Singrauli area.

6.4.4 that all coal mines shall ensure that transportation of coal shall only be either by railway wagons or by the dedicated conveyor system. No transportation of coal shall be permitted by road to any of the industries in the Singrauli area.

6.4.5 that all hazardous waste generated from the coal mines shall dispose off through either authorized TSDF or registered recyclers/users of the hazardous waste . The coal mines shall obtained authorization for the same from the concerned State Pollution Control Boards under the Hazardous Waste (Management & Handling) Rules, 2009.

6.5 **Stone crushers**

6.5.1 That all stone crushers which operate without effective dust suppression system and without the consent of the concerned SPCB shall be closed forthwith. Feasibility should be assessed for providing wind breaking walls towards upwind direction to prevent dispersion of fugitive dust.

6.5.2 That the concerned State Pollution Control Boards, in consultation with the Central Pollution Control Board, shall also look into the ambient air quality of the area in the 500 m zone from the crushers and suggest and enforce such measures as may be necessary to reduce the fugitive dust emission from the crushers. If necessary, the dust emission norms/ norms for the ambient air quality in the immediate vicinity of the crushers shall be reviewed and made more stringent.

6.6 Pollution Control Boards and MoEF& CC

6.6.1 that the expansion of the existing industries and permission for installation of new industries should only be considered after ensuring that the cumulative impact of emissions and effluents on ambient air and water quality of the area shall not exceed the prescribed limits.

6.6.2 that the UP & MP Pollution Control Boards shall ensure the implementation of Action Plan formulated in their respective areas under Comprehensive Environmental Pollution Index (CEPI) Programme. Besides, SPCBs shall ensure compliance with respect to emission, effluent and solid waste management by the industries and submit a progress report to the Regional Office of MoEF& CC and CPCB regularly.

6.6.3 That the industries shall provide on-line monitoring systems for emissions and effluent discharge and the data generated shall be transferred to respective SPCB and the CPCB on continuing basis.

6.6.4 That the existing network of monitoring system for AAQ monitoring in both the districts of UP & MP need to strengthened and expanded to get representative air quality status of Singrauli area. Industries in the area should install at least three continuous ambient air quality monitoring stations within six months on **"Polluter Pays Principle"** at such locations as may be decided by CPCB in consultation with the respective SPCBs. The data generated should be transferred to SPCBs and CPCB on continuing basis.

6.6.5 That the levels of mercury in ambient and ground and surface water is reported to be one of the major problems in Singrauli area. Therefore, it is essential that at least three continuous monitoring systems for mercury (Hg) monitoring in the ambient air and surface and ground water should be installed (covering both the Districts of UP & MP) at suitable locations in the Singrauli area by the industries on **"Polluter Pays Principle".** CPCB in consultation with the SPCBs shall guide the industries in the location of the monitoring stations

6.7 District Administration of respective States

6.7.1 That poor road conditions in the area are also one of the major sources of pollution. It is, therefore, recommended that the respective State Governments should take immediate measures to improve the road conditions in the area in a time-bound manner and ensure the regular maintenance of the roads.

6.7.2 That fluoride affected villages must be supplied with safe drinking water (RO treated water) under the supervision of the District Administration. All the tube wells supplying contaminated water should install SIGN BOARDS informing public not to use the tube well water for drinking purposes. The concerned Departments (Irrigation/ Jal Nigam) of the State Administration should submit a compliance report to Regional Office of MoEF& CC every month. The maintenance of these RO systems along with education of residents about proper method and benefits of RO water shall also be ensured.

6.7.3 That the concerned Departments (Irrigation/ Jal Nigam) of the State Administration shall also ensure proper disposal of the RO rejects, so as not to affect the ground water and surface water streams and the soil of the area.

6.7.4 That as the patients with clinical manifestations suggestive of fluorosis were also noted to have severe malnutrition. Therefore, mineral and nutrient supplements for these areas should be ensured by the District Administration.

6.7.5 that the patients with clinical manifestations suggestive of fluorosis must be monitored for their health through a scientific plan of periodic checkup as recommended by KGMU, AIIMS, Bhopal and IMS, BHU. Dental as well as bone fluorosis can be improved, if detected in the early stage.

6.7.6 That considering the reports of the clinical examination and recommendations by the Sub-Committee on Health, it is essential that a Standard Toxicological Testing and Analysis Laboratory should be established in the region.

6.7.7 That there is a need to train Health care workers including Doctors for identifying the sources of diseases due to fluoride/mercury emission/discharge and treating the affected patients. Therefore, Training Centers can be established in KGMU, Lucknow and AIIMS, Bhopal for such a purpose.

6.7.8 That there is a number of health related issues like silicosis, fluorosis, and the impact of mercury on the people in the area, which need to be examined in detail. Therefore, a long-term project needs to be planned with proper funding and adequate manpower under "**Polluter Pays Principle**" for estimating the magnitude of health related problem in the area.

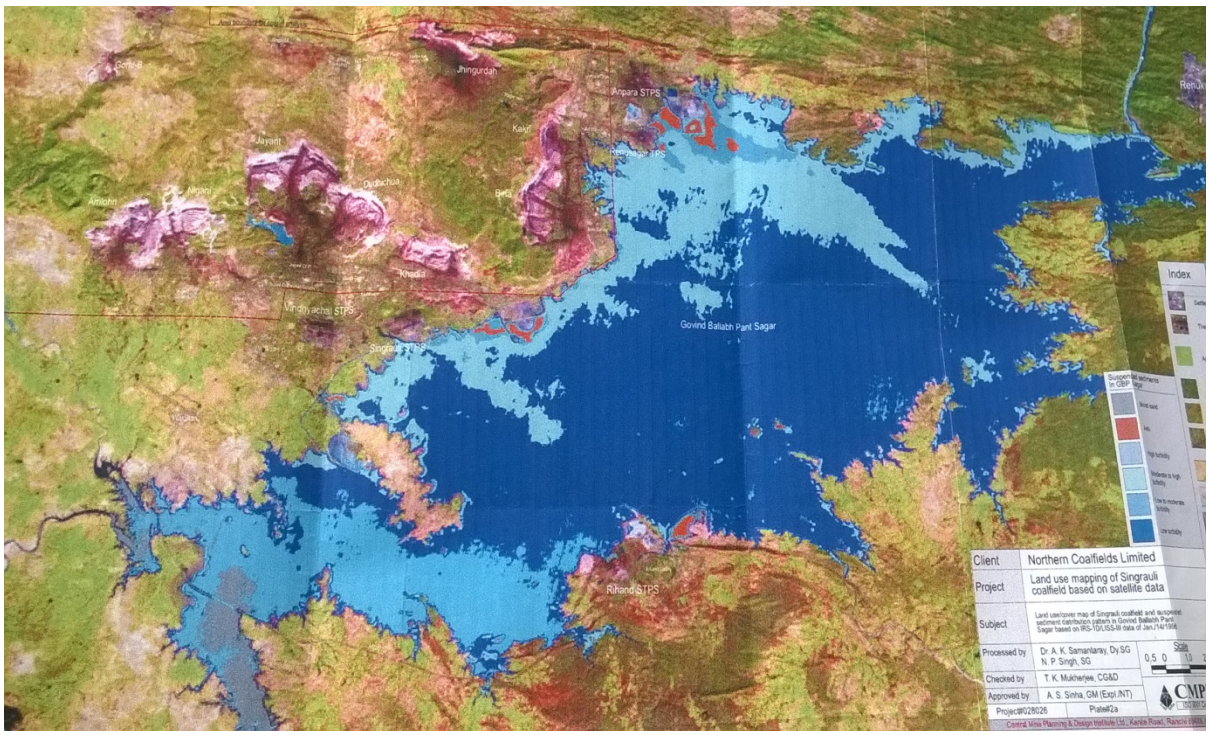
VERIFICATION :

Verified at Delhi on this 14th day of August, 2015 that the contents of the above affidavit are correct to the best of my knowledge and belief and nothing has been concealed thereon.

D E P O N E N T

REPORT OF THE CORE COMMITTEE CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL (NGT), NEW DELHIFOR "MONITORING OF POTENTIAL HAZARDS OF INDUSTRIALDEVELOPMENT IN SINGRAULI AREA"

[In the Matter of OA No. 276 of 2013& M.A. No. 59 of 2014 in O.A. No. 20 of 2014) Ashwani Kumar Dubey Vs Union Of India and Ors And Jagat Narayan Viswakarma&Ors. Vs. Union of India &Ors.]



July 2015

(Vol.I- MAIN REPORT)

Table of Contents

1. Hon'ble National Green Tribunal (NGT,vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013-Ashwani Kumar Dubey Vs Union of India)constituted a Core Committee for monitoring of potential hazards of Industrial Development in Singrauli Area(both UP & MP). In addition to this, five sub-committee werealso constituted for quantification of industrial impacts, assessment of potential impact of pollution on water resources, land resources and air quality, and the assessment of potential impact on human health with respect to Singrauli area (both UP & MP).

The terms of reference of the Core Committee are as follows:

a) Conducting survey(s) of all the industries (thermal power plants, coal mines, etc.) to assess the pollution caused by them as a result of their activities.
b) Synthesis of data compiled by Sub-Committee 1 to 5 for identifying causative factors- industry wise.
c) Suggesting remedial measures that are required for restoration of the environment and prevention of pollution in the area (both Uttar Pradesh & Madhya Pradesh)- industry wise.
d) To guide each of the sub-committee and seek progress of work on fortnightly basis. The core-team may nominate members of the core-team based on their subject expertise to look into day to day affairs of sub-committees.
e) The Committee shall submit its final report directly to NGT within 3 months

In order to guide and coordinate the work of Sub- Committees as per TOR (para D) of NGT, CPCB vide its letter No. B-33014/7/2006/PCI-II September 29, 2014 nominated one of the expert members of the Core Committee as Convenor of the each of Sub-Committees. A copy of letter is enclosed at **Annexure I(Vol-II of report).**

2. Proceedingsof the Core committee& Sub - Committees

2.1 Meetings:

Core Committee

Ist meeting	: 16.10.2014
IInd meeting	: 22.01.2015

IIIrd meeting : 27.07.2015

Sub -Committees

Ist meeting of Sub-Committee-1 : 24.09.2014
(Quantification of Industrial Impacts)

Ist meeting of Sub-Committee-2 : 24.12.2014
(Pollution Potential of water resources)

Ist meeting of Sub- Committee -3 : 21.11.0214
(Potential Impact of pollution on land resources)

Ist meeting of Sub-Committee 4 : 20.10.2014
(Potential Impact of pollution on air quality) : 14.05.2015

Ist meeting of Sub– Committee 5 : 15.12.2014
(Potential Impact of pollution on Health) : 09-10.04.2015

2.2 **Field Visits**

Core Committee : 4-5.12. 2014

Sub–Committee-3 : 3-6.12.2014

Sub-Committee-2 : 29-30.01. 2015
4 & 5.07.2015

Sub-committee-5 : 29.12.2014
: 09-10.04.2015

Note:

The visit of sub-comiittee-4 on potential impact of pollution on air quality could not be necessitated as ambient air quality monitoring in Singrauli area is being conducted by the respective SPCBs and individual industries on regular basis. The data collected by the SPCBs were compiled and presented in the meeting of the sub-committee held on May 14, 2015. Similarly, data with respect to quantification of Industrial Pollution required by Sub-Committee 1 were collected by the respective SPCBs and the Regional Offices of MoEF& CC.

The minutes of the meetings of the CoreCommittee and the visit report are given in **Annexure II (a-b)** separately in **Vol-II** of the report.

2.3 Public Consultation

The Core and Sub-Committeemembers met residents, representatives of NGO and media persons of the Singrauli area during field visits. The views and representations given by them are provided at **Annexure III** of **Vol-II** of the report. While finalising their reports, the committees considered these various representations.

3. Singrauli Area

The area in the north-eastern part of the Singraui District in the state of MP and the adjoining southern part of the Sonebhadra District in the state of Uttar Pradesh is collectively known as Singrauli.TheSingrauliAreacomprises of approximately 4328 square km. of District Sonebhadra in UP and 5672 sq.km of District Singrauli in MP. The areas surrounded by Sakti Nagar, Rihand Nagar, Vindhyanagar, Dudhichua, &Dala, Amlori, Nigahi, Jayant, and Jhingurda and the adjoining villages alogwithriver Sone fall within the boundary of the Singrauli impacted area.

Singrauli is a major power hub in the country due to availability of coal. The installed capacity of power generation at present is 21000 MW. Besides Thermal Power Plants, Aluminium Industry, Chemical Industry, Mining Industries, Cement Plants and Stone Crushers are other major industries in Singrauli Area. The details of industries located in Singrauli are given in Table 1:

Table 1:Details of number of industries located in Singrauli area

Sr.No.	Category of industry	UP	MP	Total
01	Thermal Power Plant	06	04	10
02	Coal Mines	05	11 (06)	16
03	Cement Plant	01	00	01
04	Steel / Sponge Iron	00	01	01
05	Stone Crusher Cluster (nos)	01 (264 nos)	00 (45- not in cluster)	309
06	Explosive (SMS Bulk)	00	08	08
07	Chemical	02	10	12
08	Aluminum	01	01	02
	Total	**279**	**80**	**359**

4.0 Singrauli - Critically Polluted Area (CPA)

Due to the industrialization of the area, environmental problems with respect to airand water pollution and solid waste management have been reported for the last two decades. After detailed environmental study and based on the Comprehensive Environmental Pollution Index (CEPI), CPCB has identified Singrauli as one of the critically polluted areas (CPA) in the year 2010. The industry-specific action plan considering of shortand long term action points for the prevention and control of industrial pollution in Singrauliarea was prepared and is beung implemented. The implementation of the action plan is monitored by the UP& MP Pollution Control Boards and the respective District administration periodically. The status of the implementation of action plan is given in **Annexure IV(Vol –II)**

5.0 Assessment of Potential Impact of Pollution in Singrauli area

In compliance to the order of the Hon'ble NGT , respective sub committees have submitted their reports to the Core committee. The reports of the Sub-Committee are given as **AnnexureV (a-e) of Vol -II** of the report. The findings of each of the sub-committee onthe quantification of industrial impact and its impact of pollution on water, air, soil and human health in Singrauli area are briefly discussed in the following paragraphs:

5.1 Quantification of Industrial Impact

The sub-committee-1on "Quantification of Industrial Impacts" comprisedthe representatives from CPCB, UPPCB, MPPCB, Regional office of MOEF, Lucknow & Bhopal and the experts from IITR, Lucknow and ISM, Dhanbad. The Member Secretary, CPCB coordinated the activities of the sub-committee 1. As per the decision taken in the meeting of the committee held on September 24, 2014, information/data with respect to **Inventory of Existing industries – industry wise**(Production in terms of each product either per day or per month,Raw material used: in terms of each raw material including fuel and water per day and the sources), **Pollution Load generation (** Water- quantity of each of the significant pollutant per day before and after treatment, Air- quantity emission in terms of each pollutant per day, Fly-ash-quantity per day, Hazardous waste-quantity per day and

Others, if any–specified and quantified), **Compliance Status (** Environmental Clearance conditions, Forest Clearance conditions and Consent conditions).Adequacy of each of the pollution control measure/s, census of Vehicular traffic on daily basis especially in and around residential clusters. Ambient air quality monitored in the above residential areas, Vehicular census and their usage data were used for the quantification of pollution load generation from the vehicles (separately for the petrol and diesel driven vehicles) and on the Overall status including deficiency, if anywere collected by the respective SPCBs and the regional offices of MoEF& CC. The report of the sub-committee is attached at **Annexure Va.**

The findings of the sub-committee are summarised as under:

5.1.1 There are 359 industries in the Singrauli area of which 259 are located in the State of UP and 80 are located in the State of MP . Among theseindustries , thermal power plants, aluminium and coal minesarethe major categories of industries. There are 10 thermal power plants a having total installed capacity of 21000 MW (06 in UP with an installed capacity of 9280 MW and 04 plants in MP with an installed capacity of 11640 MW), 02 aluminium plantswith 0.7 million tonnes of aluminium per annum and 0.9 million tonne of aluminaproduction per annum, 01 cement plant with capacity of 2million of tonnes of clinker and 0.5 million tonnes of cement production capacity per yearand 10 coal mines with a production capacity of 74.5 million tonnes of coal per year. Besides, there are a number of stone crushers situated in clusters in the area.

5.1.2 During the year 2013-14, about 64.64 million tonnes of coal was producedby the coal mines of NCL which was supplied to thermal power plants in the area. Thermal power plants located in Singrauliarea required about 103 million tonne of coal annually.
Coal requirement of Sasan thermal power plant is met by the captive mines of the M/s Reliance infrastructure Ltd located in MP.

5.1.3 An estimatedamount of about 35 million tonnes of flyash is generatedper year from thermal power plants in the area. Besides flyash, about 863031 tonnes of red mud and 2250.53 tonnes of Spent Pot lining (SPL) are also generatedby the

aluminium industry.In addition, about 208.78 million cubic metre of Over Burden (OB) from the coal mines was removed and stacked deposited at identified places around the mines.

5.1.4 It is also estimated that annually, about0.06million tonne total particulate matter (consisting of 0.034 million tonne of PM_{10}), 0.8 million tonne of SO_2, 0.9 million tonne of NO_x and about 8. 4 tonne of mercury is emitted from the thermal power plants in Singrauli area (both MP & UP).

5.1.5 There are two categories of thermal power plants of which one category has once through cooling (OTC) water system and another category has cooling towers (CT). The plants havingOTC use larger quantity of water,50- 70 mm3 / MWh in comparison to plants having CT, 4.5 to 7 M3 /MWh. Based on collected data,the estimated water consumption by the thermal power plants is about37.21 million cubic metre perday is used by the thermal power plantsin the area.

5.1.6 Total Bio-Chemical Oxygen Demand (BOD) load of the waste water discharged from the industries in the area is estimated to be 41722 kg per day. The effluent discharged to different water bodies ultimately reachRihand reservoir.

5.1.7About 3774.1 tonne per day used oil (categorised as hazardous waste) is generated from all major large scale industries in the area.

5.1.8 All the major large scale industries have consent to operate up to December 31, 2015 under Air (Prevention and Control of Pollution) Act,1981 and Water (Prevention and Control of Pollution)Act, 1974.

5.1.9 All major large scale industries have obtained environmental clearance from the Ministry of Environment, Forests & Climate Change.

5.1.10 Total number of registered vehicles in the districts of Singrauli and Sonebhadra of MP and UP is 207525. Among these , 65050 are four /three wheelers and 142375 two wheelers.

5.1.11 The total emission load from the vehicles in the districts of Sonebhadra and Singrauli districts is estimated to be 1324.9 and 1346.9 tonnes of NOx per annum and 3399.69 and 1015.2 tonne of CO per annum.

Compliance status

All the major large scale industries have installed effluent treatment plants and air pollution control equipment for the treatment of wastewater and the reduction of emission of particulate matter within the stipulated limits of pollutants. An Industry Specific Action Plan suggesting short and long term action points for control of industrial pollution in Singrauli area has been prepared. The implementation of Action Plan is monitored by the UP and MP Pollution Control Board and the District administration under their administered areas periodically.The status of implementation ofthe ActionPlan is given in **Annexure IV (Vol –II)**

5.2 Pollution Potential of Water Resources

The Sub-Committee-2on "Pollution Potential of Water Resources " comprised representatives from UPPCB, MPPCB, NIH Roorkee, Expert from State Irrigation Department, Ministry of Water resources and Central Ground Water authority. The Director, NIH Roorkee coordinated the activities of the Sub-Committee 2.The report of the Sub-Committee is attached at **Annexure Vb.**

Based on the survey of the Singrauli Area and available information, the findings of the sub- committee are given as under:

5.2.1 The values of pH, total hardness, fluoride, aluminium, total chromium, iron, manganese, mercury, cadmium and nickel for Kusumha pond were exceeding the acceptable limit prescribed by BIS (2012) for drinking water.

5.2.2 The analysis result of MurdhawaNala indicates that the value of fluoride are not in conformity with the effluent standards notified vide

G .S.R. 801(E) dated 31.12.1995 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.3 The analysis result of DongiyaNala indicates that the value of pH and fluoride are not in conformity with the effluent standards notified vide G .S.R. 801(E) dated 31.12.1995 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.4 The analysis result of samples from BaliyaNala, Dudhichua project ETP, Jayant project ETP and Jayant mine sump indicates that the all the analyzed values were in conformity with the effluent standards notified vide G .S.R. 801(E) dated 31.12.1995 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.5 The analysis result of effluents from Jayant Mine ETP indicates that manganese concentration exceeded the effluent standards notified vide uG .S.R. 801(E) dated 31.12.1995 nder Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.6 The analysis result of Jayant STP water indicates that the all the analyzed values except nitrate were in conformity with the effluent standards notified vide G .S.R. 801(E) dated 31.12.1995 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.7 The analysis result of Surya Nala indicates that all the analyzed values except fluoride, nitrate and iron were in conformity with the effluent standards notified vide G .S.R. 801(E) dated 31.12.1995 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.8 The analysis result of JanturiaNala indicates that all the analyzed values were in conformity with the effluent standards notified vide G .S.R. 801(E) dated 31.12.1995 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.9 The analysis result of NTPC Vindhyanagar and Shaktinagar Ash Dyke Overflow indicates that all the analyzed values were in conformity with the effluent standards notified G .S.R. 801(E) dated 31.12.1995 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.10 The analysis result of Sasan Power Drain indicates that all the analyzed values were in conformity with the effluent standards notified vide G .S.R. 801(E) dated 31.12.1995 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.11 The analysis result of Lanco Ash Dyke overflow indicates that the all the analyzed values except fluoride were in conformity with the effluent standards notified vide G .S.R. 801(E) dated 31.12.1995 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5.2.12 The values of aluminium, iron, manganese, nickel, mercury and nickel for Rihand reservoir were exceeding the acceptable limit prescribed by BIS (2012) for drinking water at several sampling locations. Mercury was detected in all the samples and is an alarming situation.

5.2.13 The concentration of total chromium and cadmium is nearing towards the limit prescribed for drinking water. Total and fecal coliforms were also detected in the reservoir samples and exceed the desirable limit set by MoEF for bathing water.

5.2.14 The analysis result of Channel flowing below Rihand River Bridge indicates that all the analyzed values except aluminum and iron were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

5.2.15 The analysis result of Rihand River indicates that all the analyzed values except aluminium, iron, and manganese were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

5.2.16 The analysis result of Renu River indicates that all the analyzed values except aluminium and mercury were in conformity with acceptable limit prescribed by BIS (2012) for drinking water. High concentration of mercury in Renu River is a matter of concern and needs thorough investigation.

5.2.17The analysis result of Chilka Lake, Shaktinagar indicates that all the analyzed values except aluminium, iron, lead, and mercury were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

5.2.18The analysis result of Ashram Talab, Govindpur indicates that all the analyzed values except aluminium, iron, and fluoride were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

5.2.19 The quality of groundwater is found deteriorated in terms of trace metals, nitrate and fluoride. Concentration of fluoride exceeded the desirable limit prescribed by BIS (2012) in the samples collected from Govindpur, Kusmaha, Kakri, Harrahwa, Khairi, Naktu, Sirsoti, Chilkadand, Pasavar raja, and Dibulgang. Concentration of mercury exceeded in the samples collected from Kirwani, Parasi, Harrahwa, Naktu, Sirsoti, Chilkadand, Parsavar-raja, Govindpur, Kusmaha, Khairahi, Jayant Colony, Jaitpur, MPCC colony, and Dibulganj.

5.2.20 The treated water from Reverse Osmosis plants installed in Bajrang Nagar, Dibulganj exceeded the permissible limits prescribed by BIS (2012) for aluminium, iron, mercury, cadmium and nickel for the samples collected in January 2015. For samples collected in April 2015, concentration of aluminum exceeded the desirable limit and lead exceeded the permissible limit prescribed by BIS (2012). The treated water from Reverse Osmosis plants installed in Parsavar-raja village exceeded the permissible limits prescribed by BIS (2012) for aluminium, iron, and mercury. This indicates that the reverse osmosis plants installed are not suitable/capable of removing the trace metals from the water.

5.3 Potential Impact of pollution on Land Resources

The Sub-Committee-3 on "Potential Impact of pollution on land resources" consistedof representatives fromIndian Institute of Toxicological Research, Lucknow, Representative of Central Pollution Control Board, Madhya Pradesh State Pollution Control Board and Uttar Pradesh State Pollution Control Board, Expert of Soil Science from Indian Institute of Soil Science, Bhopal and Expert of Forest Soil from Indian Council of Forestry Research and Education, Dehradun.The Director General, ICFRE, Dehradun coordinated the activities of the sub-committee as per the TOR given by NGT.The report of the sub-committee is attached at **Annexure Vc.**

The findings of the Sub Committee are summarised as under:

5.3.1 Physico-chemical characteristics of soil with emphasis on mercury and other relevant heavy metals, and soil fertility were studied. The values of physico-chemical parameters do not show significant variation in impact and non impact zones, except in few pockets as shown in the location map of the studied area, where pH, E.C, and Cadmium showed higher test values. In general, nitrogen status of the agriculture and forest soil showed low range. The other parameters *viz.* organic carbon, available nitrogen, exchangeable cations and cation exchange capcity (CEC) showed low test values where as available potash and phosphorous showed medium to high test values. Air pollutants including suspended particulate matter and other aerosols were also observed around the mining areas.

5.3.2 The heavy metal (Cr, Cu, Ni, Pb and Zn) levels in the levels in the soils of the agricultural land in the impact zone are not likely to have any adverse impact to soil microorganisms / plant / animals and human beings. The values indicate that there is no significant difference in the heavy metal contents (except Cd) between soils of impact zone and reference area.

5.4 Potential Impact of pollution on Air Quality

The sub-committee-4 on "Potential Impact of pollution on air quality " comprised of representatives from NEERI, Nagpur, IIT , Kanpur, Representatives from CPCB, UPPCB & MPPCB. The member Secretary CPCB, coordinated the activities of the sub-committee as per the TOR given by NGT.The report of the sub-committee is attached at **Annexure Vd.**

The findings of the Sub Committee are summarised as under:

5.4.1 Presently AAQ monitoring of four parameters (SO2 , NO2 , PM10 & SPM) is carried out by UPPCB & MPPCB at 5 locations (Anpara Colony, Renusagar Colony, NTPC Vindhynagar, Waidan& Jayant Colony) in Singrauli area. The existing AAQ monitoring network is not sufficient to get representative air quality status of Singrauli area. Therefore, there is a need to expand the AAQ monitoring network in both the districts of UP & MP. The committee is of the opinion that possibility may be explored to engage NEERI/IIT, Kanpur, ISMDhanbad and involve local agencies for regular AAQ monitoring at selected locations.

5.4.2 The AAQ monitoring data collected with respect to PM_{10}, $PM_{2.5,}$ SO_2 and NO_2during December 2014 to March 2015 at 05 monitoring stations located at Vindhynagar NTPC Colony, Jayant Expert Hostel of NCL and WaidhanBasti (Madhya Pradesh) and Anapara&Renusagar Colony (Uttar Pradesh) is given in **Annexure Vd**.

5.4.2.1 The concentrations of SO_2 and NO_2 were found in the range of 11-24and 10-39 ug/m^3respectively for all monitoring stations which well within the prescribed limit of80 ug/m^3.

5.4.2.2 The concentrations of PM_{10} and PM $_{2.5}$ were in the range of 71.5-163 and 29-62 ug/m^3respectively for all monitoring stations. The concentrations of PM_{10} exceeded the limit of 100ug/m3 at a number of days of monitoring period at Anpara Colony and Renusagar Colony, Jayant and waidhanmonitoring locations.

5.5 Potential Impact of pollution on Health

The Sub-Committee-5on "Potential Impact of pollution on Health" comprised representatives from AIIMS, New Delhi, KGMC, Lucknow , Representatives from CPCB, UPPCB and MPPCB. DR K.V. Redy ,Professor, KGMC coordinated the activities of the of the Sub-Committee as per the TOR given by NGT.The report of the sub-committee is attached at **Annexure Ve.**

The 1st meeting of Sub-Committee-5 was held on 15th December, 2014 at NTPC, Rihand Nagar, Sonebhadra. Chief Medical Officer ,Sonebhadra District, UP provided the data of health survey in 51 villages from Chopan and Myorpur blocks of Sonbhadra district which was carried out in month of November 2014 by a Technical Support Unit (TSU) of UP at the the instenceof the Principal Secretary, Medical Health & Family Welfare, Government of Uttar Pradesh, and the Director General, Health; Mission Director, National Health Mission.

A total of 1194 persons went through the health check-up. A total of 779 were treated of different diseases . Out of 1194 persons, 382 people had tooth fluorosis and 113 persons had bone and joint fluorosis. About 700 persons were suffering from diseases other than fluorosis. During survey, it was found that the area in general lacked basic facilities of improved drinking water and toilets. These patients with clinical manifestations suggestive of fluorosis were also noted to have severe malnutrition

The findings of the Sub – Committee are summarised as under:

5.5.1 The Committee found health issues pertaining to toxicity of minerals such as fluoride and lead.

Fluoride-Fluorosis appears to be highly prevalent especially in the two blocks of Chopan and Myorpur, that havebeen surveyed. It was diagnosed on the basis of clinical manifestations.

Proper RO system is required for clean drinking water for people of this region. Sub-committee recommends that maintenance of these RO systems along with education of residents about proper method and benefits of RO water usage needs to be ensured. These patients with clinical manifestations suggestive of fluorosis were also noted to have severe malnutrition, so

nutritional support for the population in the area should be ensured. Dental as well as bone fluorosis can be improved, if detected in the earlystage.

Lead: There were many patients complaining of bodyache and the symptoms suggestive of peripheral neuropathy. Someof them were having blue line on gums, suggestive of leadtoxicity. But confirmatory diagnosis of lead toxicity needs testing of lead levels in serum along with the exclusion of other causes of peripheral neuropathy. The confirmatory test could not be done because of lack of infrastructure for such testing. However, on the basis of clinical findings, it can be concluded that there are patients of lead toxicity in the region, who need to be treated.

Mercury, Arsenic and Cadmium: Arsenic and Cadmium toxicity could not be detected although some of the patients gave history suggestive of mercury toxicity. But confirmation requires testing of serum levels for mercury and other heavy metals. Due to lack of infrastructure, the confirmatory tests were not carried out. However, these need to be done in the future toascertain the magnitude of the problem and to suggest remedial measures.

Pneumoconiosis- T**he committee didnot find many patients with signs and symptoms suggestive of pneumoconiosis inChoupan and Myorpurblocks.** In the area around Dala JP cement factory area, the committee found people with signs oflung manifestations, probably suggestive of silicosis. It was also found in people residing near the coal transport roads. Provision for PFT (Pulmonary Function Test) machines along with portable X- ray machines would be of help in making provisional diagnosis of these diseases. Although more confirmatory diagnosis will require CT-scan of thorax,which is lacking in most of these areas at present.

Along withthe provisionssuggested as above, the Committee recommends the establishment of a standard toxicological laboratory in the region.

Health care workers including Doctors have to be trained for identifying and treating these problems and diseases. Training centers can be established at KGMU, Lucknow and AIIMS, Bhopal.

Finally, for estimating the magnitude of this problem, a long term project needs to be planned with proper funding and adequate manpower for intensive survey and tests about health impacts of industrial activity in singrauli area.

6.0 Field Visit of Core Committee to Singrauli area

The Core Committee visited Singrauliarea during December 4&5, 2014. The Committee interacted with the local residents and the petitioner and assessed the environmental issues. The Committee also took note of the all the issueswich rendered the Singrauli region to be identified as one of the Critically Polluted Industrial Clusters.The report of visit of the Core Committee to Singrauli area is attached at **Annexure IIb.**

The Committeeduring the field visit:

a. Interacted with applicants ShJagat Narayan Vishwkarma and Swami GyanSwaroopSanand (Dr. G. D. Agarwal former Member Secretary, CPCB currently associated with BanwasiSewa Ashram, an NGO based at Govindpur, district Sonebhadra, U.P). Written statements from people from the impacted areas were also collected.

b. Met residents of village Kusumahasuffering possibly from Fluorosis

c. Inspected locals drains (Murdhwaand Dongianallah) carrying industrial effluent

d. Inspected mercury bearing brine sludge disposal sites located in the premises of M/s Aditya Chemicals Ltd. (formally M/s Kannoria chemicals)

e. Inspected ash dyke management system and Ash Water Recirculation (AWR)system a t Anpara Thermal power Plant of UPRVUNL(UP) and Vindyachal Super Thermal Power Plant of NTPC, Vindhyanagar in (M.P.)

f. Visited coal minesnamely Northern Coal Fields Limited (NCL) Project Bina (extension) and project Nigahi

g. Inspected of local drains (Ballia nallah) carrying domestic and industrial effluent

h. Interacted with local NGOs/Media persons

7.0 Issues raised by residents/ NGO / Media

The committee received representations from residents of Gram Panchayat kusmahana, Myorepur, Godwali, Uttar Pradesh ShramJeeviPatrakar Union, Shri Hemant Mishra, Shri JwalamukhiMandir ,Sahyog and Convener of MP Human Right Commission, MP.The representations given by the residents, Gram panchayats and Patrakar Union are given at**Annexure III.** The issues highlighted through these representations can be summarized as under:

7.1 Fluorosis and drinking water problems in village Kusmaha(UP).
7.2 Health problems due to mercury in environment of villages in the Myorepur Block (UP)
7.3 Supply of drinking water in Khairahi, Kusmahana etc. Villages in UP
7.4 Pollution in Singraulidue to inadequate management of fly ash
7.5 Disposal of untreated sewage by NTPC Shaktinagar(UP)
7.6 Pollution in village Gondhwali due to emission from Sponge Iron plant (MP)
7.7 Pollution due to transportation of coal by road and disposal of fly ash
7.8 Allocation of land by NCL/NTPC for opening of R&D center for research in carbon emission by IIT BHU

8. Observations

Based on the field observations during December 4 and 5, 2014 and interaction with locals/NGOs and findings/ inferences of the Sub-Committee, salient observations of the committee are summarized as under:

8.1 Ground water in certain areas has been observed with high fluoride concentration particularly in villagesGovindpur, Kusmaha, Kakri, Harrahwa, Khairi, Naktu, Sirsoti, Chilkadand, Pasavar raja, and

Dibulgang. As such fluoride, in groundwater is attributed to the ferro-alluminious soil prevailing in the area. Fluoride is an integral part of Bauxite (hydrous silicate of aluminum), an ore of aluminium. Bauxite is exploited for aluminum extraction by aluminum smelters. Further investigations may be undertaken to relate concentration of fluoride in groundwater, especially in areas, close to aluminum smelter and red-mud disposal sites with a view to determine whether the majority of fluoride in the ground water is geogenic or anthropogenic or both and extent of contribution thereof.

Fluorosis appears to be highly prevalent especially in the two blocks of Chopan and Myorpur.

8.2 The committee was informed about the higher levels of mercury in ground water. The level of mercury cconcentration was found to be exceeding the limit of 0.001mg/l in the samples collected from Kirwani, Parasi, Harrahwa, Naktu, Sirsoti, Chilkadand, Parsavar-raja, Govindpur, Kusmaha, Khairahi, Jayant Colony, Jaitpur, MPCC colony, and Dibulganj villages.

Arsenic and Cadmium toxicity could not be detected although some of the patients gave history suggestive of mercury toxicity. But confirmation requires testing of serum levels for mercury and other heavy metals. Due to lack of infrastructure, the confirmatory tests were not carried out.

8.3 The high pH (10.9) of the effluent being discharged in DongiaNallah(UP), indicates improper treatment of effluent by the industries in the area. The DongiaNallah is well connected with the Rihand Reservoir. Therefore immediate steps are required to be taken to treat the effluent presently discharged in to the Reservoir. Also interception of the DongiaNallah at the point of discharge to the Rihand Reservoir and its diversion for further treatment should be immediately taken up.

8.4 Mercury bearing brine sludge is stored in the secured land fill having proper lining and monitoring facility in the premises of M/s Aditya Chemicals Ltd. (formally M/s Kannoriya chemicals, UP). However, it

was not possible to estimate the total generation of brine sludge since the inception of the industry till the process change from mercury cell to membrane cell, due to non availability of authentic records. These data are required to be obtained from M/s Aditya chemicals Ltd to determine whether the facility created by the industry to store brine sludge is adequate to accommodate all the sludge in the facility or a portion of it find its way to Rihand Reservoir through DongiaNallah which flows in the proximity of the industry.The water and sediment of the Reservoir should be analyzed for mercury to arrive at a conclusion.

8.5 Flyash and bottom ash of Anpara (A&B) thermal plant of Uttar Pradesh RajyaVidyut Nigam ltd. (UPRVUNL) and Anpara C thermal power plant of M/s Lanco Power are disposedoff in ash dyke located in Belvadah village situated on the bank of Rihand Reservoir. The overflow from ash pond after settling is discharged into the Reservoir. The discharge of the overflow from ash pond is proposed to be stopped, once the Ash Water Recirculation systems (AWRS) at both the plants are commissioned. AWRS at Anpara C has been constructed while; it is under advanced stage of completionat A&B plants of UPRVUNL. The commissioning of the AWRS and the stoppage of effluent into Rihand reservoir to be continuously monitored by the power plants and UPPCB.

8.6 Management of Over Burden at Bina Colliery of M/s NCL is being done in a scientific manner by adopting biological and engineering measures. However, the same is required to be carried out in a phased manner.

8.7 Pipe conveyor system for transportation of coal from Krishanshila coal mine of NCL to Renusagar Power Company is in advanced stage of completion. The Committee was informed that commissioning of the same is delayed due to delay in granting NOC by the Railways. After commissioning of pipe conveying system, about 700 trucks transporting coal will be phased out. This will help in preventing fugitive coal dust emission, noise pollution and transport pressure on the road. Railways and the concerned Mine/Power company need to take immediate measures to complete the conveying system.

8.8 Ballia Nallah flowing in between Shaktinagar(UP) and Vindhyachal Super Thermal Plants (MP) of NTPC still carries sewage as well as the effluent from the coal mine. The committee was informed that the discharge of sewage into Nallah from NTPC Shaktinagar plant has been stopped, however, monitoring of the drains from the NTPC plant/colonies (Shaktinagar) and the Municipal areas/villages is required.

8.9 Ash from NTPC Shaktinagar and Vindhyachal Super Thermal Plants is discharged in slurry form into the ash ponds having total aarea of about 1700 acres and located in MP. Both Vindhyachal&Shaktinagr Super Thermal Plant have AWRS in place.

8.10 The committee observed that huge area (more than 3000 acres) along the Rihand Reservoir has been occupied for disposal of flyashby thermal power plants of NTPC Ltd, UPRVUNL, M/s Lanco Power and M/s Hindalco Industries Ltd. (UP) in the Singrauli region. Most of the ash ponds have attained their maximum height and therefore, have no further augmentation capacity for disposal of ash slurry. The situation will be worse in the next 05 years, unless proper measures are not taken to augment and accelerate the utilization of flyash as per the Notification of 2009. The disposal of ash in the ash ponds along the Rihand Reservoir leads to silting of the Reservoir, in case of non-compliance of ash pond over flow discharge limit or any breach in ash dyke of the ash pond/s.Concerned industries are required to follow the existing guidelines and cap the ponds. Phyto-restoration of such sites should be carried out with immediate effect.

8.11 Overall environment management including Over Burden disposal, ash water recycling and Eco restoration at Nigahi coal mine area carried out so far was found to be satisfactory, however it was not adequate.

8.12 The committee was informed that out of 83 RO systemsproposed to be installed , 55RO systems have been installed in UP side of the Singrauli area and another 28 RO systems are under the advance stage of installation. All 14 RO systems have installed in MP side of

the Singrauli area. The committee was of the opinion that these RO systems need to be maintained properly and concerned SPCBs are advised to inspect periodically in order to ensure proper functioning of RO systems and the disposal of RO reject waste in an environmentally sound manner. Failure to dispose off RO reject will pose another environmental threat in the area in the near future.

8.13 The treated water from Reverse Osmosis plants installed in Bajrang Nagar, Dibulganjand Parsavar-raja was found to be exceeding the permissible limits prescribed by BIS (2012) for aluminium, iron, mercury, cadmium and nickel. This indicates that the reverse osmosis plants installed are not suitable/capable of removing the trace metals from the water.

8.14 In the area around Dala JP cement factory area, people with signs of lung manifestations were found, probably suggestive of silicosis. It was also found in people residing near thecoal transport roads.

8.15 Theheavy metal (Cr, Cu, Ni, Pb and Zn) levels in the levels in the soils of the agricultural land in the impact zone are not likely to have any adverse impact to soil microorganisms / plant / animals and human beings. The values indicate that there is no significant difference in the heavy metal contents (except Cd) between soils of impact zone and reference area.

9.0 Recommendations

For restoration of the environment and the prevention of pollution in the Singrauliarea (both Uttar Pradesh & Madhya Pradesh), the Committee based on the interaction with the people and the observations and findings during the field visit and the conclusions drawn by the respective Sub –Committees, makes the following Industry/ Institutional specific recommendations:

9.1 **Thermal Power Plants**

9.1.1 Anapara (A&B) ,Obra Thermal Power Plant of Uttar Pradesh RajyaVidyutUtpadan Nigam Ltd. (UPRVUNL) &Anpara C Thermal Power Plant of M/s Lanco Power shall complete their ash water recirculation system and stop discharge of ash pond over flow in Rihand reservoir.

9.1.2 All Thermal Power Plant in Sonebhadra and Singrauli Districts shall submit a road map and make all out efforts to achieve target of flyash utilization as per the notification of 2009. If needed, the plants shall install their own brick and block manufacturing units at suitable sites and these bricks/blocks shall be made mandatory to be used in the buildings and other construction activities by the district administration/State Government within a 200 km radius of the plants. The state Government may declare a utilization zone for such purpose. The plants shall submit quarterly compliance report to concerned Sate Pollution Control Boards.

9.1.3 As per the provisions of the notification of 2009, 25% percent of flyashshould be utilized along withOber Burden OB. Therefore, all Thermal Power Plants and Coal mines in Sonebhadra and Singrauli Districts should be asked to study the feasibility of disposal of flyash in coal minesalongwith (OB)under the guidance of the Directorate General of Mine Safety (DGMS). An action plan in this regard shall be prepared including mode of transportation of fllyash from power plants to coal mine site.

9.1.4 All Thermal Power Plant in Sonebhadra and SingrauliDistricts shall be supplied with and use coal not containing ash content morethan 34% on quarterly average basis as stipulated vide notification No GSR 02 (E) dated January 02, 2014.

9.1.5Shaktinagar, Rihand, Vindhyachal Thermal Power Plants of NTPC Ltd. and Anapara (A&B) , Obra Thermal Power Plant of UPRVUNL &Anpara C Thermal Power Plant shall install and renovate Electrostatic Precipitators to achieve emission limit of 100 mg/Nm^3 as per the long term action plan prepared under CEPI programme for improvement of air quality of Singrauli area.

9.1.6 Shaktinagar SuperThermal Power Plant of NTPC Ltd shall stop discharge of sewage into Ballia Nallah with immediate effect. The sewage from the plant should be treated tomeet the statutory requirements for recycle and reuse, for gainful purposes such as gardening.

9.1.7 Captive Power Plant(Renusagar Power Company) M/s Hindalco Industries Ltdshall commission Pipe Conveyor System for transportation of coal from Krishanshila coal mine of NCL to Renusagar Power Company within a month and shall immediate stop transportation of coal by trucks thereafter.

9.2 **Aluminum Smelter: M/s Hindalco Industries, Renukoot**

9.2.1 Industry shall achieve emission limit of 50 mg/Nm^3 for particulate matter in respect of Baking furnace No. 3& 4 and the emission from baking furnace No. 5 should also limited to 50 mg/Nm^3.

9.2.2 Industry shall ensure that no red mud is leached out to ground water during monsoon and post monsoon period. Besides, industry shall facilitate utilisation of Red Mud in nearby cement industries.

9.2.3 Industry shall submit an action plan by October 31, 2015 to achieve zero discharge of waste water by December 31, 2016

9.3 **M/s Aditya Birla Chemicals, Renukoot**

9.3.1 Industry shall ensure installation and operation of treatmentscheme for the effluent and so as to l ensure of compliance the effluent discharge standard.

9.3.2 Industry shall submit an action plan within one month to achieve zero discharge by July 31, 2016

9.4 **M/s Northern Coalfields Limited (NCL)**

9.4.1 That all the coal mines of NCL in Singrauli area shall ensure that their wastewater from different processes is integrated and subjected to treatment in effluent treatment plant. Entire treated effluent shall be reused in dust suppression on haul roads, irrigation on mine overburden and other associated operations which shall eventually result in zero discharge from coal mines.

9.4.2 Coal mines of NCL should use 25% flyashfrom thermal power plants on volume to volume basis for external dump of overburden and also 25% of the over burden in upper benches of backfilling of exhausted pits of all open cast mines of NCL under the guidance of DGMS as per the notification dated November 03, 2009. Further, the external dump and exhausted pits should be scientifically reclaimed using suitable biological and engineering measures.

9.4.3 The coal mines of NCL shall ensure supply of coal to thermal power plants in the area shall be in compliance with the notification of 2014 on supply and use of beneficiated coal.

9.4.4 The coal mines shall ensure that transportation of coal shallonly be either by railway wagons or by the dedicated conveyor system. No transportation of coal shall be permitted by road to any of the industry in the Singrauli area.

9.5 Stone crushers

9.5.1 All stone crushers which operatewithout effective dust suppression system and without the consent of the concerned SPCB shall be closed forthwith. Feasibility should assessed for providing wind breaking walls towards upwind direction to prevent dispersion of fugitive dust.

9.6 State Pollution Control Boards and MoEF& CC

9.6.1 The expansion of existing industries and permission for installation of new industries shouldonly be considered after ensuring that the

cumulative impact of emissions and effluents on ambient air and water quality of the area shall not exceed the existing levels.

9.6.2 The UP & MP Pollution Control Boards shall ensure the implementation of action plan formulated in their respective areas under Comprehensive Environmental Pollution Index (CEPI) Programme. Besides, SPCBs shall ensure compliance with respect to emission, effluent and solid waste management by the industries and submit a quarterly report to the Regional Office of MoEF& CC and CPCB.

9.6.3 That industries shall provide on-line monitoring systems for emissions and effluent discharge and the data generated shall be transferred to respective SPCB and the CPCB on continuous basis.

9.6.4 The existing network of monitoring system for AAQ monitoring in both the districts of UP & MP need to strengthened and expanded to get representative air quality status of Singrauli area. Industries in the area should install atleast three continuous ambient air quality monitoring stations within six months on "Polluter Pays Principle" at such locations as may be decided by CPCB in consultation with the respective SPCBs. The data generated should transferred to SPCBs and CPCB on continuation basis.

9.6.5 The levels of mercury in ambient and ground and surface water is reported to be one the major problems in Singrauli area. Therefore, is essential that at least three continuous monitoring system for mercury (Hg) monitoring in the ambient air and surface and ground water should be installed (covering both the Districts of UP & MP) at suitable locations in Singrauli area by the industries on "Polluter Pays Principle".

9.7 District Administration of respective States

9.7.1 Poor road conditions in the area are also one of the major sources of pollution. It is therefore recommended that the

respective State Governments should take immediate measures to improve the road conditions in the area time bound manner and ensure regular maintenance.

9.7.2 Fluoride affected villages must be supplied with safe drinking water (RO Treated water) under thesupervision of the District Administration. All the tube wells supplying contaminated water should carry boards informing public not to use the same for drinking purposes. The concerned Dept. (Irrigation/ Jal Nigam) of the State Administration shouldsubmit compliancereport to Regional Office of MoEF& CC every month.The maintenance of these RO systems along with education of residentsabout proper method and benefits of RO water needs to be ensured.

9.7.3 The concerned Dept. (Irrigation/ Jal Nigam) of the State Administration shall also ensure proper disposal of the RO rejects, so as not to affect the ground water and surface water streams and the soil of the area.

9.7.4 As the patients with clinical manifestations suggestive of fluorosis were also noted to have severe malnutrition. Therefore, mineral and nutrient supplements for these areas should be ensured by the District Administration.

9.7.5 The patients with clinical manifestations suggestive of fluorosis must be monitored for their health through a scientific plan of periodic checkup as recommended by KGMU, AIIMS, Bhopal and IMS, BHU. Dental as well as bone fluorosis can be improved, if detected in the early stage.

9.7.6 Considering the reports of the clinical examination and recommendations by the Sub-Committee on Health, it is essential that a standard toxicological testing and analysis laboratoryshould be establishedin the region.

9.7.7There is need to trainHealth care workers including Doctors for identifying the sources of diseases due to fluoride/mercury emission/dischargeand treating the affected patients. Therefore,

Training centers can be established in KGMU, Lucknow and AIIMS, Bhopal for such a purpose.

9.7.8 There are number of health related issues like silicosis, fluorosis, and impact of mercuryof the people in the area needs to examined in detail. Therefore,a long term project need to be planned with proper funding and adequate manpower under “Polluter pay Principal”for estimating the magnitude of health related problem in the area.

DR. A. B. Akolkar **Prof. I. M. Mishra**

(Member Secretary) (Prof., Chemical Engineering Dept.)
CPCB, Delhi IIT, Roorkee

Dr. R.D. Singh **Dr. D.K. Sharma** **Shri J.S. Yadav**
(Director) (MedicalSupdt.,)(Member Secretary)
NIH, Roorkee AIIMS, New Delhi UPPCB, Lucknow

Dr. KhajanchiLal **Dr. R.C. Murthy** **Shri Pankaj BDoctor**
(Principal Scientist) (Chief Scientist) (ScD,NIOH, Ahmedabad)
IARI, New Delhi IITR, Lucknow

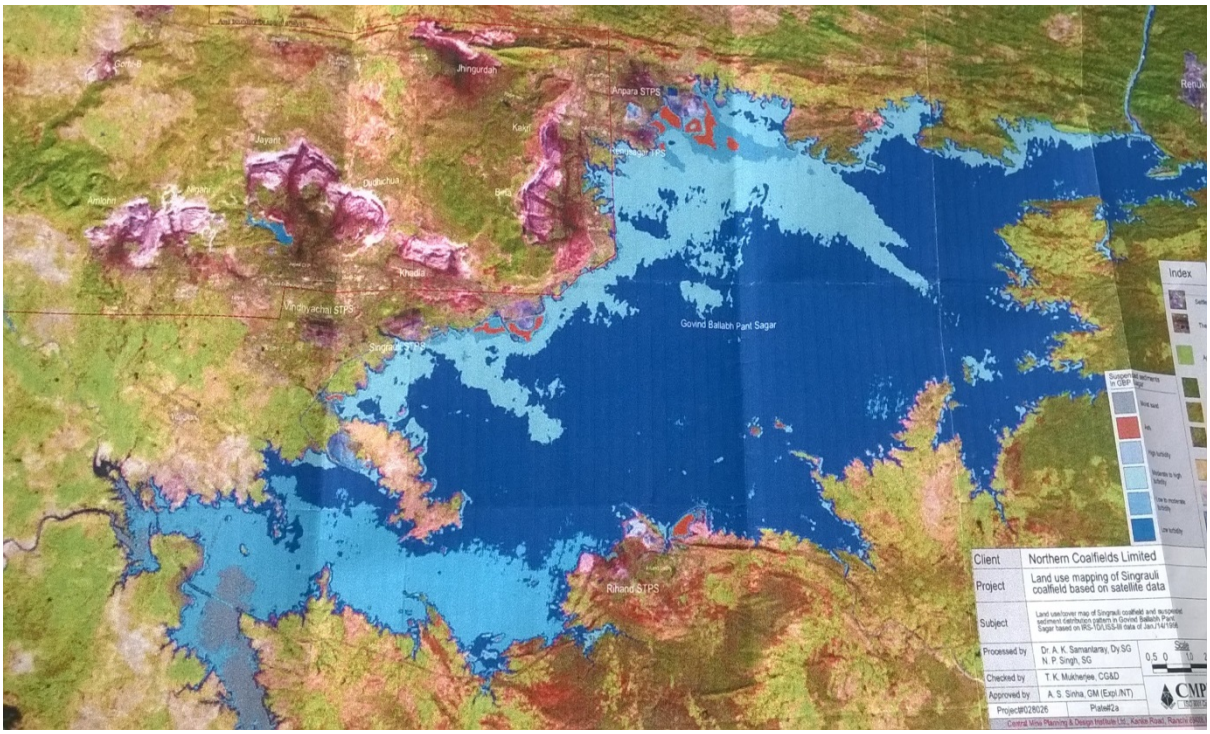
Shri Yogendra Pal Singh **Member Secretary**
(Joint Director, IA Division) (MPPCB, Bhopal)
MOEF & CC

Dr. TapanChakrabarti
(Former Director)
NEERI, Nagpur
Chairman of Core Committee

(Vol. II - ANNEXURES)

REPORT OF THE CORE COMMITTEE CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL (NGT), NEW DELHIFOR "MONITORING OF POTENTIAL HAZARDS OF INDUSTRIALDEVELOPMENT IN SINGRAULI AREA"

[In the Matter of OA No. 276 of 2013& M.A. No. 59 of 2014 in O.A. No. 20 of 2014) Ashwani Kumar Dubey Vs Union Of India and Ors And Jagat Narayan Viswakarma & Ors. Vs. Union of India & Ors.]



July 2015

List of Annexures

Annexure I

B-33014/7/2006/PCI-II September 29, 2014

Meeting Notice

Sub: **Meeting of the Core Committee in compliance of theNational Green Tribunal (NGT) Order dated August 25, 2014 & September 26, 2014 in the matter ofJagat Narayan Viswakarma & Ors. Vs. Union of India & Ors.And Ashwani Kumar Dubey Vs. Union of India & Ors. (O.A.No. 276 of 2013 & M.A. No. 59 of 2014 in O.A. No. 20 of 2014)-reg**

1. Hon,ble NGT vide order dated August 25, 2014 has constituted a Core Committee comprising of members from CPCB, MPCB, UPPCB, IARI, ICFRE, NIH, IITR,IIT, Roorkee, IIT, Kanpur, VNIT, Nagpur, Institute of Economic Growth, AIIMS , NIOH & MoEF & CC for conducting survey/s of all industries to assess the Pollution caused by them as a result of their activities. Besides, five sub Committees have also been constituted by NGT for quantification of industrial impacts, assessment of potential impact of pollution on water resources, land resources & air quality and assessment of potential impact on human health with respect to Singrauli area. A copy of the order is enclosed.

2.0 As per the order of NGT dated September 26, 2014, the Chairman, CPCB is the Chairman of the Core Committee. The first meeting of the Core Committee will be held on **October 16, 2014 at 10.30 AM at MoEF & CC in Committee Room (5th Floor) , Prathvi, Indira Prayavarn Bhawan, Jor Bagh Road, New Delhi**. You are requested to kindly make it convenient to attend the meeting. A line in confirmation is solicited.

3.0 ***Further, in order to coordinate the work of Sub- Committees as per TOR of NGT, following members of the Core Committee are nominated as Convenor of the each of Sub-Committees. Central Pollution Control Board, UP Pollution Control Board & MP Pollution Control Board shall follow the guidance of the Convenor as a Secretary of the Sub Committee***.

Sr. NO.	Committee	Convenor and Secretaries
1	**Sub-Committee I (Quantification of Industrial Impacts)**	**Convenor** : Member secretary, CPCB **Secretary** : I/c Zonal Office, CPCB, Lucknow & Bhopal
2	**Sub-Committee-2 (Pollution Potential of water resources)**	**Convenor** : Director, NIH, Roorkee **Secretary** : MS, UPPCB & MPPCB
3	**Sub- Committee -3 (Potential Impact of pollution on land resources)**	**Convenor** : Director, IITR, Lucknow **Secretary** : MS, UPPCB & MPPCB
4	**Sub-Committee 4 (Potential Impact of pollution on air quality)**	**Convenor**: Member Secretary, CPCB **Secretary** : I/c PCI-II, CPCB, Delhi with field monitoring by ZO CPCB

		Lucknow & Bhopal
5	**Sub– Committee 5** **(Potential Impact of pollution on Health)**	**Convenor** : Nominee of Director, AIIMS, New Delhi **Secretary** : MS ,UPPCB & MPPCB

The Convenor of Sub–Committee will conduct the meeting before the meeting of the Core Committee which has been scheduled on October 16, 2014 at 10.30 AM at MoEF & CC, Delhi and discharge the duties as per the TOR of the Sub-Committee. The respective State Pollution Control Boards (UP & MP) will provide all the assistance including secretarial & logistics to Convenor & member of each of the Sub-Committee as both the States are involved in implementation.

This issue with approval of the Chairman of the Core Committee.

Yours faithfully,

Sd/-

(A. B. Akolkar)
Member Secretary

Encl : As above

To

The Member Secretary **- Pl. co-ordinate with convenor & members of the Sub-Committees**

Uttar Pradesh Pollution Control Board

IIIrd Floor PICUP Bhavan
Vibhuthi Khand, Gomti Nagar, **Lucknow – 226 020**

The Member Secretary **- Pl. co-ordinate with convenor & members of the Sub-Committees**

Madhya Pradesh Pollution Control Board
Paryavaran Parisar
E-5, Arera Colony **Bhopal 463016** M.P.

Director
Indian Agricultural Research Institute
Pusa Road, Karol Bagh
New Delhi

Director
National Institute of Hydrology
Roorkee- 247667 Uttarakhand

Director General
Indian Council of Forestry Research & Education
Dehradun, Uttrakhand

Director
Indian Institute of Toxicology Research
Post Box No. 80, Mahatma Gandhi Marg
Lucknow – 226 001 UP

Dr. I.M. Mishra
Chemical Engineering Department
IIT, Roorkee- Haridwar Highway
Roorkee, Uttarakhand 247667

Dr. Vinod Tare, Professor
Environmental Engineering
IIT, Kalyanpur .**Kanpur**-208016

Dr. T. Chakrabarti
Visvesvaraya National Institute of Technology
South Ambazari Road, **Nagpur**, Maharashtra- 440010

Prof. Kanchan Chopra
Institute of Economic Growth
University Enclave
University of Delhi (North Campus)
Delhi 110 007

Director **- with request to nominate an expert to the Core Committee**
All India Institute of Medical Sciences
Ansari Nagar East, Gautam Nagar
New Delhi, 110029

Director **- with request to nominate an expert to the Core Committee**
National Institute of Occupational Health
Meghani Nagar**, Ahmedabad-380016**
Gujarat

Joint Director, EIA Division
Ministry of Environment, Forests & Climate Change
Indira Paryavaran Bhawan
Jor Bagh Road, **New Delhi 110003**

Copy to

Dr Rashid Hasan, Adviser (CP)
Ministry of Environment, Forests & Climate Change
Indira Paryavaran Bhawan (Akash)
Jor Bagh Road, **New Delhi 110003**

The Incharge - with a request to follow up with UPPCB
NorthZonal Office
Central Pollution Control Board
PICUP Bhawan, Ground Floor
Vibhuti Khand, Gomti Nagar
Lucknow-226010

The Incharge - with a request to follow up with MPPCB
Bhopal Zonal Office
Central Pollution Control Board
3rd Floor, Satkar Bhawan Near TT Nagar**,**
Bhopal – 462 016

PS to CCB - for information of CCB please

PS to MS – for information of MS please

Sd/-

(A. B. Akolkar)

Annexure IIa

Minutes of the Meeting of the Core Committee constituted by the Hon'ble National Green Tribunal (vide its order dated August 25, 2014) held on October 16, 2014 at 10.30 AM at MoEF& CC, New Delhi

1. The first meeting of Core Committee constituted by the Hon'ble NGT Order dated 25th September, 2014 in the matter of Jagat Narayan Viswakarma & Ors. Vs. Union of India & Ors. And Ashwani Kumar Dubey Vs. Union of India &Ors. (O.A.No. 276 of 2013 & M.A. No. 59 of 2014 in O.A. No. 20 of 2014), was held on October 16, 2014 at MoEF& CC, Delhi. The meeting was chaired by Dr. Rashid Hasan, Adviser, MoEF& CC as the Additional Secretary & Chairman CPCB who was scheduled to chair the meeting of Core Committee could not be able to chair the meeting due to exigency of work relating to Parliamentary Standing Committee of Rajya Sabha. The list of participants is enclosed (Annexure I). Prof Vinod Tare, IIT, Kanpur & Prof Kanchan Chopra, Institute of Economic Growth, New Delhi could not attend the meeting. Prof Kanchan Chopra informed that she has been superannuated from the Institute of Economic Growth and the representative in the committee should be from the Institute. Accordingly, she had intimated to the Director of Institute and suggested that all the future correspondence be made to Director, IEG, New Delhi directly.

2. At the outset, Dr. Rashid Hasan, Adviser, CP Division, MoEF& CC welcomed the members of the committee. He clarified that as per order dated October 1, 2014 of NGT, senior most members among the experts of the Core Committee will chair the Core Committee. He also mentioned that convenor may be nominated among the experts of the core committee to each of the sub-committees constituted by the Hon'ble NGT to coordinate their function and accomplishment of the activities as per TOR prescribed by NGT. Accordingly, following members of the Core Committee are nominated as Convenor of the each of Sub-Committees:

jSr. NO.	Committee	Convenor and Secretaries
1	**Sub-Committee I (Quantification of Industrial Impacts)**	**Convenor** : Member secretary, CPCB **Secretary** : I/c Zonal Office, CPCB, Lucknow& Bhopal
2	**Sub-Committee-2 (Pollution Potential of water resources)**	**Convenor** : Director, NIH, Roorkee **Secretary** : MS, UPPCB
3	**Sub- Committee -3 (Potential Impact of pollution on land resources)**	**Convenor** : Director, ICFRE, Dehradun **Secretary** : MS, MPPCB
4	**Sub-Committee 4 (Potential Impact of pollution on air quality)**	**Convenor**: Member Secretary, CPCB **Secretary** : I/c PCI-II, CPCB, Delhi with field monitoring by ZO CPCB Lucknow& Bhopal
5	**Sub– Committee 5 (Potential Impact of pollution on Health)**	**Convenor**: Nominee of KGMC, Lucknow **Secretary**: MS ,UPPCB

Central Pollution Control Board, UP Pollution Control Board & MP Pollution Control Board shall facilitate in organising the meetings and further follow up besides making communication to all concerned under the guidance of the Convenor.

3. Dr. Hasan further has submitted an overview of about industrial activities & environmental issued of Singrauli area. He informed that industry specific action plan to control pollution in Singrauli has already been prepared which are being implemented by the respective industries in time bound manner. The progress of implementation of action plan is being monitored by the respective state governments periodically. Dr. A. B. Akolkar. Member Secretary, CPCB make an appraisal about the Singrauli area which comprises of Dist. Sonebhadra of UP and Singrauli of MP. He highlighted that Singrauli area is agglomeration of many industrial activities related to thermal power generation, coal production, manufacturing of cement & aluminium, caustic soda and concrete etc. The generation of solid wastes, effluent and emissions from these industrial activities are polluting the area. In a study conducted by CPCB in the year 2010, Singrauli (both UP & MP) has been identified as critically polluted area based on Comprehensive Environmental Pollution Index (CEPI).

4. Member secretary, CPCB invited suggestions of the members on the action plan prepared under CEPI and approach to be followed to initiate the work as per TOR of Committee. The suggestions made by each of the member are summarised as under:

I. Member secretary, UPPCB stated that implementation of action plan will lead to minimise the impacts of air & water pollution in the area while two other aspects with respect to impacts of pollution on health and agriculture have been introduced by the Hon'ble NGT, which are needed to be studied separately. The outcome of such studies will help in improving the action plan. Besides, he also appraised that following actions have already been taken in the past:

   1. Switching over to mercury free membrane cell process for manufacturing of Caustic Soda by M/s Aditya Birla chemicals formerly M/s Kannoria Chemicals in Dist Sonebhadra of UP
   2. Earlier brine sludge has been re-handled and disposed off in environmentally sound manner through TSDF
   3. No new stone crusher is permitted in the Dist. Sonebhadra of UP

II. Prof Mishra, IIT, Roorkee suggested that there is a need to evaluate the action plan based on pollution load before and after its implementation. This will help in identifying the gaps and consideration of additional parameters. He also emphasized that there is a need for a source apportionment study in Singralui area to identify contribution in terms of pollution load from different activities in the area.

III. Director, NIH stated that review of action plan will be requiring more time. He suggested that additional time may be taken from Hon'ble NGT to review the action plan vis-a-vis to complete the work as per TOR assigned to each of the sub-committee and core Committee.

IV. Dr Murthi from IITR, Lucknow reiterated that there is need to review of the action plan based on actual field data to be collected by sub –committees. Regarding coordinating the activities of Sub- Committee -3 on Potential Impact of pollution on land resources, he mentioned that as IITR does not have expertise on soil contamination, hence it may not be appropriate for IITR to coordinate the work of the sub- committee.

V. Dr. Sharma, Medical Superintendent, AIIMS mentioned that there is need to assess the pollution level in the area which will be the base for assessing impact on the health of people of the area. Further, he mentioned that AIIMS will help in preparation of questionnaire and analysing the samples (blood, hair, nails etc), however field coordination will not be possible for our Institution.

VI. Dr Sudhir, ICFRE, Dehradun mentioned that there are many issues to be addressed however, time given is very short. He suggested that based on the expertise of each institution, specific role may be assigned as per TOR so as to complete the work and come out with specific viable remedial measures to contain the pollution in the area.

VII. Representative of MPCB mentioned that action plan under CEPI will good enough to control the pollution in the area provided it is implemented in time bound manner by the respective industries.

VIII. Shri Pankaj B Doctor, NIOH mentioned that NIOH has prepared manual for safety & Health for industrial workers under the direction from Hon'ble Supreme Court. The implementation of recommendations made in the manual will be helpful in minimising the impact on health of the workers.

IX. Dr TapanChakrabarti, VNIT, Nagpur mentioned that there are number of measures like in situ coal gasification and promoting IGCC technology in new/ expansion units of the thermal power plants, use of beneficiated coal and reuse of mine water and ash pond effluent may be considered to prevent pollution in Singrauli area.

Considering the suggestions and observations of the members and to proceed further, following actions were decided by the Committee:

a) An interim report based on available secondary data may be prepared and submitted to Hon'ble NGT with a request for extension of time by six months for submission of final report**(Action : MoEF& cc and CPCB)**

b) The concerned Central/State Pollution Control Board will hold meeting of sub committees in consultation with convenor of the Committee and work out monitoring plan as per TOR within 15 days after received of minutes and initiate action in time bound manner **(Action: CPCB/ UPPCB/MPPCB)**

c) The members of the Core committee may visit Singrauli area in order to make preliminary assessment of pollution in the area.**(Action: CPCB/ UPPCB/MPPCB)**

d) A stake holder meet/ consultation may be oraganised at Singrauli **(Action: CPCB/ UPPCB/MPPCB)**

e) Both SPCBs (UP& MP) will make necessary arrangements for transfer of funds to CPCB to organise meeting and payment of TA/DA and sitting fee to expert members of the Core Committee as per the order of Hon'ble NGT**(Action: UPPCB/MPPCB)**.

5. In addition to the above decisions, Dr Tapan Chakrabarti, Former Director, NEERI, Nagpur has been selected to be Chairman of the Core Committee unanimously. Henceforth all the meetings of the Core Committee will be chaired by him.

6. The meeting ended with a vote of thanks to the Chair.

ANNEXURE I

List of Participants

Sr. No.	Name & Designation	Organisation	Designation w.r.t Core Committee
1	Dr. Rashid Hasan. Adviser	MoEF& CC, New Delhi	Acting Chairman to Committee
2	Dr. TapanChakrabarti, Former Director, NEERI	VNIT, Nagpur	Selected Chairman of the Core Committee
3	DR. A. B. Akolkar, Member Secretary	CPCB, Delhi	Member
4	Prof. I. M.. Mishra, Chemical Engineering Dept.	IIT, Rorokee	Member
5	Dr. R.D. Singh, Director	NIH, Roorkee	Member
6	Dr. D.K. Sharma, Medical Supdt.	AIIMS, Delhi	Member
7	Dr. Sudhir Kumar, Sc F,	ICFE, Dehradun	Member
8	Shri J.S. Yadav, Member Secretary	UPPCB, Lucknow	Member
9	Dr. KhajanchiLal, Principal Scientist	IARI, New Delhi	Member
10	Dr. R.C. Murthy, Chief Scientist	IITR, Lucknow	Member
11	Shri Pankaj B Doctor, Sc D	NIOH, Ahmedabad	Member
12	Shri M.K. Mandrai, CSO	MPPCB	Rep. MPPCB
13	Shri Yogendra Pal Singh, Joint Director, IA Division	MoEF& CC, New Delhi	Member
14	Dr. Sanjay Rai, Additional Prof.	AIIMS, new Delhi	-
15	Dr S. S. Bala, Addl Director	CPCB, Delhi	-
16	Shri P.K. Mishra, Sc d & I/c	CPCB, Lucknow	-
17	Shri R.K. Singh, Sc D	CPCB, Lucknow	-
18	Shri Kalika Singh, RO	UPPCB, Sonebhadra	-
19	Shri R.P. Mishra. Sc C	CPCB , Bhoapl	-
20.	Dr. S.K. Paliwal, Sc c	CPCB , Delhi	-

Annexure IIb

VISIT REPORT OF THE CORE COMMITTEE CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL(NGT), NEW DELHI

TABLE OF CONETENTS

1. Background

Hon'ble National Green Tribunal (NGT),vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013-Ashwani Kumar Dubey Vs Union of India-.constituteda Core Committee for monitoring of potential hazards of IndustrialDevelopment in Singrauli Area(both UP & MP). Besides, 05 sub-committee have also been constituted forquantification of industrial impacts, assessment of potential impact of pollution on water resources, land resources & air quality and assessment of potential impact on human health with respect to Singrauli area(both UP & MP).

The composition and terms of reference of Core committee & Sub –committees are given in **Annexurel.**

2. Field Visit

The Core Committee , in its meeting held on October 16, 2014 , decided that members of the Core committee may visit Singrauli area in order to make preliminary assessment of pollution in the area. Accordingly, members of the Core Committee, under the chairmanship of Dr. Tapan Chakrabarti visited Singrauli area during December 4&5, 2014. The list of the members of the Committee who participated in in field visit is given in **Annexure II.**

The Committee interacted with the local residents and Applicant and assessed the environmental issues. The Committee also took note on the entire issues whereby, Singrauli region has been identified as one of the Critically Polluted Industrial Cluster.

TOR of Core committee as per Hon'ble National Green Tribunal (NGT),vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013-Ashwani Kumar Dubey Vs Union of India is as follows:

a) Conducting survey/s of all the industries (thermalpower plants, coal mines, etc.) to assess thepollution caused by them as a result of their activities.

b) Synthesis of data compiled by Sub-Committee 1 to5 for identifying causative factors- industry wise.

c) Suggesting remedial measures that are required forrestoration of the environment and prevention ofpollution in the area (both Uttar Pradesh &MadhyaPradesh)- industry wise.

d) To guide each of the sub-committee and seekprogress of work on fortnightly basis. The core -team may nominate members of core-team based ontheir subject expertise to look into day to day affairsof sub- committees.

e) The Committee shall submit its final report directlyto NGT within 3 months;

*The Committee carried-out inspection of the Sonebhadra (UP) area on December 4, 2014.*The visit of the Committee mainly focused as under:

On December 04, 2014 a. Interaction with applicant ShJagat Narayan Vishwkarma and Swami GyanSwaroopSanand (Dr. G. D.Agarwal) former Member Secretary, CPCB currently associated with BanwasiSewaAsram, NGO based at Govindpur, district Sonebhadra, U.P was held.Written statements from people from impacted areas were collected and annexed as **Annexure III.**

b. Met residents of village Kusumahan suffering from Fluorosis due to consumption of fluoride contaminated ground water

c. Inspection of locals drains (Murdhwa&Dongianallah) still carrying industrial effluent

d. Mercury bearing Brine sludge Disposal sites located in the premises of M/s Aditya Chemicals Ltd. (formally M/s Kannoria chemicals)

e. Inspection of ash dyke management system and Ash Water Recirculation system at Anpara Thermal power Plant of UPRVUNL.

f. Coal mine namely Northern Coal Fields Limited (NCL) Project Bina (extension)

The Committee carried-out inspection of the Singrauli (MP) area on December 5, 2014.The visit of the Committee mainly focused as under:

a. Inspection of local drains (Ballianallah) still carrying domestic and industrial effluent

b. Inspection ofash disposal system and Ash Water Recirculation system of Vindyachal Super Thermal Power Plant of NTPC, Vindhyanagar. Distt.Singrauli in (M.P.)

c. Inspection of Coal mine namely Northern Coal Fields Limited (NCL) Project Nigahi (Singrauli, MP)

d. Internal assessment by the committee members to finalize its recommendations as interim measures.

e. Interaction with local NGOs/Media persons

3.Observations and findings

Based on the field observations during December 4 &5, 2014 and interaction with locals/NGO, salient findings of the committee are summarized as under:

3.1 Ground water in particular eastern and south eastern part of District Sonebhadra, UP is contaminated with fluoride. However, source of contamination (geogenic and/or anthropogenic is yet to be established.

3.2 The committee was informed about the higher levels of mercury in ground water. The level of contamination is to be assessed.

3.3 The high pH(10.9) of effluent being discharged in DongiaNallah(UP), indicates improper treatment of effluent by the industries in the area. The DongiaNallah is well connected with the Rihand dam, therefore immediate attention is required to treat the effluent discharge in to the dam.

3.4 Mercury bearing Brine sludge is stored in secured land fill having proper lining and monitoring facilityin the premises of M/s Aditya Chemicals Ltd. (formally M/s Kannoriya chemicals, UP)

3.5 Fly ash and bottom ash of Anpara (A&B) thermal plant of UttarPradesh RajyaVidyut Nigam ltd. (UPRVUNL) and Anpara C thermal power plant of M/s Lanco Power are disposed in ash dyke located in Belvadah village situated on the bank of Rihand Dam. The overflow from ash pond after settling is discharged into the dam. The discharge of overflow from ash pond will be stopped once Ash Water Recirculation systems (AWRS) at both the plants are commissioned. AWRS at Anpara C has been constructed while at A&B plants of UPRVUNL, it is under advanced stage of completion.

3.6 Management of Over Burden at Bina Colliery of M/s NCL is being done in scientific manner by adopting biological and engineering measures. However, the same is required to be carried out in a phase manner and retreading method.

3.7 Pipe conveyor system for transportation of coal from Krishanshila (UP) coal mine of NCL to Renusagar Power Company is in advanced stage of completion. The Committee was informed that commissioning of the same is delayed due to delay in granting NOC by Railways. After commissioning of pipe conveying system, about 700 trucks transporting coal will be phased out. This will help in preventing fugitive coal dust emission, noise pollution and transport pressure on the road.

3.8 Ballia Nallah flowing in between Shaktinagar(UP) and Vindhyachal Super Thermal Plants (MP) of NTPC still carries sewage of NTPC Shaktinagar(UP). There was no discharge of any effluent into Nallah from Vindhyachal Super Thermal Plant of NTPC(MP).

3.9 Ash from NTPC Shaktinagar and Vindhyachal Super Thermal Plants is discharged in slurry form into the ash ponds having total area of about 1700 acres and located in MP. Both Vindhyachal & ShaktinagrSuper Thermal Plant have provided AWRS.

3.10 The committee observed that huge area (more than 3000 acres) along the Rihand dam has been occupied for disposal of flyash from thermal power plants of NTPC Ltd, UPRVUNL, M/s Lanco Power and M/s Hindalco Industries Ltd. (UP) in the Sonebhadra (UP) region. Most of the ash ponds have attain their maximum height and have no augmentation capacity for further disposal of ash slurry. The situation will be worsein another 05 years, if proper measures are not taken to augment utilization of flyash as per 2009 notification. The disposal of ash in ash ponds along the Rihand dam is prone to silting of Dam in case of non-compliance of ash pond over flow discharge limit or any breach in ash pond/s.

3.11 Overall environment management including Over Burden disposal, ash water recycling and Eco restoration at Nigahi coal mine carried out so far was found to be satisfactory but not fully adequate.

4.0 Issues raised by residents/ NGO / Media

The committee received representations from residents of Gram Panchayat kusmahana, Myorepur, Godwali, Uttar Pradesh ShramJeeviPatrakar Union, Shri Hemant Mishra, Shri

JwalamukhiMandir ,Sahyog and Convenor of MP Human Right Commission, MP. The copies of representations received by the Committee are attached at **Annexure III**. The issues highlighted through these representations are summarized as under:

4.1 Fluorosis and drinking water problem in village Kusmahana(UP).
4.2 Health problems due to mercury in environment of village Myorepur (UP)
4.3 Supply of drinking water in Khairahi, Kusmahana etc. Villages in UP
4.4 Pollution in Singrauliare due to inadequate management of flyash
4.5 Disposal of untreated sewage by NTPC Shaktinagar(UP)
4.6 Pollution in village Gondhwali due to emission from Sponge Iron plant(MP)
4.7 Pollution due to transportation of coal by road and disposal of flyash
4.8 Allocation of land by NCL/NTPC for opening of R&D center for research in carbon emission by IIT BHU

5.0 Interim Recommendations

5.1 Presently, Dongia, Murdhawa, BaliaNallah and numerous small drains carry industrial waste are draining in to Rihand Reservoir which has a potential to be used as drinking water resource. It should be mandatory that the industries should recycle the wastewater within their premises and practice a zero discharge. Multiple effect evaporators should be used for bleed-offs, if any. All arrangements should be in place within three months. Any non-compliance should be punished suitably.

5.2 Anpara(A& B) , Obra of UPRVVNL and Anpara C of M/s LancoPower must complete their ash water recirculation system scheme by 31st July 2015.

5.3 The concerned states shall have domestic and municipal waste treatment plants(STPS). As an interim arrangement, the sewage should be given a primary settling and chemical treatment . This arrangement should be in place within three months.

5.4 The discharge from ETP and STPs shall conform to surface water standard and used for industrial purposes.

5.6 No treated/partially treated/untreated effluent shall find way to Rihand reservoir.

5.7 The fluoride affected villages must be supplied with safe drinking water under the supervision of the District Administration. All the tube wells supplying contaminated water should carry boards informing public not to use the same for drinking purposes. District Administration should file compliance report every month.

5.8 Flyash transport should be carried out in covered vehicle. A manifest system, similar to hazardous waste transport, must be followed to avoid illegal dumping of fly ash.

5.9 Pipe conveying system for transportation of coal from Krishnasila coal mine of NCL to Renusagar Power plant to be completed after obtaining necessary permission from Railways. The concerned Railways Department may be directed to expedite the permission.

5.10 All brick kilns located within 100 km area of fly ash generation in Singrauli area should use 25% flyash in clay brick manufacturing within 3 months as per notification dated August 27, 2003 issued by Ministry of environment & Forests.

5.11 Construction agency engaged in construction of building within a radius of 100 kms from coal power plants in singrauli area shall use only flyash based products for construction as per notification dated November 03, 2009. Flyash shall also be used in construction of roads and flyover embankments within 100 kms from thermal power plants of Singrauli area as per the specifications/guidelines issued by Indian Road Congress (Specification No 58 of 2001 as amended time to time)

5.12 Coal mines of NCL should use 25% flyash on volume to volume basis for external dump of overburden and same percentage in upper benches of backfilling of exhausted pits of all open cast mines of NCL under the guidance of DGMS as per notification dated November 03, 2009. Further, the external dump and exhausted pits should be scientifically reclaimed using suitable biological and engineering measures.

5.13 All the coal based thermal power plants including captive power plants of 100 MW and above located in Singrauli area shall use and supplied with beneficiated coal not containing ash more than 34% as per notification January 02, 2014.

5.14 All stone crusher, without effective dust suppression system installed, should be closed forthwith.

5.15 All the mine dumps lying unattended in the area should be rehabilitated in phase manner and sufficient surface water management provided in each mine to avoid contamination and siltation in the nearby water bodies.

5.16 The catchment of the Rihand dam should be studied and treated accordingly.

5.17 The team is of the opinion that a comprehensive carrying capacity study be carried out in Singrauli and Sonebhadra industrial area in order to make an assessmentof environmental quality for future industrialization in the area.

Annexure I

BEFORE THE NATIONAL GREEN TRIBUNAL,PRINCIPAL BENCH, NEW DELHI

Original Application No.276 of 2013
And
M.A. No.59 of 2014InOriginal Application No.20 of 2014

Ashwani Kumar DubeyVs. Union of India &Ors.
And
Jagat Narayan Viswakarma and Ors. Vs. Union of India &Ors

Date andRemarks **Orders of the Tribunal**

Item No.17 & 18
August25, 2014

None of the parties have filed any objection /suggestions to the proposed Committees and the ToR. Theonly prayer made is that the Chairman,Central PollutionControl Board be permitted to be substituted by theMember-Secretary of the CPCB. Ordered accordingly. Therefore, we constitute the following Committeeswith the ToR as indicated as below.

Monitoring of potential hazards of IndustrialDevelopment in Singrauli Area

Core Team:

a. Member Secretary, Central Pollution Control Board
b. Member Secretary, Madhya Pradesh PollutionControl Board
c. Member Secretary, Uttar Pradesh Pollution ControlBoard
d. Director of Indian Agricultural Research Institute
e. Director of Indian Council of Forestry Research andEducation
f. Director of National Institute of Hydrology
g. Director of Indian Institute of Toxicology Research
h. Dr.I. M Mishra, Chemical Engineering, Department,IITRoorkee
i. Dr.Vinod Tare, Professor EnvironmentalEngineering, IIT Kanpur
j. Dr. T. Chakrabarti, Visvesvaraya National Instituteof Technology, Nagpur.
k. Porf.KanchanChopra, Institute of Economic Growth.
l. Nominee of Director, All India Institute ofMedicalSciences
m. Nominee of Director, National Institute ofOccupational Health, Ahemdabad.
n. Joint Director, EIADivision, Ministry of Environmentand Forests.

Terms of Reference:

a) Conducting survey/s of all the industries (thermalpower plants, coal mines, etc.) to assess thepollution caused by them as a result of their activities.
b) Synthesis of data compiled by Sub-Committee 1 to5 for identifying causative factors- industry wise.
c) Suggesting remedial measures that are required forrestoration of the environment and prevention ofpollution in the area (both Uttar Pradesh &MadhyaPradesh)- industry wise.
d) To guide each of the sub-committee and seekprogress of work on fortnightly basis. The core -team may nominate members of core-team based ontheir subject expertise to look into day to day affairsof sub-committees.
e) The Committee shall submit its final report directlyto NGT within 3 months;

Note:

a. The expenditure in conducting the inspection,survey and studies will be met by the respectiveState Governments for the region and they may be permitted to recover it from the industrial units,thermal power and coal mines on pro-rata basis.
b. The non-Government members be given the sittingfees for the meetings/inspections, actual travellingexpenses incurred by them as may be decided bythe core-team.

Quantification of Industrial impacts Sub-Committee-1

Terms of Reference:

Inventory of existing industries – industry wise:

a. Production: in terms of each product either perday or per month basis.
b. Raw material used: In terms of each rawmaterial including fuel and water per day &its source.

Pollution load generation:

a. Water- quantity of each of the significantpollutant per day before & after treatment.
b. Air- quantity emission in terms of eachpollutant per day.
c. Fly-ash-quantity per day.
d. Hazardous waste-quantity & type/day.
e. Others, if any – specify & quantify

Compliance Status:

a. Environmental Clearance conditions
b. Forest Clearance conditions

c. Consent conditions

Adequacy of each of the pollution controlmeasure/s.

Daily basis Vehicular traffic census especially inand around residential clusters. Ambient air qualityshould also be monitored in the above residentialareas.

Vehicular census and their usages data to be usedfor quantification of pollution load generation fromthe vehicles (petrol and diesel driven separately).

Overall working and deficiency, if any.

Team:

a. Zonal Officer of the Central Pollution Control Board,Lucknow and Bhopal.

b. Regional Officer of Madhya Pradesh State PollutionControl Board and Uttar Pradesh State PollutionControl Board.

c. Indian Institute of Toxicology Research, Lucknow.

d. Expert on Environmental Issues from Indian SchoolMines.

e. Regional Officer, Ministry of Environment andForests Bhopal and Lucknow.

f. Member Secretary, Central Pollution Control Boardto co-ordinate the entire work as per the ToR andfollow Standard Sampling Methodology.

Potential impact of pollution on water resourcesSub-Committee-2

Terms of Reference:

Water Quality Survey of the area

Appropriate sampling methodology should beadopted to give representative picture of theentire area vis-à-vis location of industries.

Inventory of sources (surface and groundwatersources) and their utilization status.

Physical, chemical and micro-biologicalproperties of surface and ground water sourceswith special reference to concentrationofheavymetals including mercury, and other hazardouswaste, if any.

Team:

a. Representative of the Central Ground WaterAuthority having experience in Water Quality

b. Representative of the Ministry of Water Resourceshaving experience in Water Quality

c. Representative of State Irrigation Departmenthaving experience in Water Quality

d. Representative of National Institute of Hydrology from Water Quality Laboratory

Potential impact of pollution on land resourcesSub-Committee-3

Terms of Reference:

Representative samples of soil should be collectedfrom areas reasonably away from the industriescluster apart from sampling in and aroundindustries giving due regard to land use.

General Types of Soil with specific reference todumping sites and discharge point of effluent/s,nearby agriculture fields and forests.

Physical and chemical properties of soil withemphasis on mercury and other relevant heavymetals, and soil fertility.

Team:

a. Representative of Indian Institute of ToxicologyResearch, Lucknow.

b. Representative of Central Pollution Control Board,Madhya PradeshState Pollution Control Board andUttar Pradesh State Pollution Control Board notbelow the rank of Regional Officer.

c. An Expert of Soil Science from Indian Institute ofSoil Science, Bhopal.

d. An Expert on ForestSoil from Indian Council ofForestry Research and Education, Dehradun.

Potential Impact of pollution on air qualitySub-Committee- 4

Terms of Reference:

Ambient air quality sampling (PM2.5, PM10,SOX,NOX, CO, Hg) in the project area based onappropriately designed sampling methodology asper the guidelines of CPCB.

Team:

a) Representative of the Central Pollution ControlBoard,
b) Representative of the Madhya Pradesh PollutionControl Board
c) Representative of the Uttar Pradesh PollutionControl Board
d) An expert on Air Quality from NationalEnvironmental Engineering Research Institute,Nagpur.
e) An expert on Air Quality from IIT, Kanpur.

Potential Impact of Pollution on HealthSub-Committee-5

Terms of Reference And Team:

a) Base line data on socio-economic aspects, potentialhealth hazards. Sample survey using standardstatistically designed epidemiology Study.

b) On findings of this data, a team of expertscomprising of Doctors from AIIMS, King GorgeMedical College, Lucknow to visit the area forconducting sample survey on health profiling ofresidents and workers.

c) A team of experts comprising of Doctors and SocialScientist to develop a questionnaire on healthimpact. This questionnaire to be used for all thesurvey.

d) Committee to have atleastone Doctor each from UttarPradesh and Madhya Pradesh apart from one SocialScientist from each of the state and involvePanchayatiRaj Institutions for collection of primary data.

The above Committee shall submit its report to theTribunal within one month from today. If the final reportis not possible to be submitted on record, then place theinterim report before the Tribunal for further directions onthe next date of hearing.

List the matter for hearing on 26th September, 2014.

……..,CP
(Swatanter Kumar)
……..,JM
(M.S. Nambiar)
……..,EM
(Dr. D.K. Agrawal)
……..,EM
(Prof. A.R. Yousuf)
……..,EM
(Dr. R.C. Trivedi)

Annexure II

List of the Core Committee Members visitedSingrauliareaduring December 4 & 5, 2014

Sr. No.	Name & Designation	Organization
1	Prof (Dr.) TapanChakrabarti	Chair Professor VNIT, Nagpur
2	Prof. (Dr.) I.M. Mishra	Professor, IIT Roorkee,
3	Sudhir Kumar, Scientist-‘F’(EM)	ICFRE, New Forest, Dehradun
4	S.K. Misra, Environment Engineer	U.P. Pollution Control Board, Lucknow
5	P.K. Mishra, Zonal Officer	CPCB, Lucknow
6	Dr. D.K. Soni, Scientist ‘D	ÇPCB, Zonal Office (N), Lucknow
7	Swami Nath, CEO	UPPCB, Lucknow
8	Dr. M.K. Sharma, Scientist ‘D	N.I.H. Roorkee
9	Kalika Singh, R.O.	UPPCB, Sonebhadra
10	Dr. R.P. Mishra, Scientist ‘C’	CPCB, Bhopal
11	Manoj Kumar Mandrai, EE	MPPCB, Bhopal
12	Dr. A.K. Shrivastava, RO	MPPCB, Singrauli
13	S.P. Jha	MPPCB, Singrauli
14	S.K. Paliwal, Sc C	CPCB, Delhi

Annexure III

Public Consultation

ANNEXURE-III

सेवा मे,

श्रीमान अध्यक्ष (कोर कमेटी)
एन॰ जी॰ टी॰ (N.G.T.)

महोदय,

सादरअनुरोध अवगत कराना है कि ग्राम पंचायत कुसुम्हा खण्ड विकास म्योरपुर, त॰ व प॰ दुद्धी, जनपद सोनभद्र (उ॰ प्र॰) मे पिछले 10 दस वर्षो मे हमारे गांव मे कई तरह की बिमारियो (रोगो) मे वृद्धि हुई है, जैसे विकलांगता, बाझपन टी॰ बी आदि। आये दिन लोग इन बिमारियो की चपेट मे आते जा रहे है, जिसमें बुढे से नव जवान महिला-पुरुष बच्चे तक शामिल है। और महोदय से मे भी अवगत कराना है कि हमारे ग्राम पंचायत मे तीन आर॰ ओ (R.O.) प्लांट लगाया जा रहा है जो बिना पाईप लाईन की सफाई है, जो सिर्फ दिखावा किया जा रहा है क्योकि इससे सारे ग्रामीण भाइयो को शुद्ध पेयजल उपलब्ध नही हो पायेगा, कोई भी ग्रामीण भाई किसी दूर से पानी लेने नही आ पायेगा मात्र 30-40 परिवार ही लाभान्वित होंगे। जिससे ग्रामवासियो मे आक्रोश है।

अतः आप महोदय से अनुरोध है कि उक्त बिमारियो की जांच करते हुए उचित कार्यवाही करने का कष्ट करे।

संलग्न
1. विकलांग
2. बाझपन व टी॰बी॰
3- चर्म रोग व मिरगी

भवदीय
दीपक

Annexure IV

SINGRAULI ACTION PLAN DISTT. SONBHADRA

ISSUES REGARDING NTPC - SHAKTI NAGAR, DISTT. SONBHADRA

A – Short Term Action Points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	An action plan to achieve PM emission of 100mg/Nm^3	• Feasibility study completed. ESP will be retrofitted. • Contract has been awarded on 14.11.2013 for retrofitting of ESP's work schedule 62 months. • During meeting District Magistrate, Sonbhadra has directed to submit revised time bound programme in written also within 15 days.	Dec.,2015	Revised time bound programme not yet received.
2.	Provision of dry ash collection system.	**Stage-I** • (5x200 MW) Dry ash collection system is installed in two unit of 200 MW. Further, work has awarded in June'10 for DAES installation in all units of Stage-I. **Stage-II** • (2x500 MW) Civil work for compressor house & Silo is in progress. Materials are being received at site. The work has not been completed till date. • During meeting District Magistrate, Sonbhadra has directed to submit revised Time bound programme within 15 days.	March, 2014	-- do --
3.	On line opacity meter has been install in stack of all power plants of NTPC. The matter of linking data of CPCB/UPPCB Network will be carried out within six months.	The Data have been linked with corporate office for further connection to CPCB Network; further data shall be linked to UPPCB for which arrangement required at UPPCB end in this line visit done at TNPCB by UPPCB & industries representative.	Complying	--
4.	Two (02) continuous Ambient Air Quality	AAQMS Data have been linked with CPCB Network. Further data shall be	Complying	--

	Monitoring Stations are commissioned and the same will be linked with CPCB/UPPCB network within six month.	linked to UPPCB for which arrangement required at UPPCB end.		
5.	Hazardous Waste shall be treated and disposed properly.	HW Waste is being send to TSDF and sold to registered recyclers through MSTC.	Complying	--
6.	Proper Management of Bio-Medical Waste generated from Hospital of NTPC Units shall be ensured.	NTPC Shaktinagar has installed an incinerator of 50 Kg./hr. (Oil fired double chambered) and for the treatment of waste water generated by hospital.	Complying	--

ISSUES REGARDING NTPC - SHAKTI NAGAR, DISTT. SONBHADRA

B – Long Term Action Points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Road maps for 100% fly ash utilization by Dec., 2014.	NTPC mentioned difficulties 100% utilization by Dec., 2014. They stated that studies have shown it can be utilized in active over burden dump in Coal Mines. It was decided that NTPC will submit self contained proposal to MoEF and the Joint Secretary, MoEF will write letter to Ministry of Coal/Power in this regard. However, the direction has been given to industry for the completion of the work within given time target.	Dec.,2015	--
2.	Continuous operation and maintenance of APCS & oil spillage treatment.	Continuous operation & maintenance of APCS & Oil spillage treatment is being carried out regularly	Complying	--
3.	Complete recirculation of new ash pond over flow to achieve zero discharge effluents shall be achieved by NTPC Shakti Nagar.	AWRS installation work of new ash pond is completed. Now it is working w.e.f. 04.12.2014.	Complying	--
4.	The possibility should also be explored for co-processing of	The industries are carrying out co-processing of oil bearing sludge in their	Complying	--

	oil bearing sludge in cement kilns.	own boilers.		

ISSUES REGARDING NTPC – RIHAND NAGAR, DISTT. SONBHADRA

A – Short Term Action Points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	An action plan to achieve PM emission of 100mg/Nm^3	Work awarded to M/s. Hitachi Plant Technologies Ltd., Japan on 01.03.2013. Work in progress. During meeting industry directed to complete the work within given time target.	Dec., 2015	--
2.	Provision of dry ash collection system.	Dry Ash Evacuation System (DAES) **Stage-I:** (2x500 MW) Budget under approval. **Stage-II:** (2x500 MW) 100% dry ash collection system is in operation for (2x500 MW) **Stage-III:** (2x500 MW) Provision is made for dry ash collection system. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	March, 2014	Revised time bound programme has not been submitted till date.
3.	On line opacity meter has been install in stack of all power plants of NTPC. The matter of linking data of CPCB/UPPCB Network will be carried out within six months.	Possibility of linkage with CPCB network is being examined by NTPC Corporate IT department, keeping in view the feasibility & operational security of thermal power plant.	Complying	--
4.	Three (03) continuous Ambient Air Quality Monitoring Stations (Rihand) are commissioned and the same will be linked with CPCB/UPPCB network within six month.	AAQMS Data has already been linked with CPCB net work from 28.07.2010.	Complying	--
5.	Facilities shall be installed for control and treatment of Oil spillage.	Complying.	Complying	--

6.	Hazardous Waste shall be treated and disposed properly.	Complying. Hazardous Waste is being sold to registered recyclers through MSTC.	Complying	--
7.	Proper Management of Bio-Medical Waste generated from Hospital of NTPC Units shall be ensured.	Complying.	Complying	--
8.	Ensuring of 5 cycle recirculation of cooling water in NTPC Rihand TPP.	Optimized to 2.5.	Complying	--
9.	The possibility should also be explored for co-processing of oil bearing sludge in cement kilns.	The Industries have been asked to explore the possibility for co-processing of oil bearing sludge in cement klins.	--	--

ISSUES REGARDING NTPC RIHAND NAGAR, DISTT. SONBHADRA

B – Long Term Action Points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Road maps for 100% fly ash utilization by 2014.	NTPC Rihand has already submitted time bound action plan to utilize 100% dry ash up to the year 2013-14. Guide line for 2014-15 is awaited. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	Dec., 2015	Revised time bound programme has not been submitted till date.
2.	Continuous operation and maintenance of APCS & oil spillage treatment.	Continuous operation & maintenance of APCS & Oil spillage treatment is being carried out regularly.	Complying	--
3.	The possibility should also be explored for co-processing of oil bearing sludge in cement kilns.	The industries have been asked to explore the possibility for co-processing of oil bearing sludge in Cement Klins.	--	--

ISSUES REGARDING U.P.R. VIDYUT UTPADAN NIGAM LTD., OBRA, SONBHADRA.

A - Short term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Complete recycle of ash pond over flow. The clear time should be given with date of complete regarding recycling of Ash pond overflow under refurbishment package. Details of plan should be provided.	Work is in progress (Obra) Civil Work - 95% Completed. Mechanical - Completed. Electrical - 70% Completed. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	March, 2014	Revised time bound programme has not been submitted till date.
2.	Provision of dry ash collection system.	Provision of dry ash collection system in Unit Nos. 1, 2 & 9 has been made and fly ash is being lifted by M/s. J.P. Associates. Similarly provision for the dry fly ash collection system in unit Nos.10,11,12& 13 of BTPS, Obra has been made. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	April, 2014 for unit no. 10,11,12& 13 in phase manner as per the revised schedule of BHEL.	-- do --
3.	High Oil spillage has been observed in the drain. Up-gradation of ETP shall be completed within 2 years by Obra TPS.	E.T.P. Construction work completed under commissioning. - All the Oil trap pit (11 nos.) have been constructed.	Complying	-- do --
4.	Use of low sulphur auxiliary fuel in Obra TPP	Obra Thermal Power Station has been asked to use low sulphur auxiliary fuel.	Complying	-- do --
5.	Installation of Opacity meters	Purchase order has been placed for installation of Opacity meter in unit no.1 & 2 of ATPS and same shall be installed shortly. Opacity meter has been installed in unit No. 9 after R&M work. In the remaining units i.e. in units no. 10, 11, 12 & 13 of BTPS the opacity meter will be installed with the R&M work in phase.	April, 2014 for unit no. 10,11,12& 13 in phase manner.	-- do --

ISSUES REGARDING U.P.R. VIDYUT UTPADAN NIGAM LTD., OBRA, SONBHADRA

B - Long term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Installation and renovation of ESPs to achieve PM emission of 100 mg/NM^3	The R & M work in Unit nos. 1, 2 & 9 has been completed and time bound "Action Plan" for Unit 10, 11, 12 & 13 has been submitted. The work order for installation of ESP's has already been placed with BHEL. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	Dec., 2014	Revised time bound programme has not been submitted till date.
2.	Road map for 100% fly ash utilization by 2014.	M/s. J.P. Associates has already started the work for installation of dry ash extraction system for 5x200MW construction of compressor house/ switch gear room. Work of Laying of Pipe Line etc. shall be started as soon as erection of ESP's is completed in Obra TPS. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	Dec., 2014	-- do --
3.	To control fugitive emissions from ash dyke area, action plan may be prepared including the possibility of installation of high concentration slurry disposal systems.	ATPS has been granted approval by ETS and Tender specification is under progress for installation of dry ash collection. ATPS has submitted the time bound action plan. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	Dec., 2014	-- do --
4.	Complete recirculation of new ash pond over flow to achieve zero discharge	AWRS Civil & mechanical work completed. Pipe laying work is in progress. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	March, 2014	-- do --

ISSUES REGARDING U.P.R. VIDYUT UTPADAN NIGAM LTD., ANPARA, SONBHADRA.

A - Short term action points

Sl.No.	Action Points	Compliance Status	Time Target	Remarks
1.	Complete recycle of ash pond over flow. The clear time should be given with date of complete regarding recycling of Ash pond overflow under refurbishment package. Details of plan should be provided.	Work going on and about 80% work completed. Electrical & Mechanical work will be started soon. Reported to be completed July, 2015. During meeting direction has been given to submit time bound programme in written also.	December, 2014	Revised time bound programme has not been submitted till date.
2.	Provision of dry ash collection system.	**3x210 MW, ATPS, Anpara:-**Nigam have decided to install their own DFAES. For this invitation of EXPRESSION OF INTEREST from the firms using Ash is under process. **2x500 MW, BTPS, Anpara:-**Dry Fly Ash collection system has already been provided. Tender for Ash collection under process. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	December, 2015 December, 2014	-- do --
3.	Installation of Opacity meters on all 5 stacks & data should be linked with CPCB/UPPCB network.	Opacity meter has been installed in four units ie 1,3,4 & 5 and in units No. 2, it could not be installed due to want of shut down which is expected to be installed shortly. During meeting direction has been given to submit time bound programme in written also.	Oct, 2014.	-- do --

ISSUES REGARDING U.P.R. VIDYUT UTPADAN NIGAM LTD., ANPARA, SONBHADRA

B - Long term action points

Sl. No.	*Action Points*	*Compliance Status*	*Time target*	*Remarks*
1.	Installation & renovation of ESPs to achieve PM emission of 100 mg/NM^3	M/s BHEL Ranipet was requested to submit its recommendations in view of performance evaluation test carried out for ESP of Unit no 4 & 5 in march-12. Report from M/s BHEL has been obtained. Discussion on the report has been done with UPRVUN Ltd. Offer has been received	Dec., 2014	Revised time bound programme has not been submitted till

		from BHEL which is under process for negotiation & approval. M/s BHEL have carried conditional assessment, site survey & internal inspection of ESP of Unit no 1 in June- 12 for achieving the desired SPM level. The report by M/s BHEL has been submitted and will do the performance evaluation test soon. Similarly same action shall be taken for Unit no. 2 & 3. On the basis of report. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.		date.
2.	Road map for 100% fly ash utilization by 2014.	**"B" – TPS (2x500 MW):** M/s JP Associatehas lifted the ash upto 14th June, 2012 and after that firm has withdrawn themselves from the work. After this, a fresh tender had been floated for engaging a firm for complete O&M of DFAES and lifting of ash. But no firm participated and again tender has been floated. Best efforts are being done in this matter by the UPRVUN Ltd. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	Dec., 2014	-- do --
3.	To control fugitive emissions from ash dyke area, action plan may be prepared including the possibility of installation of high concentration slurry disposal systems.	ATPS has been granted approval by ETS and Tender specification is under progress for installation of dry ash collection. ATPS has submitted the time bound action plan. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit time bound programme for the completion of work within 15 days.	- Dec., 2014	-- do --
4.	Complete recirculation of new ash pond over flow to achieve zero discharge	AWRS is under construction.	Jan., 2015	-- do --

ISSUES REGARDING LANCO ANPARA, DISTT. SONBHADRA

A - Short term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	An action plan to achieve PM emission of 50 mg/Nm^3	High efficiency ESP (99.9%) along with EFF has already been installed to achieve the prescribed norms.	Achieved/ Complied	
2.	Provision of dry ash collection system.	One silo of capacity 1000 tones is already in place another is under erection.	30.06.2015	
3.	Installation of online opacity meter and status of linking data with CPCB/UPPCB Network.	Online opacity meters for both the units are already in place. The matter of linking data of CPCB/UPPCB Network is under progress.	30.06.2015	

4.	Installation of continuous Ambient Air Quality Monitoring Station and status of linkage with CPCB/UPPCB network.	Management approval granted and procurement of continuous ambient air quality monitoring (CAAQMS) stations are under progress. During meeting District Magistrate, Sonbhadra has directed to representative of Industry to submit revised time bound programme for the completion of work within 15 days.	Aug, 2015.	
5.	Hazardous Waste shall be treated and disposed properly.	Separate hazardous waste storage shed has been made within premises for further disposal of its through authorized party/TSDF.	Complying	
6.	Proper Management of Bio-Medical Waste generated from Hospital shall be ensured.	Membership of common Bio-Medical Waste Treatment Facility has been taken and all generated Bio-Medical waste is being disposed through it.	Complying	
7.	Installation of continuous Ambient Air Quality Monitoring Station in collaboration with M/s. Hindalco Industries Ltd. (Captive Power Plant).	Installation of online Ambient Air Quality Monitoring Station has been completed by M/s. Environment S.A. India Pvt. Limited, its commissioning, sensor calibration and connectivity for data exchange/transmission works are under progress.	Complying	

ISSUES REGARDING LANCO ANPARA, DISTT. SONBHADRA

B - Long term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Road maps for 100% fly ash utilization.	One silo of capacity 1000 tones is already in place another is under erection. Tie-up with local cement agencies/coordinators has been done to enhance the fly ash utilization.	Dec., 2015	
2.	Continuous operation and maintenance of APCS & oil spillage treatment.	Continuous operation of ESP and FF (Fabric Filter) is being ensured to control the emission well within prescribed limit and daily monitoring of PM Values by online opacity meters is being done. For oil spillage treatment in FOPH (Fuel oil pump house) area, the Oil water separator has already being installed and commissioned.	Complying	
3.	Complete recirculation of new ash pond over flow to achieve zero discharge effluents shall be achieved.	The Ash water recovery system for recirculation of ash pond overflow has partially commissioned and work is under progress to complete the same.	31.07.2015	
4.	The possibility should also be explored for co-processing of oil bearing sludge in cement	Presently the hazardous waste is being disposed through TSDF however the possibility will be look out to supply the oil	Dec., 2015	

	kilns.	bearing sludge to cement kilns.		

ISSUES REGARDING HINDLACO INDUSTRIES LTD. (CAPTIVE POWER PLANT)

A - Short term action points

Sl.No.	Action Points	Compliance Status	Time Target	Remarks
1.	Installation of continuous Ambient Air Quality Monitoring Station in collaboration with M/s. LANCO Anpara Power Co.	Installation of online Ambient Air Quality Monitoring Station has been completed by M/s Environment S.A. India Pvt. Limited, its commissioning, sensor calibration and connectivity for data exchange/transmission works are under progress.	Complying	
2.	Complete recycle of ash pond over flow.	Ash Water Recovery System (AWRS) has already been installed and effluents after treatment is recycled and reused in the process.	Complying	
3.	Continuous operation and Maintenance of Air & Water Pollution Control System may be done.	All Air and water pollution control system are working well. For its performance results of ESP, STP, & ETP are being sent regularly.	Complying	

ISSUES REGARDING HINDLACO INDUSTRIES LTD. (CAPTIVE POWER PLANT)

B - Long term action points

Sl.No.	Action Points	Compliance Status	Time Target	Remarks
1.	Road map for 100% fly ash utilization by 2014. Action plan for 100% fly ash utilization to be provided to CPCB	**1.**In the light of the provisions of ash utilization Notification dated 14.09.1999 amended as on date, HIL-RPD has started proactive approach for utilization of fly ash and developed infrastructure in phased manner. **2.** Fly ash off take for cement industries had gone to 21.1% in FY 2006-2007 from 0.5% in FY 2003-2004 due to conversion of wet ash disposal system into dry fly ash collection system and by installation of dry fly ash transportation system in the year 2004.	Dec., 2014	

		3. Hindalco by further persuading the cement industries and transporters by having various meetings with them and also by improving the infrastructure increased the take of fly ash from 38.96% to 50.51% in FY 2008-2009 and FY 2009-2010 respectively. **4.** Hindalco has entered into Long Term Agreement with cement industries for lifting, disposal and unitization of fly ash for next five years with M/s. J.P. Cement, Prism Cement, Hyderabad Industries Ltd., Birla Corporation and other cement companies. This has resulted into utilization of fly ash for the month of July & August 2010 of about 100%. On an average, about 70% fly ash generated in FY 2010-2011 has been disposed by Renusagar Power Division (RPD) and in order to dispose off 100% fly ash, RPD is developing a new fly ash loading point at its ash disposal yard by March 2011. **5.** RPD has installed an ash brick manufacturing unit within its premises for its captive consumption. **6.** RPD has also represented that for ensuring better and 100% utilization of fly ash. i) The quantity of fly ash to be used by cement industries should be increased from 15%. ii) Exhausted coal mines should be made available on compulsory basis to Thermal Power Plant for its refilling by fly ash. iii) The Contractor for road construction should also be compulsory forced to use ash instead of earth soil.		
2.	Provision of dry ash collection system.	Dry Ash collection system has been installed in all the units and sent to Cement manufacturer.	Complying	

ISSUES REGARDING HINDLACO INDUSTRIES LTD. (ALUMINUM DIVISION)

A - Short term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Up gradation / retrofitting in baking furnace	Retrofitting Job of Baking Furnaces No.3 & 4 has been completed and stabilized. A new Baking furnace in place of old Baking Furnace 1&2 has been installed commissioned to achieve desired results. Further Inspection & Monitoring is required.	Complying	
2.	Installation of one continuous Ambient Air Quality Monitoring Station should be installed in collaboration with Adity Birla Chemicals Limited & Hi-Tech Carbone Limited.	Continuous Ambient Air monitoring equipment Opsis, Sweden has already been installed at Renukeshwar Mandir, Renukoot jointly with M/s. Hi-Tech Carbon and M/s. Aditya Birla Chemicals (Kanoria Chemicals Limited) on March 30, 2011. System is	Complying	

	Time frame for commissioning of CAAQMS to be submitted.	operational and data is available at Site. Real time data transmission to CPCB server has been established.		
3.	Monitoring of Fluoride in all stack.	On-Line monitoring of PM and F performed in all pot – line stacks is in place.	Complying	
4.	Monitoring of Fluoride emission in pot room and roof top.	Periodic monitoring by LVS undertaken for fugitive and roof top emission. Fluoride emission monitoring system is already in operation and data is being reported to Regulatory Authorities (Ministry, Central And State) regularly.	Complying	
5.	Monitoring of PAH and HC in Anode Baking stack.	PAH and HC monitoring conducted by certified lab once in a year.	Complying	
6.	Monitoring of Ground water (at least two locations) near the Red mud Pond, for Fe, F, CN & reporting of data to CPCB & UPPCB. Proper interpretation/ analysis of data pertaining to ground water monitoring, be made and if accordingly Action Plan to be prepared for remediation	Three Piezo wells are identified by CGWB Officials at Hindalco establishment. Half yearly monitoring is being done by certified lab regularly. M/s IITR, Lucknow will collected samples in the month of November/ December, 2013	Complying	

ISSUES REGARDING HINDLACO INDUSTRY LTD. (ALUMINUM DIVISION)

B - Long term action points

Sl.No.	Action Points	Compliance Status	Time Target	Remarks
1.	Utilization of Red Mud.	There is no economical process for utilization of Red Mud word-wide till date. Currently red-mud is disposed as 60-70% solids and partially utilized in soil conditioning/plantation. Till now the industry is using red mud for reclaiming land by filling and developing plantation called "Sanjeevani Project" in patches on used disposal sites. Prposal from Alumimium Association of India is still awaited. At present Dala Cement Factory is using Red Mud **150-200 TPD** in manufacturing of cement.	Time target not given. R & D process is going on.	

ISSUES REGARDING ADITYA BIRLA CHEMICALS (INDIA) LIMITED, RENUKOOT

A - Short term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Treatment of brine sludge to reduce mercury concentration in the leachate to less than 0.1 mg/L.	With changeover from mercury cell to membrane cell technology the possibility of mercury brine sludge completely eliminated. w.e.f. 22nd september, 2011.	Completed	
2.	Quantification of brine sludge generation and submission of reports to CPCB and SPCB.			
3.	Reduction in mercury emission to less than 2 gm/T of the product. Action Plan to achieve the Mercury emission standards (2 gm/T of product) should be submitted in detail with clear time line.	With changeover from mercury cell to membrane cell technology the possibility of mercury release to environment completely eliminated.	Completed	
4.	Installation of online mercury analyzer and individual flow meters for quantification of effluent discharge from cell house, brine plant, chlorine handling and HCL plant.	With changeover from mercury cell to membrane cell technology the possibility of mercury bearing effluents completely eliminated. Accordingly the On Line Mercury Analyser is not required.	Completed	
5.	Complete recycling of effluent from the plant.	With changeover from mercury cell to membrane cell technology the possibility of mercury bearing effluents completely eliminated. Accordingly recycling of mercury bearing effluents are not required.	Completed	
6.	Monitoring of groundwater at least two locations (Hg, Res. Cl, OCPs and general parameters) near sludge/HW disposal area and reporting of data to CPCB and SPCB.	The sampling and analysis of borewells have been awarded to IITR, Lucknow and reports submitted.	Completed	
7.	Installation of new boilers with adequate APCS.	Boilers of both 25MW power plant are equipped with ESPs. New boiler with adequate APCS, commissioned, the old boilers phased out.	Complying.	
8.	Adequate measures for proper utilization of fly ash to be taken.	Fly ash brick plant produces 10 Lakh bricks & rest ash delivered to Cement manufacturing units.	Complying.	
9.	Reduction of Hg conc. In Cell House Ventilation gas to 1 g/T. Clear Action Plan should be given regarding reduction of Mercury concentration in Cell House ventilation gas to 1g/T with proper	With changeover from mercury cell to membrane cell technology the treatment of cell room ventilation gas is not required.	Completed.	

	time line			
10.	Monitoring of HCL furnace stack for HCL and send reports to CPCB and SPCB.	With changeover from mercury cell to membrane cell technology the treatment of cell room ventilation gas is not required.	Completed.	
11.	Establishment of two AAQMS for Hg, PM, Sox & NOx. Date of completion to be specified. Chlorine monitoring also to be included. Reference of revised AAQM standards notified in 2009 be taken.	On line ambient air monitoring equipment has been installed on 30.03.2011 for parameters PM 10, PM 2.5 Chlorine, Mercury & Hydrogen fluoride near Renukeshwar Temple Renukoot in collaboration with M/s. S.K.I.Carbon & M/s. Hindalco Industries Ltd.	Completed.	
12.	Monitoring ambient air quality as per decision of meeting held on 18.1.10 and reporting data to CPCB and SPCB.	The data is available in our office. Data transfer to be done jointly with CPCB & SPCB.	Completed.	

ISSUES REGARDING ADITYA BIRLA CHEMICALS (INDIA) LIMITED, RENUKOOT

B - Long term action points

Sl.No.	Action Points	Compliance Status	Time Target	Remarks
1.	Action Plan for complete changeover to Membrane Cell Process. The process should be completed by December, 2011. There are some operational issues. CPCB should study the EIA clearance given by MoEF to the unit and if need be, move for its revision. The CPCB shall take Bank Guarantee of suitable amount from the Unit for the compliance.	Stopped permanently the mercury cell caustic soda plant w.e.f. 22nd September, 2011 and installed 145 TPD caustic soda membrane cell plant. Thus completed the changeover process well ahead of deadline 2012 as stipulated in environmental clearance letter.	Complying.	
2.	Reduction in mercury consumption to less than 50 gm/T of the product.	With changeover from mercury cell to membrane cell technology the treatment of cell room ventilation gas is not required.	N.A.	
3.	The Industry should ensure removal	Sent entire 632 MT fresh brine	Complying	

	and safe disposal of Hazardous waste stored in the Industry premises to the TSDF in time bound manner. Clear time bound road map should be given by the industry for removal and safe disposal of Hazardous Waste stored in industrial premises.	sludge to TSDF Ramky Kanpur. Hazardous Used Oil being sent to TSDF Bharat Oil & Waste Management Ltd., Kanpur.	Complying	

Note:-**Industries has permanently stopped mercury cell based caustic soda plant and confirmed to UPPCB, Lucknow vide our letter No. ABCIL/ ENV/11-12/152 dtd. 22 September, 2011.**

NORTHERN COAL FIELDS LTD. MINE UNITS (BINA, KAKRI, KHADIA, DHUDICHUA & KRISHNASHILA)

A - Short term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Coal characterization in terms of ash, fluoride, mercury and submission of results to CPCB and SPCB.	The coal samples are regularly analyzed. As per the results submitted of CMPDI Ash – 33%; F BDL; Hg 0.01 – 0.09 PPM.	Complying	
2.	Monitoring of effluent and noise for compliance of standards and reporting of data to CPCB and SPCB.	Monitoring effluent & noise is being done by CMPDI fortnightly.	Complying	
3.	Action Plan needs improvement.	The following points are being included in the action plan:- 1. Thick Green belt already made through UP Forest Deptt. 2. All the OB generated dumped in decoaled are in internal dump. 3. All permanent service roads are metalled, temporary haul roads are WBM.	Complying	
4.	Recycling plan for achieving zero discharge for NCL should be prepared and submitted by December 2010, and implementation by December 2011.	Time bound Recycling plan for achieving zero discharge for NCL has been prepared. District Magistrate has directed to submit time bound programme to achieve zero discharge within month.	July, 2015	
5.	Monitoring of effluent, reaching Rihand reservoir should also be done and if found polluted its impact on reservoir should be assessed and remedial measures be taken accordingly.	The monitoring is being carried out by UPPCB. The industry has been directed to submit time bound programmed to achieve Zero discharge. In no any case the effluent is being discharged in to Rihand reservoir after confirming the prescribed standards laid down by the Board.	Complying	

6.	Action plan for bio-remediation of OB dumps should be prepared by March 2011.	Biological reclaimation of OB dump is being done by plantation of plants through U.P.Forest Deptt.	complying	
7.	Possibility of installation of coal conveyance system through closed conveyor belts should be assessed to control fugitive emissions due to hauling of coal.	The Coal Handling Plant (CHP) already installed and efficiently having closed conveyor belts to control fugitive emissions due to hauling of coal.	Complying	
8.	Establishment of AAQMS (at least 2) for monitoring SOx, NOx, PH and reporting the data to CPCB and SPCB.	Four No. of AAQMS established for monitoring of SOx, NOx, PM_{10}, PH 2.5 and reporting data to CPCB and SPCB regularly.	Complying	

ISSUES REGARDING NORTHERN COAL FIELDS LTD. MINE UNITS (BINA, KAKRI, KHADIA, DHUDICHUA & KRISHNASHILA)

B - Long term action points

Sl.No.	Action Points	Compliance Status	Time Target	Remarks
1.	Ensuring supply of washed coal to the power plant/users away from the pithead.	Pleaded difficulty in terms of cost/economics factor. The issue may be taken up at higher/ corporate level.	Time target not given.	
2.	Regarding supply of washed coal to the power plant, NCL mentioned difficulty and referred this case to corporate level. In view of this situation, possibility may be explored for establishment of common washery to be owned by thermal power plants sourcing coal from NCL	The power plants of Singrauli Area situated in District Sonbhadra (U.P.) have been asked to explore the possibility for establishment of common washery to be owned by thermal power plants sourcing coal from NCL. The power plants mentioned problems in using washed coal on the basis of designing of plants.	Time target not given.	
3.	Strengthening of Internal Environmental management.	The Industry has been directed to strengthen of Internal Environmental management. Industry representative has directed to submit total of E.M.G. within 15 days.	30.06.2015	

ISSUES REGARDING HI-TECH CARBON (HC)

A - Short term action points

Sl.No.	Action Points	Compliance Status	Time Target	Remarks
1.	Regular monitoring of Sox, NOx, PM in stack emission and submission of data to CPCB and SPCB.	System for monitoring is in place. Data submission is regular.	Complying	
2.	Ambient Air Quality Monitoring.	Continuous Ambient Air monitoring equipment Opsis, Sweden has already been installed at Renukeshwar Mandir, Renukoot jointly with M/s Hindalco Industries Ltd. (Aluminum Division) and M/s Aditya Birla Chemicals (Kanoria Chemicals Limited) on March 30, 2011. System is operational and data is available at Site. Real time data transmission to CPCB server has been established.	Complying	
3.	Establishment of AAQMS for PM_{10}, PH 2.5, SOx & NOx.	As above.	Complying	
4.	Monitoring ambient air quality and reporting data to CPCB and SPCB.	As above.	Complying	
5.	Monitoring of effluent for compliance of standards and reporting of data to CPCB and SPCB.	As above.	Complying	
6.	Operation and maintenance protocol of pollution control devices like Bag filters should also be included in action plan as action plan includes only monitoring part	The industry has been directed to comply operation and maintenance protocol of pollution control devices like Bag filters.	Complying	

ISSUES REGARDING STONE CRUSHERS IN SINGRAULI AREA DISTRICT SONEBHADRA

A - Short term action points

Sl.	Action Points	Compliance Status	Time Target	Remarks

No.				
1.	Installation and proper operation of dry dust collection system, dust containment-cum-suppression system, Wind breaking walls and noise containment system.	• To implement the provision of EPA, the UPPCB has taken strict action and issued closure orders to 25 units. • Random inspection and air monitoring is being carried out by the UPPCB. **At present some stone crushers are closed due to non availability of raw materials & funds.**	Complying	
2.	As per the minutes of the review meeting for status of Singrauli Action Plan held on 18.09.10, during summer months (2 months) when water scarcity exists, stone crushing shall be stopped. Only those units having dry scrubbing facilities shall be allowed for operation during the summer months.	• Expert committee of members has been established by CPCB. • Field visit of Expert committee members has been done on 13-14 July, 2011. • Final comments and suggestion provided from the expert committee has been received. **Directions have been issued to all Stone Crushers for the compliance.**	Complying	
3.	UPPCB should ensure compliance of pollution control arrangement guidelines issued by CPCB for stone crushers and time bound action plan should be prepared	UPPCB is ensuring compliance of pollution control arrangement guidelines issued by CPCB for stone crushers and as per the decision of review meeting for status of Singrauli Action Plan. • Tree plantation & Construction of C.C. Road inside the Stone Crusher area is in progress. • Construction of Varanasi-Shaktinagar Road is in progress, reported to be completed by Aug., 2015.	Complying	

ISSUES REGARDING DALLA CEMENT FACTORY, DALLA IN SINGRAULI AREA DISTT. SONEBHADRA

A - Short term action points

Sl.	Action Points	Compliance Status	Time Target	Remarks

No.				
1.	Installation of continuous Stack and AAQ monitoring stations.	Equipments of On-line ambient Monitoring station are Installed and Commissioned. Generated data to be linked to CPCB website shortly. Opacity meters are installed at all stacks for continuous monitoring of emission of dust concentration. Generated data to be linked to UPPCB/CPCB website shortly.	Complying	
2.	Proper implementation of Mine Management Plan.	Are being complied.	Complying	
3.	The present plan pertains regarding installation of continuous stack & AAQ monitoring stations only whereas important environmental issues like control of fugitive emissions, stack emissions, efficacy of pollution control devices etc. should also be addressed	1. To control fugitive emissions, following activities are being carried out as follows:- - Bag filters are installed at all transfer points like Lime Stone crushing plant, Lime stone stock pile, transport gantry, Raw Material Hopper, Raw Mill, Raw Mill Silo, Kiln Feed, Preheater, Clinker Silo, transport, Coal feeding, Coal Storage, transport, Coal Mill Coal Feeding, coal Storage Transport, Cement Silo, packing plant, Fly Ash storage, Cement Mill, Coal Handling plant, Bunker and Fly ash silo. - 100% concrete road has been made. - Automatic Road sweeping machine is deployed - Treated water of STP is being sprinkling on haul Roads. - Water fogging system on conveyer Belt - Plantation work is under progress. 2. To control the stack emission, efficient Air Pollution Control System (APCS) devices like ESPs, Reverse Air Bag House and Bag filters has already been installed at all process Duct which is designed for < 50 mg/Nm3.	Complying	

Issues regarding the Government of U.P. and Central

A - Short term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	To ban the use of recycled plastic bags.	The State Govt. has imposed ban the use of recycled plastic of below 40 microns in the radius of 200 meters from the River bank.	Complying	

2.	Safe Drinking Water Supply should be provided in the affected villages Govindpur, Myorepur, Labhari, Kamaridar, Garbandha, Kushmha and Renukoot etc.	In the compliance of the order passed by Hon'ble National Green Tribunal, U.P. Jal Nigam & all Industries situated in Critically Polluted area is supplying Safe Drinking Water to 45 effected villages in Distt- Sonbhadra	Complying	

Issues regarding the Government of U.P. and Central

B - Long term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Construction of Varanasi-Shaktinagar Highway and Roads in the Stone Crusher area of Dala.	Under construction and construction started by the State Highway Authority U.P. for 2 to 4/6 Lane construction under process. Construction work will be completed by August, 2015.	Aug., 2015	
2.	Development of Municipal solid Wastes sites to be done by local bodies.	Project proposal is under preparation and installation of MSW facilities will be carried out after approval of Govt. of India.	Dec., 2015	
3.	Supply of LPG Gas to resident of Villages to avoid the de-forestation.	Concerned agencies have been requested to submit the proposal.	Time target not given.	
4.	District Sonbhadra of U.P. is power hub of India and the electric supply is in very poor condition. The steps are required to strengthen the electric supply to the residence of Distt. Sonbhadra.	State Govt. has been requested to allow the Distt. Sonbhadra as 24 hour electric supply zone.	Time target not given.	
5.	To shift the Stone Crusher Units situated along Road side in Dala, Distt. Sonbhdra to suitable site.	The suitable site is not available so the Distt. Administration has decided to construct 12' High Wall along the road side of Varanasi-Shaktinagar Highway in the Stone Crusher area of Dala.	Site not available.	
6.	Treatment facility for Bio-Medical Waste	The Govt. Hospitals are the members of CBWTF Varanasi (SNG) and Pvt. Hospitals are member of CBWTF (CPC) Varanasi. The Factory's Hospitals have installed their own facility.	Complying	
7.	Remedial Action Plan for de-siltation of Rihand Reservoir and other water bodies.	The State Irrigation department has been asked to submit the detailed project report for de-siltation of Rihand Reservoir.	Time target not given.	
8.	In-situ bio-remediation of sewage	All the local bodies of the area have been requested to install the STP in their respective area.	Dec., 2015	
9.	Present status and future plan for green belt development as per the norms fixed in the Master Plan of the area.	More than 50% area of Distt. Sonbhadra is covered under Forest, Gardens and shrubs. It has been decided to strengthen Green belt in Stone Crusher Area by Shaktinagar Special Area Development Authority & Forest Department.	Complying	
10.	Action plan for promotion of Bio-compost and Bio-Fertilizer alongwith the chemical fertilizer to minimize unutilized chemical fertilizer run-off into the natural water resources through	Approx. 20,000 MT Chemical fertilizer have been utilized per year. The Agriculture Deptt.,Govt. of U.P. has been requested to formulate the policy for promotion of Bio-compost and Bio-Fertilizer alongwith the	Time target not given.	

	Govt. policy.	chemical fertilizer to minimize unutilized chemical fertilizer run-off into the natural water resources.		

Issues regarding U.P. Pollution Control Board

A - Short term action points

Sl. No.	Action Points	Compliance Status	Time Target	Remarks
1.	Regular monitoring of surface water sources and Ground water.	UPPCB is regularly monitoring of surface water sources and Ground water.	Complying	
2.	Regular monitoring of Industrial E.T.P. and APCS.	Quarterly inspection and sampling is being carried out by UPPCB.	Complying	
3.	Details of Public awareness and training programme.	UPPCB is organizing the Public awareness programmes with the cooperation of Director Environment of U.P. Govt. under '**District Plan'.** The officials of UPPCB are participating in the Training Programmes organised by CPCB/Other Environmental Agencies/Abroad through MoEF.	Complying	
4.	As per letter dt. 20.12.2010 of CPCB regarding Monthly monitoring Committee of Action Plan in Chairmanship of District Magistrate.	The Committee have been notified vide letter No. 25/Singrauli Action Plan/2011 dt. 07.01.2011 in Chairmanship of The District Magistrate, Sonebhadra for critically polluted area. Discussions & progress reports is sending time to time.	Complying	

Issues regarding U.P. Pollution Control Board

B - Long term action points

Sl.No.	Action Points	Compliance Status	Time Target	Remarks
1.	To install Automatic Ambient Air Quality monitoring stations at sensitive places in the area.	The Financial assistance from CPCB has not yet been received as the decided in the Review meeting of Singrauli Action Plan held on 18.01.2010.	Complying.	
2.	To shift the Stone Crusher Units situated along Road side in Dala, Distt. Sonbhdra to suitable site with the help of State Govt./Central Govt	The suitable site is not available so the Distt. Administration has decided to construct 12' High Wall along the road side of Varanasi-Shaktinagar Highway in the Stone Crusher area of Dala.	Land not available.	
3.	Action plan for GIS-GPS system for pollution sources monitoring.	GIS-GPS system for pollution sources monitoring will be installed with financial assistance of CPCB.	Complying.	
4.	GIS-GPS based tracking system for transportation of hazardous waste.	GIS-GPS based tracking system for transportation of hazardous waste will be installed with financial assistance of CPCB.	Yet to be done.	
5.	Action point/strategy for health impact assessment.	The work of detailed health impact study has been awarded to the expert agency consisting at least one Doctor from AIIMS & one from KGMC, Lucknow & CMO, Sonbhadra.	Complying.	

CRITICALLY POLLUTED AREA SINGRAULI –MADHYA PRADESH

ACTION TAKEN REPORT- STATUS OF COMPLIANCE OF ACTION PLAN (CEPI)

A: ACTION PLAN FOR INDUSTRIAL POLLUTION CONTROL

S.No	Action Plan	Compliance status
A	After the declaration of singrauli as critically polluted area , Government of MP & MP pollution control board has considered it seriously and necessary steps have been taken . Hon'ble Minister , Ministry of Housing & Environment, with Principal Secretary, Department of H & Env., Member Secretary, MPPCB & district Collector Singrauli have conducted Ariel survey of the area and necessary discussion /meeting with officer/ public of the area. Necessary direction are	Complied. Time to time directions have been issued to the concerned industries/mines by the Board.

	issued to industries for better implementation of environmental laws, where ever violation is observed	
B	It is decided to establish of Regional Office & laboratory of MP pollution control board in Singrauli MP	Complied. R.O. Office at Singrauli established.
C	Rapid EIA study [with limited Scope] with the involvement of Govt. of MP, EPCO and MPPCB	As per MoEF office memorandum dated 05-7-2011 CPCB was directed for examine possibility to undertake a regional environmental study involving all the stakeholders including SPCBs.
D	Involvement of International Agencies like DFID, WHO etc . for Financial Assistance in environmental studies.	Not concerned. .
E	Involvement of Industries and Mines for co-ordination of efforts.	(1) For the purpose of technology improvement ,and awareness, the Northern coal field Ltd has conducted workshop on dump slope stability in coal mines with experts of reputed institution on 14thJuly 2011. (2) MP Pollution control Board has also organized a workshop on Environmental Management in Coal mines & Thermal power plants on 3rd Sept 2011 with active participation of industrial organiza tions. . (3) Workshop on Innovative techniques for use of fly ash management on dated 07-02-2013 organized by MPPCB. (4) Workshop on E-waste management on dated 14-3-2013 & prevention of pollution due to idol immersion in river or water bodies was also conducted on 01-09-2013 by MPPCB
F	Enforcement of stringent environmental standards and stricter conditions in forthcoming consent cases	Stringent conditions for improvement in pollution control measures is imposed by the Board in consent/ renewal letters.
G	Though thermal power plant of NTPC & coal mines of Northern coal field ltd have	Compliance of EC condition are monitored time to time and some

	established necessary pollution control arrangement but there are still some violation regarding hazardous waste management rules ,& provisions of environmental clearance . After a technical discussion with all industry representative in presence of Principal Secretary, Department of H & Env., all Industries are issued direction to submit time bound action plan with bank guarantee.	violations regard's OB dump reclamation has been observed.
H	Rigorous Plantation program outside the industrial premises and nearby area will be developed.	Complied. Plantation has been done by all the projects

B -Thermal Power Plants

01.**Vindhyachal Super Thermal power project**- NTPC Vindhyanagr Distt SINGRAULI MP. (Capacity -6X500 MW + 6X210 MW = 4260 MW)

S.No	Action Plan	Compliance status
1	Preparation of system for spillage & leakage detection/ correction in ash-slurry-pipelines within 03 months and implementation within 06 months.	As per the time bound action plan submitted for the year 2009-10 to 2013-14, 138 km old pipeline was planned to be replaced. Upto September 2013 130km, old pipeline for transportation of ash slurry from plant to ash dykes have been replaced. Spillage and leakages have been detected and repaired. At present, no significant leakages have been found during the survey along the pipeline. Regular inspection and repairing work is taking place..
2	Implementation of recollection system to pump back accidental discharge of ash slurry into Surya nalla within 06 months to protect Rihand Reservoir.	Approx. 50000 M3 ash deposited along the pipeline have been removed and work is continue to keep the area clean.
3	Strengthening of Environmental Cell with accountability to ensure functioning of ETP & STP at all time within 30 days.	Complied .Management has given this responsibility to Senior officer in the rank of AGM . ETP & STP have been made functional. Regular monitoring is carried by the Board.
4	Clearance of Hazardous waste from storage area by disposal to authorized CTSDF, Pithampur,	Hazardous waste (spent resin approx. 12 MT) has been found stored in HDPE bags within shed on pucca floor. The industry has not complied so far regarding disposal to CTSDF. However, used oil is sold regularly to registered and authorized recyclers.
5	Industry shall comply with the condition of EC regarding involvement of local NGO's like Vanvasi Sewa Ashram to inventories industries operating around the Rihand Reservoir within 06 months	Industry has taken initiative for this study. It has been informed that TOR has been received from TERI, Bangalore on 05/08/13 and accordingly proposal is being processed for awarding contract.
6	S-2 Ash Dyke pertaining to Thermal	Complied. Permission has been obtained from MP

	Power Project Shaktinagar operating in UP has been developed without prior permission of Govt. of MP or MPPCB. The activities shall be stopped immediately till such time the due permissions are sought.	Pollution Control Board.
7	Installation of continous real time monitoring station for display with in 12 months. Establishment of continuous ambient air quality monitoring station .The matter of linking monitoring data with CPCB/SPCB	(a) Continuous ambient air monitoring station -04 Nos. have been established & linked with CPCB. (b) Opacity meters are installed for all 11 stacks
8	Improvement in existing house keeping within 03 months	Complied. Housekeeping has been improved by regular cleaning of the area within plant and premises.
9	An action plan to achieve PM emission of 100 mg/Nm3	a) Already achieved in 05 units of 500 MW under stage II , Stage – III and stage-IV. b) For units of Stage_I (6x210 MW) stake emission limit given by MPPCB is 150 mg/m3. The industry has submitted proposal for renovation and modernization of ESPs to achieve PM level <100 mg/NM3 for which contract work has been awarded to M/s BHEL
10	Provision of dry ash collection system	a) Dry ash collection system /silo of capacity 4000 t with distribution/ loading capacity of 6000 t/day is installed. Which meets the present demand of dry fly ash b) Proposal for installation of additional dry ash collection silo & railway wagon loading facility is being installed.
11	Establishment of continuous ambient air quality monitoring station .The matter of linking monitoring data with CPCB/SPCB	Details as point no 7
12	Complete recirculation of ash pond overflow to achieve zero discharge .	The industry has installed ash water recirculation system for utilization of ash pond over flow.
13	Facility for control treatment of Oil spillage	Complied. Oil & grease separation system is established.
14	Hazardous waste treatment and proper disposal	a) Used oil is generated as hazardous waste which is stored within shed and sold regularly.. b) Other hazardous waste (spent resin) have been found stored within shed .
15	Proper management of bio-medical waste	Complied. Disposal of BMW after collection ,segregation ,and treatment in autoclave and disposal by deep burial as per provision of the Rules
16	Ensure regular running & proper functioning of sewage treatment plant	Maintenance of Sewage treatment plant is completed & it is found in working condition during visits.

17	Establishment of Ash water recirculation system by NTPC Shaktinagar (UP) from ash pond S-1 in Village Rampur Vindhyanagar Singrauli. (March 2014)	Construction work in progress. As per action plan submitted the completion of Ash water recirculation system by NTPC, Shaktinagar UP is proposed in March 2014. Approx. 60-70 % work of pipe line erection is complete & construction of pump house approx 60% .

C- Coal Mines projects of Northern coal field Ltd Singrauli

There are 08 coal mines projects viz. Amlori, Nigahi, Jayant, Dudhichua, Jhingurda, Block B project Gorbi, Bina, and Khadiya are located in Singrauli district in MP. Out of these 08 mines ,03 mines viz. dudhichua project , Khadiya project,and bina extension open cast coal mines project have their infrastructure setup in the adjoining area of Uttar Pradesh in district Sonbhadra. Current status of compliance of action plan by the NCL mine projects are as follows: -

S.No	Action Plan	Compliance status
1	Preparation of plan for management of over Burden dumps within 06 months for the following:	- Mine management have submitted clarification that most of the dumps are active and dumping on these OB dumps is in progress to achieve maximum permissible height. So plantation / biological reclamation is not possible at present.
	(a)- Maintain face of dump slop as per provision given in mining plan & EC.	Mines management agreed to maintain all external Dump slop as per EC (28°) after technical and biological reclamation. -
	(b)- Implementation of progressive physical stabilization of dumps in accordance with the condition of EC to protect gully formation and overflowing of material with runoff.	Mines management has submitted that improve techniques for dump stabilization as per EC are being implemented. Proper compaction, bench formation , maintaining the OB slop construction of retaining wall, garland drain and siltation pond are being carried out to protect the river or natural drains with run off silt. & protection of OB dump erosion of soil and gully formation .
	(c)- Detailed data regarding expenditure on plantation and the actual plantation done on field along with survival rate be prepared for at least 15 yrs and submitted within 03 months.	Data regarding plantation is prepared . Overall survival rate in last 15 years is approx 40-50 %. Approx 51 Lakh plantation is done up to 2010-11 based on 50 % survival rate. During 2011 to 3013 approx 5.5 lakh plantation has been reported by coal mine projects of NCL.
	(d)- Provision of garland drains be made within 06 months.	Complied.
	(e)- Mine closer plan shall be submitted to MPPCB within 03 months with adoption of backfilling plan as per mining	All 08 mines have submitted mine closure plan to MPPCB. MPPCB has directed to make amendments as per circular of Coal India Ltd. The

	lease.	amended plans have not been received so far.
2	Clearance of Hazardous waste from storage area by disposal to authorized TSDF, Pithampur, Indore M P, within not more than 03 months.	Complied. mines have made agreement with CTSDF pithampur , for regular disposal of hazardous waste. Used oil is being sold to registered recyclers.
3	Improvement in existing house keeping within 03 months	Complied . House keeping in all coal mine Projects of NCL have been improved .
4	Reclamation of old Gorbi mine is to be done within 01 year as per condition of EC.	- Gorbi mine of NCL is a closed mine. Closure Plan approved by NCL Board is submitted in July 2011 includes reclamation of mine. Work is not started
5	Establishment and proper running of Effluent treatment Plant	Following mines have established & operating Effluent treatment plant (ETP) and Sewage treatment plant (STP) in addition to oil –grease trap at source of generations 1. Amlori Project- 01 ETP & 01 STP 2. Nigahi Proect- 02 ETP & 01 STP 3. Jayant Project – 01 ETP & 01 STP 4. Jhigurda Project- 01 ETP & 01 STP 5. Dudhichua Project – 01 ETP &01 STP Block B project mine has 01 ETP and proposal for construction of 01 STP.- status- tender stage. Other 02 Project – Bina extension project and Khadia open cast coal mine have establishments in UP & ETP /STP are in UP.

Annexure V

Reports of the Sub- Committees

Annexure Ia

Report of Sub- Committee-1 constituted by Hon'ble National Green Tribunal

On

Quantification of Industrial Impacts

[In the Matter of OA No. 276 of 2013 & M.A. No. 59 of 2014 in O.A. No. 20 of 2014) Ashwani Kumar Dubey Vs Union Of India and Ors And Jagat Narayan Viswakarma & Ors. Vs. Union of India & Ors.]




June 2015

1. Background:

Hon'ble National Green Tribunal (NGT),vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013-Ashwani Kumar Dubey Vs Union of India constituted a Core Committee for Monitoring of Potential Hazards of Industrial Development in Singrauli Area(both UP & MP). In addition, Hon'ble NGT also constituted five sub-committees each for Quantification of Industrial Impacts, Assessment of Potential Impact of Pollution on Water Resources, Land Resources & Air Quality and on Human Health with respect to Singrauli area (both UP & MP).

The sub –committee-1 on "Quantification of Industrial Impacts" was constituted comprising representatives from CPCB, UPPCB, MPPCB, Regional office of MOEF, Lucknow & Bhopal and expert from IITR, Lucknow and ISM, Dhanbad. The terms of reference of the sub- committee are given as under:

1.1 **Inventory of Existing industries – industry wise**

1.1.a Production in terms of each product either per day or per month
1.1.b Raw material used: in terms of each raw material including fuel and water per day &its sources

1.2 **Pollution Load generation**

1.2.a Water- quantity of each of the significant pollutant per day before & after treatment.
1.2.b Air- quantity emission in terms of each pollutant per day.
1.2.c Fly-ash-quantity per day.
1.2.d Hazardous waste-quantity & type/day.
1.2.e Others, if any – specify & quantify

1.3 **Compliance Status:**

a. Environmental Clearance conditions
b. Forest Clearance conditions
c. Consent conditions

1.4 **Adequacy of each of the pollution control measure/s.**

1.5 Daily basis Vehicular traffic census especially in and around residential clusters. Ambient air quality should also be monitored in the above residential areas.

1.6 Vehicular census and their usages data to be used for quantification of pollution load generation from the vehicles (petrol and diesel driven separately).

1.7 **Overall working and deficiency, if any**

2.0 Approach & Methodology

The Sub- Committee in its meeting held on September 24, 2014 finalised the Approach and Methodology to carryout the activities as per the Terms of References set by the Hon'ble NGT. The representatives of the UPPCB & MPPCB provided available recent data with respect to industries located in their States. The minutes of the meeting are attached at **Annexure I**. The following working approach and methodology for execution of each task was finalised :

2.1 **Inventory of Existing industries** – industry wise :Information available with MPPCB, UPPCB and Zonal offices of CPCB shall be compiled by the respective SPCBs and submitted to the Sub-Committee.

2.2 Pollution Load generation : Information collected by MPPCB, UPPCB and Zonal offices of CPCB through various studies shall be compiled by the respective SPCBs and submitted to the Sub-Committee. Wherever, required data is not available, the same will be collected by respective SPCB and compiled.

2.3 Compliance Status compliance with respect to Environmental Clearance conditions,. Forest Clearance conditions and Consent conditions shall be provided by MOEF &CC. Hence, it was decided that concerned regional offices of MoEF & CC will provide the same. Information pertaining to compliance of consent conditions will be provided by the respective SPCBs.

2.4 Adequacy of each of the pollution control measure/s.

The Committee decided that adequacy of pollution control measures shall be adjudged by SPCB / CPCB based on actual monitoring of effluent and emissions in all the concerned industries and the same shall be submitted to the Committee.

2.5 Daily basis Vehicular traffic census especially in and around residential clusters. Ambient air quality should also be monitored in the above residential areas and Vehicular census and their usages data to be used for quantification of pollution load generation from the vehicles (petrol and diesel driven separately).

Regarding collection of data on vehicular traffic census, it was decided that respective SPCBs will collect the same alongwith average running of each type vehicle in the respective area. Vehicular Pollution load shall be computed by applying Emission Factor.

The Committee was informed that transportation of coal by road was limited to M/s Renusagar Power Company and partially with M/s Lanco Power. M/s Renusagar Power Company is in the process of switching over to belt Pipe Conveying System while M/s Lanco Power has switch over to dedicated rail transport system, thereby eliminating possibility of fugitive dust emission due to transportation of coal. Other industries including thermal power plants, cement plant have dedicated rail transport system for transportation of coal.

2.6 Overall working and deficiency, if any

Besides industrial pollution in Singrauli area, it was noted that there are Technical and Administrative issues responsible for pollution in the area. Such issues have been identified and characterised as under :

Technical issues:

1. Considering quantum of heavy traffic, the roads preferably in areas close to stone crushers, are required to be made of Cement Concrete
2. Burning of coal by domestic users in residential clusters
3. Transportation of material to and from stone crushers undertaken through open trucks lead to spillage of material and cause road- side dust being air borne
4. Considering a large number of Reverse Osmosis (RO) plants being established in the area for supply of safe drinking water, it would be pertinent to ensure disposal of RO Rejects in environmentally sound manner.

3.0 Quantification of Pollution Load

The data collected by the respective SPCBs regarding production and consumption of raw material including fuel by the industries in the area and thereby pollution load w.r.t emission, waste water & solid waste generation are given **Annexure II**. The industrial category wise details of production, raw material/fuel consumption and pollution load generation are summarised as under:

3.1 Thermal Power Plants

There are 10 thermal power plants in Singrauli (Both UP & MP) comprised of total power generation capacity of 21000 MW and requiring about 103.984 million tonne coal annually.Estimated pollution load w.r.t emission of Particulate matter, suphurdioxide, Oxide of nitrogen and mercury from these power plants is summarized in the table below:

Pollution (Emission) Load:

Name of the Plant	Coal requirement (Million tonne per annum)	Particulate Matter (tonne per annum)	RSPM (tonne per annum)	SO_2 (tonne per annum)	NOx (tonne per annum)	Mercury (tonne per annum)
Existing						
Vindhyachal NTPC, MP	22.15	1.24	0.682	168340	199350	3.101
Sasan (RPL)	20.592	0.38	0.209	52136	61740	0.9604
Mahan (Essar Power), MP	3.12	0.19	0.105	23712	28080	0.4368
J P Niegre, MP	6.864	0.28	0.209	52136	61740	0.9604
Rihand, NTPC	15.6	0.87	0.479	118560	140400	2.184
Singrauli, NTPC	10.4	0.58	0.319	79040	93600	1.456
Obra , UPVUNL	6.69	0.37	0.204	50844	60210	0.9366
Anpara, UVUNL	8.48	0.47	0.259	64448	76320	1.1872
Anpara C, Lanco	6.24	0.35	0.193	47424	56160	0.8736
Renusagar, HINDALCO	3.85	0.22	0.121	29260	34650	0.539
Total	**103.986**	**5.814**	**3.198**	**790172**	**899485**	**14.61**
Tonne/day	**0.315109**	**0.018**	**0.0097**	**2394.46**	**2725.71**	**0.0443**

Note:

1. Coal requirement is estimated using 5.2 million tonne coal per 1000 MW.
2. Particulate matter emission is estimated based on the US EPA Factor 8A (A : % ash content in coal) & Efficiency of ESP (99.8%)
3. RSPM estimation are based on the 55% of the particulate matter
4. SO_2 emission is based on the US EPA factor (19S) where S is sulphur content in coal (0.4%)
5. NOX emission based on the factor 9 kg /tone of coal (US EPA)
6. Hg emission is calculated assuming 0.14 ppm Hg coal in NCL mines (based on the study conducted by CIMFR, Dhanbad. Emission factor was taken as .56 of total mercury in coal

3.1.1 Water Consumption and Waste Water generation:

Thermal power Plant is one of the water intense categories of industry. The water is mainly used for cooling and disposal of flyash. Out of 10 power plants, 04 plants have once through cooling system thus require more water in comparison to plants having cooling tower. Based on data collected on water consumption, it has been estimated that plants in the area consume more than 5 M3/MWh water is much higher than the proposed limit of 4.5 M3/MWh. Based on data collected, it is estimated that about 37.21 M^3 water per day is used by the thermal power plants in the area.

3.1.1 Solid Waste Generation:

It is estimated that about 35 million tonne flyash is generated annually from thermal power plants in the area

3.2 Aluminium Industry

There are 02 aluminium plant of 0.7 & 0.9 million tonne aluminium & alumina production capacity respectively. Red mud and spent pot lining are major solid waste from aluminium industry. There tqo plant aluminium plant in Singrauli area. However, one plant is integrated while other is new and only smelter. About 863031 tonne of red mud and 2250.53 tonne of Spent Pot lining (SPL) is generated from aluminium industry during the year 2014-15.

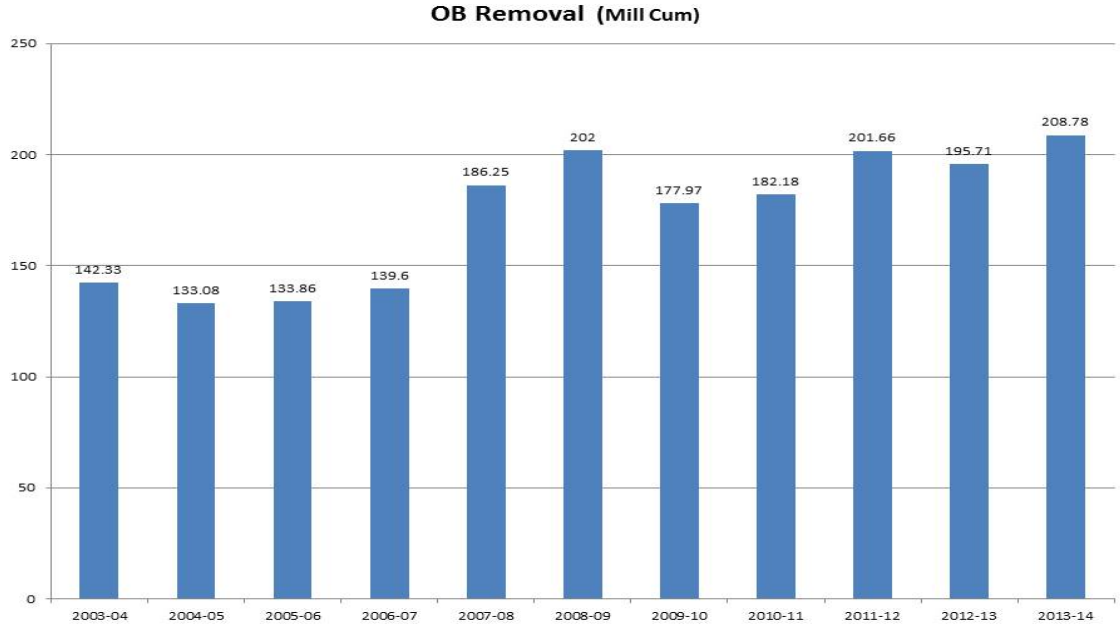
3.3 Coal mining :

There are 10 coal mines having production capacity of 74.5 million tonne of coal. Mine wise coal production during 2013-14 and projected coal coal for the year 2016-17 is given as under.

PROJECT	SANCTIONED		BALANCE RESERVES (MT) AS ON 01/04/2014	PRODUCTION (Mill. Tes.)		
	CAPACITY (Mtpa)	CAPITAL (Rs.Crs.)		2013-14 (Actual)	2014-15 (Target)	2016-17 (Optimistic)
Existing Mines						
Jhingurdah	3.00	63.12	5.12	1.56	1.62	1.00
Completed Projects						
Jayant	10.00	375.04	70.47	11.74	13.00	10.00 + 5.0 N
Dudhichua	10.00	1281.39	317.83	11.17	14.00	10.00 + 5.0 N
Kakri	3.00	186.59	4.85	2.50	2.00	0.00 + 0.5 N
Bina Extn.	06.00	168.97	78.45	06.00	06.50	06.00
Ongoing Projects						
Amlohri Expn.	10.00	1143.54	206.26	08.51	10.00	10.00
Khadia Expn.	10	1131.28	224.00	05.14	05.50	10.00

Block-B	3.50	535.10	62.17	04.38	04.38	04.00
Krishnashila	04.00	741.62	77.89	04.00	05.00	05.00
Nigahi Expn	15.00	259.40	375.48	13.65	15.00	15.00
Total©	**74.50**	**5717.08**	**1422.52**	**68.64**	**77.00**	**81.50**

In coal mining, over burden (OB) is the only solid waste which generated while mining of coal. Year wise OB removal from the mines of NCL is given below. During 2013-14 about 208.78 milliom M^3 OB was removed and stacked with proper management.



4.0 Vehicular Pollution Load

There are 45000 and 33873 registered vehicles in district of Sonebhadra ,UP and Singrauli, MP. The details of registered vehicle share given as under:

Sr. No.	Type of Vehicle	Number of vehicles		Type of Fuel used
		Singrauli MP	Sonebhadra UP	
1	Heavy goods vehicles	5016	757	Diesel
2	Buses	462	1049	Diesel
3	Car/ jeep (Private owned vehicle	6044	17117	Diesel/Petrol
4	Taxi/Maxi	2480		Diesel
5	Three wheelers	506	528	Diesel/Petrol

6	Tractors	1248	12778	Diesel
7	Other commercial vehicles like JCB,Crane etc	1052		Diesel
8	Two wheelers	33873	141323	Petrol
Total		**50691**	**154101**	

As per the information collected by the District administration , about 19950 and 70910 litres of petrol and diesel is consumed per day in district Singrauli of MP. The estimated vehicular pollution load based on the registered vehicle population in districts of sonebhadra, UP and Singrauli , MP is given as under:

Type of vehicle	**Pollution load Sonebhadra, UP (Tonne per annum)**				**Pollution load Singrauli , MP (Tonne per annum)**			
	CO	**HC**	**NOx**	**PM**	**CO**	**HC**	**NOx**	**PM**
Heavy good vehicle (trucks)	78.1	19.8	135.8	4.9	517.7	130.9	899.8	32.5
Buses	216.5	54.8	730.1	27.2	95.4	24.1	321.6	11.9
Car/ jeep (Private owned vehicle/Taxi/Maxi	372.9	33.4	128.4	17.9	189.1	19.1	81	10.9
Three wheelers	75.29	32.3	2.4	1.7	72.1	30.9	2.3	1.6
Two wheelers	2656.9	1458.2	328.2	70.7	140.9	4.6	42.2	16.9
Total	**3399.69**	**1598.5**	**1324.9**	**122.4**	**1015.2**	**209.6**	**1346.9**	**73.8**

Note:

Following assumption were taken while computing vehicular emission load:

1. 60% vehicle of the total vehicle registered during 2001-05 while remaining 40% during 2006-2015 and accordingly, emission factor is used
2. 30% cars/ jeep are diesel based and 70% petrol based
3. 30% 2 wheelers are 2T and 70% are petrol based

* VKT (vehicle kilometre travelled) and EF (Emission factor) are taken as formulated by Mukhopadhyay Committee.

5.0 Hazardous waste generation

Used oil and waste oil are major waste generated either from transformers or heavy vehicles used in thermal power plants, coal mines and other industries in the area. About 43.9 metric tonne per day used & waste oil (categorised as hazardous waste) is generated from all major large scale industries in the area. Industry wise details of hazardous waste generation in given in Annexure II .

6.0 Findings:

The findings of sub-committee are summarised as under:

6.1.1 There are 359 industries in Singrauli area of which 259 & 80 are located in the State of UP & MP respectively. Among these, thermal power plants, aluminium and coal mining are major categories of industries comprising of large scale of industries. There 10 thermal power plants having total installed capacity of 21000 MW (06 in UP with installed capacity of 9280 MW and 04 plants in MP with installed capacityof 11640 MW), 02 aluminium plant of 0.7 & 0.9 million tonne aluminium & alumina production capacity respectively, 01 cement plant of 2 million of tonne of clinker and 0.5 million of cement production capacity and 10 coal mines having production capacity of 74.5 million tonne of coal. Besides, there are number of stone crushers which are in clusters.

6.1.2 During 2013-14 about 64.64 million tonne coal was produced by the mines of NCL which was supplied to thermal power plants in the area. Thermal power plants located in Singrauli area required about 103 million tonne of coal annually. Coal requirement of Sasan thermal power plant is met by captive mines of the M/s Reliance infrastructure ltd.

6.1.3 It is estimated that about 35 million tonne flyash is generated from thermal power plants in the area. Besides flyash, about 863031 tonne of red mud and 2250.53 tonne of Spent Pot lining (SPL) was also generated from aluminium industry. In addition about 208.78 million M^3 of Over Burden from coal mines was removed and staked at identified places with proper management.

5.1.4 It is also estimated that about 5.8 tonne total particulate matter (consisting of 3.2 tonne PM_{10}), 0.8 million tonne of SO_2, 0.9 million tonne of NO_x and about 14.6 tonne per annum mercury is emitted from thermal power pants in Singrauli area (both MP & UP).

6.1.5 An estimation of water consumption in thermal power plants was also done. There are two categories of thermal power plants which have once through cooling (OTC) water system and another category of pant have cooling towers (CT). The plants have once through cooling system uses more water in comparison to plants which have cooling tower. The water consumption in plants varies from 50-70 mm3/MWh in OTC and 4.5 to 7 M3 /MWh in case of CT based power plants. Based on data collected, it is estimated that about 37.21 M^3 water per day is used by the thermal power plants in the area.

6.1.5 Total Bio-Chemical Oxygen Demand (BOD) load form the industries in the area (UP) is estimated to be 41722 kg per day which is being discharged to different water bodies which ultimately joins Rihand reservoir.

6.1.6 All the major large scale industries have consent to operate valid up to December 31, 2015 under Air & Water (Prevention and Control of Pollution) Acts 1981 & 1974 respectively.

6.1.7 All major large scale industries have obtained environmental clearance from Ministry of Environment, Forests & Climate Change.

6.1.7 About 43.9 metric tonne per day used & waste oil (categorisedas hazardous waste) is generated from all major large scale industries in the area.

6.1.8 There are about 207525 total registered vehicles in Singrauli and Sonebhadra district of MP & UP respectively. Among these , 65050 are four /three wheelers and 142375 two wheelers.

6.1.9 The total NOx and CO emission load from the vehicles in Sonebhadra and Singrauli districts is estimated to be 1324.9 & 1346.9 and 3399.69 & 1015.2 tonns per annum respectively.

Annexure I

Minutes of the First Meeting of *Sub-committee-I onQuantification of Industrial Impacts* in complianceto theNGT Order dated 25, 2014 in the matter ofJagat Narayan Viswakarma & Ors. Vs. Union of India & Ors. And Ashwani Kumar Dubey Vs. Union of India & Ors. (O.A.No. 276 of 2013 & M.A. No. 59 of 2014 in O.A. No. 20 of 2014), held on September 24, 2014 at CPCB, Delhi

1.0 The first meeting of *Sub-Committee-I on "Quantification of Industrial Impacts"* in complianceto the NGT Order dated 25, 2014 in the matter of Jagat Narayan Viswakarma & Ors. Vs. Union of India & Ors. And Ashwani Kumar Dubey Vs. Union of India & Ors. (O.A.No. 276 of 2013 & M.A. No. 59 of 2014 in O.A. No. 20 of 2014), was held on September 24, 2014 at CPCB, Delhi. The meeting was chaired by Dr. A. B. Akolkar Member Secretary, CPCB. The list of participants is enclosed (**Annexure I**). Regional officer of MoEF (Bhopal & Lucknow) and expert from Indian School of Mines could not attended in the meeting.

2.0 Member Secretary informed that MoEF & CC has defined, vide office circular No. Q-18011/12/2014/ CPA dated 22.09.2014 (**Annexure II**), the Chairman and member convenors of core team and coordinators for sub committees (1-5) referring to the order of the Hon,ble National Green Tribunal (NGT) dated 25.08.2014 . All the member institutions were provided copy of the circular under reference.

3.0 The Sub- Committee discussed the Approach and Methodology to carryout the activities as per the Terms of References set by the Hon,ble NGT. The representatives of the UPPCB & MPPCB provided available recent data with respect to industries located in their States. Thereafter, discussion was held in respect of each part of the TOR. After detailed discussion, working approach and methodology for execution of each task was finalised as below:

3.1 **Inventory of Existing industries – industry wise**

3.1.a Production in terms of each product either per day or per month
3.1.b Raw material used: in terms of each raw material including fuel and water per day & its sources

Representatives of MPPCB, UPPCB and Zonal offices of CPCB informed that information on the above is available with SPCBs. It was agreed that the same shall be compiled by the respective SPCBs and submitted to the Sub-Committee.

3.2 **Pollution Load generation**

3.2.a Water- quantity of each of the significant pollutant per day before & after treatment.
3.2.b Air- quantity emission in terms of each pollutant per day.
3.2.c Fly-ash-quantity per day.
3.2.d Hazardous waste-quantity & type/day.

3.2.e Others, if any – specify & quantify

It was informed by representatives of MPPCB, UPPCB and Zonal offices of CPCB that information/data on the above mentioned tasks is available with SPCBs through various studies conducted by respective SPCBs and other institutions in past. The Sub Committee agreed that the same shall be compiled by the respective SPCBs and submitted to the Sub-Committee. Wherever, required data is not available, the same will be collected by respective SPCB and compiled.

3.4 Compliance Status:

a. Environmental Clearance conditions
b. Forest Clearance conditions
c. Consent conditions

Monitoring of environmental & forest clearance conditions is done by MOEF &CC. Hence, it was decided that concerned regional offices of MoEF & CC will provide the same. Information pertaining to compliance of consent conditions will be provided by the respective SPCBs.

3.5 **Adequacy of each of the pollution control measure/s.**

The Committee decided that adequacy of pollution control measures shall be adjudged by SPCB / CPCB based on actual monitoring of effluent and emissions in all the concerned industries and the same shall be submitted to the Committee.

3.6a Daily basis Vehicular traffic census especially in and around residential clusters. Ambient air quality should also be monitored in the above residential areas.

3.6b Vehicular census and their usages data to be used for quantification of pollution load generation from the vehicles (petrol and diesel driven separately).

Regarding collection of data on vehicular traffic census, it was decided that respective SPCBs will collect the same alongwith average running of each type vehicle in the respective area. Vehicular Pollution load shall be computed by applying Emission Factor.

The Committee was informed that transportation of coal by road was limited to M/s Renusagar Power Company and partially with M/s Lanco Power. M/s Renusagar Power Company is in the process of switching over to Pipe Conveying System while M/s Lanco Power has switch over to dedicated rail transport system, thereby eliminating possibility of fugitive dust emission due to transportation of coal. Other industries including thermal power plants, cement plant have dedicated rail transport system for transportation of coal.

3.7 Overall working and deficiency, if any

Besides industrial pollution in Singrauli area, it was noted that there are Technical and Administrative issues responsible for pollution in the area. Such issues shall be identified and characterised as under :

3.7.1 Technical issues:

3.7.1.1Considering quantum of heavy traffic, the roads preferably in areas close to stone crushers, are required to be made of Cement Concrete

3.7.1.2 Burning of coal by domestic users in residential clusters

3.7.1.3 Transportation of material to and from stone crushers undertaken through open trucks lead to spillage of material and cause road-side dust being air borne

3.7.1.5 Considering a large number of Reverse Osmosis (RO) plants being established in the area for supply of safe drinking water, it would be pertinent to ensure disposal of RO Rejects in environmentally sound manner.

3.7.2 Administrative:

3.7.2.1 Delay in construction of highway by SADA

3.7.2.2 Supply of LPG to locals using coal for cooking

4. The Committee was informed that currently there are 19 RO Plants have been established in UP while 04 RO plants in MP State. Additionally, a dedicated (piped) water supply system has been provided by M/s Renusagar Power Company (Hindalco), Dala Cement Works and NCL Dudhichua coal mine in their vicinity.

5. The Committee took note of the fact that there are number of locations where regular ambient air quality monitoring is being carried out. These stations are being managed either by SPCB or by industries. It was agreed that a rationalised approach shall be followed so as to relocate the existing stations with a view to make representative assessment of ambient air quality in residential areas.

The meeting ended with a vote of thank to the Chair.

Meeting of sub-committee-I in compliance to theNGT Order dated August 25, 2014 in the matter ofJagat Narayan Viswakarma & Ors. Vs. Union of India & Ors. And Ashwani Kumar Dubey Vs. Union of India & Ors. (O.A.No. 276 of 2013 & M.A. No. 59 of 2014 in O.A. No. 20 of 2014 held on on September 24, 2014 at CPCB , Delhi

List of Participants

Sr. No.	Name & Designation	Organisation
1	Dr. A. B. Akolkar, Member Secretary	Central Pollution Control Board
2	Dr. S. S. Bala, Addl Director	-do-
3	Dr. R. C. Murthy, Scientist	IITR, Lucknow
4	Shri. P.K. Mishra, Sc D & I/c Zoanl Office	Central Pollution Control Board, Lucknow
5	Shri. Kalika Singh, R O ; Sonebhadra	UP Pollution Control Board
6	Shri S. N. Dwivedi, RO , Singrauli	MP Pollution Control Board
7	Shri. P.K. Vishwkarma, ASO	UP Pollution Control Board
8	Shri. R.K. Singh, Sc D	Central Pollution Control Board, Lucknow
9	Dr. R.P. Mishra, Sc C	Central Pollution Control Board, Bhopal
10	Sri. M.K. Mandrai, EE	MP Pollution Control Board , Bhopal
11	Dr. S. K. Paliwal, Sc	Central Pollution Control Board, Delhi

Annexure II

Inventorisation of Industries of district Sonebhadra , UP

Sr. No.	Name of Industry	Capacity	Raw materials per day MT/KLS	Pollution emission per day mg/Nm^3	Pollution Load.	Fly Ash generation per day (MT)	Air Pollution Control	Water Pollution Control equipment
1	2	3	4	5	6	7	8	9
1.	M/s Anpara Thermal Power Station Unit 'A' Anpara Sonbhadra	Electricity 2 × 210 MW = 630 MW	Coal – 10000 MT/Day Water – 1460000 MT/Day Oil – 20 KL/Day	PM – 144 SO_2 – 600 NO_X – 430	BOD – 36646 Kg/Day S.S – 46720 Kg/Day	2800	ESP Sprinkler Cyclone Stack-225 & 275 Mtr.	Ash Pond Neutralisation Pit Sewage Plant AWARS under Construction ETP under lender process
	M/s Anpara Thermal Power Station Unit 'B' Anpara, Sonbhadra	Electricity 2 × 500 MW = 1000MW	Coal – 16000 MT/Day Water – 2561000 MT/Day Oil – 10 KL/Day	PM – 148 SO_2 – 740 NO_X – 550		4500		
2.	M/s Hindalco Industries Ltd.,(Aluminum) Renukoot, Sonbhadra	Aluminum-472000MT/Year Alumina-900000MT/Year	Bauxite-2140719.842MT/Year, CP Coke-153745.145 MT/Year, Caustic Soda-104860.269 MT/Year, Lime-23312.812 MT/Year, Borax-93.450 MT/Year, Soda ash Dense-1297.338 mt/Year, FO (KL)-79596.655 MT/Year, Steam Coal-959601.661 MT/Year, HSD(KL)-6541.008 MT/Year, Starch-60.4000 MT/Year, Water-39757 KL/Day	PM – 122.8 SO_2 – 705 NO_X – 581	BOD – 27.26 Kg/Day S.S. – 125.4 Kg/Day	Fly Ash – 1033.66 MT/Day Red Mud-2746.17 MT/Day	ESP Sprinkler Cyclone Bag Filter	ETP STI AWRS
3.	M/s Hindalco Industries Ltd., (Aluminum) Renukoot, Sonbhadra	Electricity 840 MW	Coal – 14290 Water – 56454	PM – 99.498 SO_2 – 372.2 NO_X – 223.3	BOD – 249 Kg/Day S.S. – 541 Kg/Day	4495	ESP Sprinkler Cyclone	ETP STI AWRS
4.	M/s Aditya Birla Chemicals (India) Ltd.,	1. Casting soda – 12900 MTPA 2. Liquid		PM – 99.498 SO_2 – 372.2 NO_X –	BOD – 6.6 Kg/Day S.S. – 41.8 Kg/Day	_	Bag Filter. Hypo towers, Scrubber for	ETP

	Renukoot, Sonbhadra	chlorine – 103560 MTPA 3. Stable bleaching power – 3000 MTPA 4. CPW – 20000 MTPA 5. Aluminum chloride 17000 MTPA 6. P.A.C. – 50000 MTPA		223.3			waste gases	
	M/s Aditya Birla Chemicals (India) Ltd., (Power Division) Renukoot, Sonbhadra	Electricity 2 × 25 MW	Coal – 1.032 MT/Kwh HSD – 0.00030 KL/Kwh	PM – 87 Sox – 312 NO_X – 258		323.7 MTPD	Bag Filter & ESP	ETP
5.	M/s NTPC, Rihand Nagar, Sonbhadra	3000 MW	Coal 43268 MT/Day	**Stage-I** SPM-145 SO_2-622 NO_X-207 **Stage-II** SPM-85 SO_2-642 NO_X-225 **Stage-III** SPM-46 SO_2-630 NO_X-229	BOD – 1106 Kg/Day S.S. – 564 Kg/Day	14629	ESP Dust Extraction & Dust suppression system	LWTP ETP STP (Oxidation Pond) AWRS
6.	M/s NTPC, Saktinagar, Sonbhadra	Electricity 2000 MW	Coal 30165 MT/Day	SPM-129 SO_2-731 NO_X-424	BOD – 336 Kg/Day S.S. – 3444 Kg/Day	10317	ESP DE/DS Sprinklers	LWTP STP AWRS (in progress)
7.	M/s Northern Coal-Fields Ltd., Dodhichua, Sonbhadra	Coal 15.5 Milion Tan/Per Year	Blasting material-14423.322 MT/Years Diesel – 57.6 KL/Day Lubricands-2.69 KL/Day	PM-10-179.6 mg/m^3 SO_2-22.4 mg/m^3 NO_X -27.1 mg/m^3	BOD – 51.3 Kg/Day S.S. – 96.0 Kg/Day	NIL	-Closed Conveyors-Sprinklers-cyclone Bag Filers	ETP STP
8.	M/s Northern Coal-Fields Ltd., Bina Unit, Sonbhadra	Coal 6.00 Milion Tan/Per Years (Dt. 05.08.14) Present 7.5 Milion Tan/Years (Dt. 06.08.14)	Water – 124.80 KL/Day Blasting material - 34.20 Ton/Day Lubricants – 1.40 KL/Day	PM-10-126.5 mg/m^3 SO_2-12.6 mg/m^3 NO_X -33.1 mg/m^3	BOD – 142.8 Kg/Day S.S. – 571.5 Kg/Day	NIL	-Closed Conveyors-Sprinklers-cyclone Bag Filers	ETP STP
9.	M/s Northern Coal-Fields	Coal – 3.30 MT	Blasting material - 16.55 Ton/Day	PM-10-145.9	BOD – 57 Kg/Day	NIL	-Closed Conveyors-	ETP STP

	Ltd., Kakri Unit, Sonbhadra		Diesel – 16.50 KL/Day Grish – 0.068 Mobil – 0.89	mg/m^3 SO_2-18.9 mg/m^3 NO_X -33.6 mg/m^3	S.S. – 131 Kg/Day		Sprinklers-Cyclone Bag Filers	
10.	M/s Northern Coal-Fields Ltd., Khariya Unit, Sonbhadra	Coal – 10 Milion Tan/Per Years	Blasting material - 570 Ton/Month Diesel – 650 KL/Month Oil & Grish – 66.5 Tan/Month Mobil – 0.89	PM-10-226.7 mg/m^3 SO_2-19-8 mg/m^3 NO_X -36.5 mg/m^3	BOD – 46.22 Kg/Day S.S. – 71.90 Kg/Day	NIL	-Closed Conveyors-Sprinklers-cyclone Bag Filers	ETP STP
11.	M/s Norhern Coal-Fields Ltd., Krishansila Unit, Sonbhadra	Coal – 4.00 MTPA	Blasting material - 14.8 Ton/Day Diesel – 7972 Lit/Day Lubricants – 315 Lit/Day	SPM-309 mg/m^3 SO_2-19 mg/m^3 NO_X-19 mg/m^3	ETP not installed	NIL	Water Sprinklers – Dust Extractor – Plantation	ETP no installed
12.	M/s Obra Tharmal Power Station Unit 'A' Obra, Sonbhadra	Electricity 5×50 MW 3×100 MW	Coal – 2400 MT/Day Water – 20000 MT/Day	PM- 401 SO_2- 509 NO_X -246	BOD – 444 Kg/Day S.S. – 3280 Kg/Day	31784.68 MT/Year	ESP Sprinkler Plantation	Ash Pond AWRS unde Construction ETP unde commissionin g
	M/s Obra Tharmal Power Station Unit 'B' Obra, Sonbhadra	Electricity 5×200 MW		PM- 152 SO_2- 537 NO_X -288				
13.	M/s Dala Cement Factory (a unit of Jai Prakash Associates), Dala, Sonbhadra	Clinker – 2.0 MTPA Cement – 0.5 MTPA CPP – 27 MW	Lime Stone – 8820 MT Iron ore – 90 MT Red Mad – 90 MT	PM - < 50 SO_2 - < 100 NO_X - <600	N.A.	250 MT	Bag House/ESPs/ Bag Filters	STP
14.	M/s Hi Tech Carbon, Renukoot, Sonbhadra	5100 MT/Month	Carbon Black – 400 T/Day Potassium Nitrite – 0.06 T/Day Malases – 1.00T/Day HCL – 1.00 T/Day	PM – 98.2 SO_X - - NO_X- -	BOD – 8.7 Kg/Day S.S. – 725 Kg/Day	–	Bag Filter Pure Gas Filter Scrubber	ETP STP
15.	M/s Lanco Anpara Power Ltd., Anpara, Sonbhadra	1200 MW	Coal – 12750 MT/Day Water – 64714 KL/Day	PM – 41 SO_X – 632 NO_X – 204	BOD – 2.03 Kg/Day S.S. – 34.0 Kg/Day	4453	ESP EFF	ETP STP AWRS

Up to May, 2015

INVENTORY OF HW GENERATION IN THE STATE OF UP REGIONAL OFFICE, SONEBHADRA

DISTT. SONEBHADRA

Sl. No.	Name and address of the Unit	District	Products manufactured (in TPA)	Haz. Waste (HW)Generating Process as per Sch. 1	HW Generating streams as per		HW Generation in TPA as per	Hw Generation in TPA as per	Total Quantity of HW Generation in TPA	Quantity of HW in TPA Disposal		
					Sch. 1	Sch. 2	Sch.1	Sch.2		Landfill-able	Recyclable	Incinerable
1	2	3	4	5	6	7	8	9	10 (8+9)	11	12	13
1.	Anapara T.P.S. (Unit-A) Anpara, Sonebhadra	Sonebhadra	Thermal Power 3x210MW	Waste Oil/used oil	5.1	-	70 TPA	-	70.00	-	70.000	-
2.	Anapara T.P.S. (Unit B) Anpara, Sonebhadra	Sonebhadra	Thermal Power 2x500MW	Waste Oil/used oil	5.1	-	90 TPA	-	90.000	-	90.000	-
3.	Hindalco Ltd. Renukoot, Sonebhadra	Sonebhadra	Aluminum Metal 362793 TPA Alumina 71578 MT (Yrs. 5-6) Vanadium Sludge.	Waste Oil ETP Sludge Spent Pot Lining	5.1 & 5.2 11.2 34.3	- - -	1747.40 KL/Year 2651 MT/ Year 4051 MT/Year	-	8449.4	–	8449.4	-
4.	Hindalco Ltd. Renusagar Power Renusagar, Sonebhadra	Sonebhadra	Thermal Power 6111.227 Million Units 5251827000 Units (Yrs. Jan6-Oct. 06)	Waste Oil	5.1 & 5.2	-	27.83 MT/Year	-	27.83 MTPA	-	27.83 MTPA	-
5.	HI-TECH Carbon Ltd.	Sonebhadra	Carbon Black 5100 Mt/Month	Waste Oil	5.1	-	0.096 TPA	-	0.096	-	0.096	-
6.	Aditya Birla Chemicals (India) Ltd. Renukoot, Sonebhadra.	Sonebhadra	Sodium Hydroxide (Na OH) 47166 TPA	Brine Sludge HCH Much	16 33 34	-	896.173 TPA	-	2335.693	896.173	1439.520	-
								Total:	10973.019	896.173	10076.846	

1	2	3	4	5	6	7	8	9	10 (8+9)	11	12	13
7.	N.T.P.C. Ltd. Shakti Nagar, Sonebhadra.	Sonebhadra	Thermal Power 2000 MW	Asbestos Containing waste as AC profiling Waste Oil	15 5.1	-	27 TPA 154.45 TPA	-	181.450	-	181.450	-
8.	N.T.P.C. Ltd. Rihand Nagar Sonebhadra	Sonebhadra	Thermal Power 2000 MW	Waste Oil	5.1	-	45.56 TPA	-	45.560	-	45.560	-
9.	Northern Coal Fielfs Ltd. Kakri, Sonebhadra	Sonebhadra	Open Cast coal Mine 3 million Ton/A	Waste Oil (burned oil)	5.1 5.2 5.2	-	200 KL/Yr. 8 Ton/Year 2 Ton/Year	-	160.00	-	160.00	-
10.	Northern Coal Fielfd Ltd. Beena Sonebhadra.	Sonebhadra	Open Cast Coal Mine 4.05 Mill. T/A	Waste Oil	5.1 5.2	-	156.472 TPA	-	156.472	-	156.472	-
11.	Northern Coal Fields Ltd. Dudhicuwa, Sonebhadra.	Sonebhadra	Open cast Coal Mine 40370000T/A	Waste Oil	5.1 5.2	-	234.148 TPA 1.5 TPA	-	237.648	-	236.148	1.500
12.	Northern Coal Fields Ltd. Khadia, Sonebhadra.	Sonebhadra	Open Cast Coal Mine 4 Mi. T/A	Waste Oil	5.1 5.2	-	140 TPA -----	-	140.00	-	140.00	-
13.	Obra T.P.S. (Unit-A) Obra, Sonebhadra	Sonebhadra	Thermal Power 500MW	Waste Oil	5.1	-	20 TPA	-	20.00	-	20.00	-
14.	Obra T.P.S. (Unit-B) Obra, Sonebhadra	Sonebhadra	Thermal Power 10000MW	Waste Oil	5.1	-	32 TPA	-	32.00	-	32.00	-
15.	Orient Micro Abravives, Renukoot Sonebhadra.	Sonebhadra	CPW 16.6 MT/day	Lime Slurry from hypo Plant	34.3	-	5 TPA	-	5.00	5.00	-	-
16.	Dalla Cement Factory (A Unit of J.P. Associates Ltd.), Dalla, Sonebhadra.	Sonebhadra	Cement (CPP) K4-1500PPB K5-4500TPD Power Generation 27M.W.	Waste Oil/used oil	5.1 & 5.2	-	250 TPA	-	250 TPA	-	250 TPA	-
17.	J.P. Churk Industrial Complex, Churk, Distt. Sonbhadra.	Sonebhadra	4x60MW 1X60MW Running	Used Oil Residue Resin	5.1 5.2 34.2	-	22 KL 16 KL 0.375	-	22 TPA 16 TPA	-	22 KL 16 KL	0.375
								Total:	1266.13	05.000	1221.630	1.875
								Grand Total:	12239.149	901.173	11336.476	1.875

M P Pollution Control Board

D-3 Russian Complex Vindhya Nagar Singrauli (M P)

INVENTORISATION OF INDUSTRIES (NGT CASE NO. 276/13 - SINGRAULI)

S.No.	NAME AND ADDRESS OF INDUSTRY	TYPE OF INDUSTRY	PRODUCTS & PRODUCTION CAPACITY	QUANTITY OF RAW MATERIAL USED PER DAY	WATER CONSUMPTION			SOURCE OF WATER	QUANT OF F ASH GENE ED P DA
					INDUSTRIAL	DOMESTIC	OTHERS		
1	Vindhyachal Super Thermal Power Project (NTPC) Vindhya nagar Distt. Singrauli	TPP	stage –I 6 x210MW stage II 2x 500MW Stage-III 2x500 MW stage-IV 2x500 MW	Water coal	329300	16900	65000	Rihand through cooling water discharge canal of NTPC Shktinagar (UP)	19000M
2	Sasan Power Limited Village Siddh Khurd Distt. Singrauli,	TPP	6x660 MW	Water coal	240994	2064	35000	Rihand Reservoir	9600 M
3	Essar Power MP Ltd Village Bandhaura Distt. Singrauli	TPP	2x600MW	Water coal	19962	200	--	Rihand Reservoir	2100 M
4	Jaiprakash Power Venture Ltd.-Jaypee Nigrie Super Thermal Power Project, Village Nigarie Distt. Singrauli	TPP	2x660MW + Cement 2.0 million tonnes	Water Coa Cement clinkers	107271	720	--	Gopad River	2500 M

5	Hindalco Industries Limited- Mahan Aluminium Project Village Bargawan Distt. Singrauli	Aluminium + CPP	Aluminium3.59 lakh tonne/year Captive Power Plant 6x150 MW	Alumina Aluminium Fluoride Coal CP coke Fuel Oil CPP Fuel Oil Smelter Pitch	14550	475	--	Gopad River	1000 M
6	Trimula Industries Ltd Village Gondiwali Distt. Singrauli	Sponge Iron	2x350 TPD	Iron ore Coal Ferro alloys	800	65	60	Bore wells + water storage ponds	100 MT
7	Moher & Moher Amlori Extension Coal Mine Project (Sasan Power Ltd) Village Amlori, Distt. Singrauli	Open Cast Coal Mine	12 Million tonnes per year (MTPA)	Diesel Explosives	2390	250	--	Bore Well + mine water	Not Applica
8	MP state MIning Corporation Amiliya Joint Venture with J PAssociates)	Open Cast Coal Mine	2.8 MTPA	Diesel Explosives	191	260	--	Bore Well + mine water	Not Applica
9	Jayant Project-Northern Coalfield Ltd Village Jayant, Distt. Singrauli	Open Cast Coal Mine	15.5 MTPA	Diesel Explosives	3720	2200	--	Rihand Reservoir through IWSS Khadia + mine water	Not Applica
10	Amlori Project-Northern Coalfield Ltd	Open Cast Coal	10.0 MTPA	Diesel Explosives	3755	1745	--	Rihand Reservoir	Not Applica

	Village Amlori, Distt. Singrauli	Mine						through IWSS Khadia + mine water	
11	Nigahi Project-Northern Coalfield Ltd Village Nigahii, Distt. Singrauli	Open Cast Coal Mine	15.5 MTPA	Diesel Explosives	3320	1760	--	Rihand Reservoir through IWSS Khadia + mine water	Not Applica
12	Jhingurda Project-Northern Coalfield Ltd Village Jhingurda, Distt. Singrauli	Open Cast Coal Mine	5 MTPA	Diesel Explosives	2600	1800	--	Rihand Reservoir through IWSS Khadia + mine water	Not Applica
13	Block B Project-Northern Coalfield Ltd Village Gorbi Distt. Singrauli	Open Cast Coal Mine	4.375 MTPA	Diesel Explosives	670	450	--	Rihand Reservoir through IWSS Khadia + mine water	Not Applica
14	Dudhichua Project-Norther Coalfield Ltd Village Dudhichua, Distt. Singrauli	Open Cast Coal Mine	15 MTPA	Diesel Explosives	500	1671	--	Rihand Reservoir through IWSS Khadia + mine water	Not Applica
15	Khadia Project-Northern Coalfield Ltd Village Kdadia Distt. Singrauli	Open Cast Coal Mine	10 MTPA	Diesel Explosives	150	-	--	Rihand Reservoir through IWSS Khadia + mine water	Not Applica
16	Bina Ext Project-Northern Coalfield Ltd Village Bina Distt. Singrauli	Open Cast Coal Mine	6 MTPA	Diesel Explosives	130	--	--	Rihand Reservoir through IWSS Khadia + mine water	Not Applica

Annexure Vb

Report of the Sub- Committee -2

On

Impact of Pollution on Water resources

Annexure Vc

Report of the Sub- Committee -3

On

Impact of Pollution on Land resources

Annexure Vd

Report of Sub- Committee-4 constituted by Hon'ble National Green Tribunal

On

Potential Impact of Pollution on Air quality

[In the Matter of OA No. 276 of 2013& M.A. No. 59 of 2014 in O.A. No. 20 of 2014) Ashwani Kumar Dubey Vs Union Of India and Ors And Jagat Narayan Viswakarma & Ors. Vs. Union of India & Ors.]

June 2015

1. Background:

Hon'ble National Green Tribunal (NGT),vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013-Ashwani Kumar Dubey Vs Union of India constituted a Core Committee for Monitoring of Potential Hazards of Industrial Development in Singrauli Area(both UP & MP). In addition , Hon'ble NGT also constituted five sub-committees each for Quantification of Industrial Impacts, Assessment of Potential Impact of Pollution on Water Resources, Land Resources & Air Quality and on Human Health with respect to Singrauli area (both UP & MP).

The sub –committee-4 was constituted comprising representatives from CPCB, UPPCB, MPPCB and expert from IIT, Kanpur and NEERI, Nagpur. The terms of reference of the sub-committee are given as under:

"*Ambient air quality sampling (PM2.5, PM10,SOX, NOX, CO, Hg) in the project area based on appropriately designed sampling methodology is to be carried out as per the guidelines of CPCB*".

2. Existing AAQ Monitoring Net Work :

In order to make an assessment of existing ambient air quality monitoring network in Singrauli area and status of ambient air quality, the sub –committee met on October 20, 2014 and May 14, 2015. The minutes of the same are attached at **Annexure I**.

Total 05 AAQ monitoring stations (03 in MP & 02 in UP) are being operated under National Ambient Air Quality Monitoring programme. NAAQM stations located in MP area have facility for monitoring of only PM_{10}& PM $_{2.5}$ only while stations located in UP area have facility for monitoring of PM_{10}& PM $_{2.5,}$ SO_2 and NO_2. However, as per feedback received from Pollution Assessment, Monitoring and Assessment (PAMS) Division of CPCB, out of 12 notified pollutants under NAAQS, only 09 pollutants can be monitored manually while pollutants like CO, Benzene and Benzo-Pyrene can only be monitored using instruments as per the reference methods specified in the notification.

UP & MP pollution Control Boards upgraded the NAAQMS for monitoring of PM10, PM2.5, SO2 & NO2. Besides, NAAQMS, There are about 32 more AAQ monitoring stations (manual & continuous both) are being operated by the industries in Singrauli area. These stations are generally located either inside the factory premises or periphery of the boundary wall. These stations may be relocated based on the wind direction pattern and likely impacted area in the region. Thereafter, these stations can be used for monitoring of ambient air quality after verifying calibration of instruments used for the monitoring.

3.0 Constrains:

Monitoring of CO & mercury in ambient air could not be carried out as CO & Mercury in ambient are monitored using continuous monitoring system. Therefore, it is necessary that continuous monitoring system should install in Singrauli area for Hg monitoring.

4.0 Status of AAQ

The AAQ monitoring data collected w.r.t PM_{10}, $PM_{2.5,}$ SO_2 and NO_2 during December 2014 to March 2015 at 05 monitoring stations located at Vindhynagar NTPC Colony, Jayant Expert Hostel of NCL and Waidhan Basti (Madhya Pradesh) and Anapara & Renusagar Colony (Uttar Pradesh) is given in **Annexure II**. The summary of reults is given as under:

4.1 The AAQ monitoring data collected with respect to PM_{10}, $PM_{2.5,}$ SO_2 and NO_2 during December 2014 to March 2015 at 05 monitoring stations located at Vindhynagar NTPC Colony, Jayant Expert Hostel of NCL and Waidhan Basti (Madhya Pradesh) and Anapara & Renusagar Colony (Uttar Pradesh) are given in **Annexure Vd** .

4.2 The concentrations of SO_2 and NO_2 were found in the range of 11-24 $\mu g/m^3$ and 10-39 $\mu g/m^3$, respectively for all monitoring stations which arewell within the prescribed limit of 80 $\mu g/m^3$.

4.3 The concentrations of PM_{10} and $PM_{2.5}$ were in the range of 71.5-163 $\mu g/m^3$ and 29-62 $\mu g/m^3$, respectively for all monitoring stations. The concentrations of PM_{10} exceeded the limit of 100 $\mu g/m^3$ at a number of days of monitoring period at Anpara Colony and Renusagar Colony, Jayant and waidhan monitoring locations.

5. Suggestion for improvement of monitoring Network

The Committee based on the inputs provided the expert members and representatives of UP & MP Pollution Control Boards suggests the following:

1. UPand MP Pollution Control boards shall continue operation of existing NAAQMS and submit data on monthly basis to CPCB.

2. UP pollution Control Board will add three more stations as sanctioned and ensure the operation of the same within a fortnight for monitoring of 09 parameters viz: PM_{10}, $PM_{2.5}$, SO_2, NO_2, NH_3, O_3 ,As, Ni, & P.

3. Local agencies/NGOs will be involved for regular monitoring of AAQ at selected locations afterconfirming their capabilities and availability of Infrastructure.

4. IIT, Kanpur and NEERI will prepare a project either jointly or separately on assessment of assimilative carrying capacity of Singrauli area including remedial measures for the existing industrial installations and the same may be considered by Core Committee for recommendations to Hon,ble NGT for appropriate orders.

5. A map indicating monitoring stations of air, water and soil quality may be prepared jointly by UP & MP PCBs.

6. Continuous monitoring system for Hg monitoring atleast for three locations should be installed (covering both Districts of UP & MP) in Singrauli area on polluter pay principle .

7. AAQ monitoring stations (manual & continuous both) operated by the industries in Singrauli area should be relocated based on the wind direction pattern and likely impacted area in the region. The data generated through these stations should be utilised to assess the level of AAQ in Singrauli area.

Annexure I

Minutes of the Meeting of the Sub-Committee -4 on Impacts of Pollution on Air Quality constituted by the Hon'ble National Green Tribunal (vide its order dated August 25, 2014) held on October 20, 2014 at 2.30 PM at CPCB, New Delhi

1.0 The first meeting of the Sub-Committee -4 constituted by the Hon,ble NGT,vide its order dated August 25, 2014 on Impacts of pollution on air quality was held on October 20, 2014 at CPCB , Delhi. The meeting was chaired by Dr. A. B. Akolkar, Member Secretary, CPCB and other members of the sub committee Dr K.V. George , NEERI,Nagpur; Shri R.S. Kori, Addl Director, CPCB,, Bhopal, Dr. A. K. Srivastav, Chief chemist, MPPCB, Singrauli, Shri P.K. Mishra, Sc D, CPCB, Lucknow, Dr. S. S. Bala, Addl. Director, CPCB, Delhi attended the meeting. Member Secretary, UPPCB and expert from IIT, Kanpur could not attend the meeting. Prof Mukesh Sharma, IIT Kanpur informed that the decisions taken in the meeting may be communicated to him as he discussed the matter pertaining to air quality monitoring and carrying capacity.

2.0 Member Secretary welcomed the members of the sub committee. He enquired about the existing AAQ monitoring network in Singrauli area. It was informed that total 05 AAQ monitoring stations (03 in MP & 02 in UP) are being operated under National Ambient Air Quality Monitoring programme. NAAQM stations located in MP area have facility for monitoring of only PM_{10}& PM $_{2.5}$ only while stations located in UP area have facility for monitoring of PM_{10}& PM $_{2.5,}$ SO_2 and NO_2. Member Secretary further stated that as per feedback received from Pollution Assessment, Monitoring and Assessment (PAMS) Division of CPCB, out of 12 notified pollutants under NAAQS, only 09 pollutants can be monitored manually while pollutants like CO, Benzene and Benzo-Pyrene can only be monitored using instruments as per the reference methods specified in the notification. He emphasized that at each location of monitoring, all 09 parameters should be monitored using defined monitoring protocol. Accordingly, UP & MP pollution Control Boards were asked to upgrade the NAAQMS immediately. Incharge, Zonal office, CPCB, Lucknow informed that in addition to NAAQMS, about 32 more AAQ monitoring stations (manual & continuous both) are being operated by the industries in Singrauli area. He suggested that data generated through these stations can also be evaluated to assess the ambient air quality in the area and for future studies. These stations can be used for monitoring of ambient air quality after verifying calibration of instruments used for the monitoring. Rep. of MPPCB mentioned that monitoring of all 09 parameters may not be feasible due to lack of man power and analysis facilities at the laboratory of MPPCB, Singrauli. Member Secretary, CPCB categorically mentioned that AAQ monitoring network in Singrauli area was established way back in late 90's and therefore, non availability of proper infrastructure for monitoring of notified parameters after about 20 yrs clearly indicates that sincere efforts have not been taken by the respective agencies for capacity building. Further , he asked that respective SPCBs shall ensure that AAQ monitoring data are received on regular basis at regular intervals, number of parameters monitored, performance assessment of monitoring stations and quality of data reported.

3.0 The committee was informed that in recent past (Jan-Feb, 2014), CPCB has got conducted AAQ monitoring at 18 locations in Singrauli area through M/s Bhagwathi Ana Labs, Hyderabad to evaluate CEPI of the Singrauli area. The monitoring was carried out for all 12 notified parameters. Member

Secretary, CPCB told that data generated through this study and NAAQMS will be compiled and interim report will be prepared for the information of Hon, NGT.

4.0 It was noticed that existing AAQ monitoring net work will not be sufficient to get representative air quality status of Singrauli area, therefore, it is a need to expand the AAQ monitoring network in both the districts of UP & MP. Member Secretary mentioned that possibility may be explored to engage NEERI/IIT, Kanpur and involve local agencies/NGOs for regular AAQ monitoring at selected locations.

5.0 Considering the rapid industrial development in Singaruli area which may further put stress on its local environment and damage ecology of the areas, it will be prudent to carryout assimilative carrying capacity of Singrauli as it was done about 25 yrs back by NTPC engaging EDF, France. Member Secretary, CPCB suggested that IIT, Kanpur and NEERI should prepare a project either jointly or separately on assessment of assimilative carrying capacity of Singrauli area including remedial measures for the existing industrial installations and the same may be considered by Core Committee for recommendations to Hon'ble NGT for appropriate orders.

6.0 The committee observed that Singrauli is a vast area and therefore, physical inspections of each and every monitoring location w.r.t air, water and soil quality monitoring will be a long process. It will appropriate that a map indicating monitoring stations air, water, soil quality may be prepared jointly by UP & MP PCB_S. The chairman also mentioned that since AAQ monitoring is being carried out since last 20 yrs, SPCBs shall carryout trend analysis of air quality based on data collected in past.

7.0 Regarding monitoring of mercury in ambient air, Rep. NEERI informed that Hg in ambient is monitored using continuous monitoring system. Therefore, it is necessary that continuous monitoring system should install in Singrauli area for Hg monitoring.

Based on detailed discussion, following was decided:

I. UP & MP pollution Control Boards will upgrade the NAAQMS immediately for monitoring of 09 parameters viz: PM_{10}, $PM_{2.5}$, SO_2, NO_2, NH_3, O_3 ,As, Ni, & P. **(Action : UP & MPPCB)**

II. Existing AAQ monitoring network in both the districts of UP & MP will be expanded to get representative air quality status of Singrauli area**(Action : UP & MPPCB)**

III. SPCBs shall ensure that AAQ monitoring data are received on regular basis at regular intervals, number of parameters monitored, performance of monitoring stations and quality of data reported. **(Action : UP & MPPCB)**

IV. Data generated through NAAQMS and study conducted M/s Bhagwathi Ana Labs, Hyderbad will be compiled and interim report will be prepared for the information of Hon, NGT. **(Action : CPCB, UP & MPPCB)**

V. NEERI/IIT, Kanpur and local agencies/NGOs will be involved for regular monitoring of AAQ at selected locations **(Action : CPCB, UP & MPPCB)**

VI. IIT, Kanpur and NEERI will prepare a project either jointly or separately on assessment of assimilative carrying capacity of Singrauli area including remedial measures for the existing industrial installations and the same may be considered by Core Committee for recommendations to Hon,ble NGT for appropriate orders.
(Action : NEERI & IIT, Kanpur)

VII. A map indicating monitoring stations of air, water and soil quality may be prepared jointly by UP & MP PCB_S**(Action : UP & MPPCB)**

VIII. Continuous monitoring system for Hg monitoring atleast for three locations should be installed (covering both Districts of UP & MP) in Singrauli area on polluter pay principle **(Action : UP & MPPCB)**.

IX. Participation of local level Institutions having experience and knowledge of the area like Banwasi Sewa Ashram may be sought. Such agency can also be involved in monitoring activities.

8.0 In addition, it was decided that next meeting of the sub-Committee-4 will be held on November 15, 2014 at UPPCB, Lucknow .

The meeting ended with a vote of thank to the chair.

Minutes of the Meeting of the Sub-Committee -4 on Impacts of Pollution on Air Quality constituted by the Hon'ble National Green Tribunal (vide its order dated August 25, 2014) held on May 14, 2015 at 10.30 AM at CPCB, New Delhi

1.0 The second meeting of the Sub-Committee -4 constituted by the Hon,ble NGT,vide its order dated August 25, 2014 on Impacts of pollution on air quality was held on May 14, 201 at CPCB , Delhi. The meeting was chaired by Dr. A. B. Akolkar, Member Secretary, CPCB and other members of the sub committee ; Prof Mukesh Sharma, IIT Kanpur , Dr S.S. Bala , Director, CPCB, Dr. A. K. Srivastav, Chief chemist, MPPCB, Singrauli, Shri R.P. Mishra, Sc C, CPCB, Bhopal and Shri P.K.Vishwkarma, ASO, RO, UPPCB, Sonebhadra and Dr Sanjeev Aggarawal, Sc D, CPCB attended the meeting.Dr K.V. George , NEERI,Nagpur informed could not attend the meeting due to preoccupation in some other work.

2.0 Member Secretary welcomed the members of the sub committee. He reviewed the progress made in the decisions taken in the last meeting of the sub-committee. The representatives of UP and MP Pollution Control informed that AAQ monitoring is being carriedout regularly at the 05 (2 in UP and 03 in MP) locations under NAAQM Prograamme. Report on the monitoring data were submitted by the respective SPCBs. It was further informed that 03 more NAAQMS stations have been sanctioned by the UPPCB. The monitoring in these stations shall be initiated shortly.

The Sub-Committee was informed besides NAAQMS, there are about 32 more AAQ monitoring stations (manual & continuous both) are being operated by the industries in Singrauli area. These stations are generally located either inside the factory premises or periphery of the boundary wall. The member secretary suggested that these may relocated based on the wind direction pattern and likely impacted area in the region. The data generated through these stations should be utilised to assess the level of AAQ in Singrauli area.

3.0 Considering the rapid industrial development in Singaruli area which may further put stress on its local environment and damage ecology of the areas, it will be prudent to carryout assimilative carrying capacity of Singrauli as it was done about 25 yrs back by NTPC engaging EDF, France. Member Secretary, CPCB suggested that IIT, Kanpur and NEERI should prepare a project either jointly or separately on assessment of assimilative carrying capacity of Singrauli area including remedial measures for the existing industrial installations and the same may be considered by Core Committee for recommendations to Hon'ble NGT for appropriate orders.

4.0 The committee again emphasized that Singrauli is a vast area and therefore, physical inspections of each and every monitoring location w.r.t air, water and soil quality monitoring will be a long process. It will appropriate that a map indicating monitoring stations air, water, soil quality may be prepared jointly by UP & MP PCB_S.

5.0 Regarding monitoring of mercury in ambient air, it was suggested that that Hg in ambient is monitored using continuous monitoring system. Therefore, it is necessary that continuous monitoring system should install in Singrauli area for Hg monitoring. Accordingly, it

was decided that atleast three continuous mercury monitoring system may be installed in the Singrauli area based on Polluter Pay principle.

Based on detailed discussion, following was decided:

8. UPand MP Pollution Control boards shall continue operation of existing NAAQMS and submit data on monthly basis to CPCB. **(Action : UPPCB & MPPCB)**
9. UP pollution Control Board will add three more stations as sanctioned and ensure the operation of the same within a fortnight for monitoring of 09 parameters viz: PM_{10}, $PM_{2.5}$, SO_2, NO_2, NH_3, O_3 ,As, Ni, & P. **(Action : UPPCB)**
10. Local agencies/NGOs will be involved for regular monitoring of AAQ at selected locations a**fter** confirming their capabilities and availability of Infrastructure.
11. IIT, Kanpur and NEERI will prepare a project either jointly or separately on assessment of assimilative carrying capacity of Singrauli area including remedial measures for the existing industrial installations and the same may be considered by Core Committee for recommendations to Hon,ble NGT for appropriate orders.(**Action : NEERI & IIT, Kanpur)**
12. A map indicating monitoring stations of air, water and soil quality may be prepared jointly by UP & MP PCB_S**(Action : UP & MPPCB)**
13. Continuous monitoring system for Hg monitoring atleast for three locations should be installed (covering both Districts of UP & MP) in Singrauli area on polluter pay principle **(Action : UP & MPPCB)**.
14. AAQ monitoring stations (manual & continuous both) operated by the industries in Singrauli area should be relocated based on the wind direction pattern and likely impacted area in the region. The data generated through these stations should be utilised to assess the level of AAQ in Singrauli area. [**Action : CPCB Zonal Office (Lucknow & Bhopal, UPPCB & MPPCB]**

6.0 In addition, it was decided that a report based on data submitted by UP and MP pollution control Boards shall be prepared and submitted to Core Committee before the its next meeting .

The meeting ended with a vote of thank to the chair.

Annexure II

Regional Office
M.P. Pollution Control Board Singrauli

National Ambient Air Monitoring Programme (NAMP) Report code – 514 NTPC Colony Vindhya Nagar
Month - December 2014

Parameter											
date	Location Station code - 514	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NOx µg/m3	NH3 µg/m3	Ar µg/m3	Ni µg/m3	Bengo-a-pyrine &PAH		
									Benz{a} Anthracence	Benzo{a} fluranthene	Benzo {a}Pyrine
1/12/14	Vidhyanagar	97	45	18	30	9	RA	RA	ND	ND	ND
4/12/14	Vidhyanagar	86	48	20	28	10	RA	RA	ND	ND	ND
8/12/14	Vidhyanagar	84	42	17	32	8	RA	RA	ND	ND	ND
11/12/14	Vidhyanagar	95	44	16	29	7	RA	RA	ND	ND	ND
15/12/14	Vidhyanagar	Continuous Raining									
18/12/14	Vidhyanagar	87	47	19	31	11	RA	RA	ND	ND	ND
22/12/14	Vidhyanagar	98	46	17	32	10	RA	RA	ND	ND	ND
25/12/14	Vidhyanagar	93	43	21	27	9	RA	RA	ND	ND	ND
29/12/14	Vidhyanagar	88	42	21	31	12	RA	RA	ND	ND	ND

ABBRIBATION: RA = RESULT AWAITED, ND= Not deducted

spdubey

J.L.A (NAMP)

Chief chemist
Regional Laboratory
MPPCB

Regional Office
M.P. Pollution Control Board Singrauli
National Ambient Air Monitoring Programme (NAMP) Report CODE 515 NCL Jayant expert hostel
Month - December 2014

Parameter											
Date	**Station code - 515**	**PM10 µg/m 3**	**PM2.5 µg/m 3**	**SO2 µg/ m3**	**NOx µg/m 3**	**NH3 µg/m 3**	**Ar µg/m 3**	**Ni µg/m 3**	**Bengo-a-pyrine &PAH**		
									Benz{a} Anthracene	**Benzo{a} fluranthene**	**Benzo {a}Pyrine**
2/12/14	Jayant	95	56	23	31	10	RA	RA	ND	ND	ND
5/12/14	Jayant	102	54	21	34	8	RA	RA	ND	ND	ND
9/12/14	Jayant	104	52	24	33	9	RA	RA	ND	ND	ND
12/12/14	Jayant	96	49	22	32	11	RA	RA	ND	ND	ND
16/12/14	Jayant	94	57	19	37	7	RA	RA	ND	ND	ND
19/12/14	Jayant	103	53	23	36	12	RA	RA	ND	ND	ND
23/12/14	Jayant	90	60	21	34	11	RA	RA	ND	ND	ND
26/12/14	Jayant	105	55	20	35	8	RA	RA	ND	ND	ND
30/12/14	Jayant	93	51	22	32	12	RA	RA	ND	ND	ND

ABBRIBATION: RA = RESULT AWAITED, ND= Not deducted

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Chief chemist
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M.P. Pollution Control Board Singrauli

National Ambient Air Monitoring Programme (NAMP) Report For 516 Waidhan Basti near IDBI bank

Month – December 2014

Parameter											
Date	**Location Station code - 516**	**PM $_{10}$ µg/m 3**	**PM $_{2.5}$ µg/m 3**	**SO2 µg/m 3**	**Nox µg/m3**	**NH3 µg/m 3**	**Ar µg/m 3**	**Ni µg/m 3**	**Bengo-a-pyrine &PAH**		
									Benz{a} Anthracence	**Benzo {a} fluranthene**	**Benzo {a}Pyrine**
3/12/14	Waidhan	107	52	16	38	10	RA	RA	ND	ND	ND
6/12/14	Waidhan	96	60	18	34	11	RA	RA	ND	ND	ND
10/12/14	Waidhan	93	53	20	32	9	RA	RA	ND	ND	ND
13/12/14	Waidhan	106	59	17	39	12	RA	RA	ND	ND	ND
17/12/14	Waidhan	92	62	19	36	14	RA	RA	ND	ND	ND
20/12/14	Waidhan	108	57	20	35	13	RA	RA	ND	ND	ND
24/12/14	Waidhan	110	60	21	37	11	RA	RA	ND	ND	ND
27/12/14	Waidhan	98	48	15	32	10	RA	RA	ND	ND	ND
31/12/14	Waidhan	95	58	19	35	13	RA	RA	ND	ND	ND

ABBRIBATION: RA = RESULT AWAITED, ND= Not deducted

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M.P. Pollution Control Board Singrauli
National Ambient Air Monitoring Programme (NAMP) Report Station code – 514 NTPC Colony Vindhyanagar
Month - January 2015

Parameters											
Date	**Location Station code - 514**	**PM10 µg/m3**	**PM2.5 µg/m3**	**SO2 µg/m3**	**Nox µg/m3**	**NH3 µg/m3**	**Ar µg/m3**	**Ni µg/m3**	**Bengo-a-pyrine & PAH**		
									Benz{a}	**Benzo{a}**	**Benzo{a}Pyrine**
1-1-15	Vidhyanagar	Continuous Rain					-	-	-		
5-1-15	Vidhyanagar	92.22	47.03	14.85	23.09	8.02	ND	ND	ND	ND	ND
8-1-15	Vidhyanagar	113.40	70.22	17.19	31.41	15.12	ND	ND	ND	ND	ND
12-1-15	Vidhyanagar	98.92	47.93	10.27	20.75	10.57	ND	ND	ND	ND	ND
15-1-15	Vidhyanagar	103.08	38.79	13.77	24.29	11.17	ND	ND	ND	ND	ND
19-1-15	Vidhyanagar	111.25	62.01	9.54	21.70	9.58	ND	0.01	ND	ND	ND
22-1-15	Vidhyanagar	93.44	42.39	11.85	21.62	10.50	ND	ND	ND	ND	ND
27-1-15	Vidhyanagar	98.15	37.69	10.96	21.78	10.19	ND	ND	ND	ND	ND
30-1-15	Vidhyanagar	85.89	41.10	11.12	25.96	8.75	ND	ND	ND	ND	ND

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M.P. Pollution Control Board Singrauli

National Ambient Air Monitoring Programme (NAMP) Report Station code – 515 NCL Jayant near expert hospital

Month - January 2015

Parameter											
Date	**Location Station code - 515**	**PM10 µg/m3**	**PM2.5 µg/m3**	**SO2 µg/m3**	**Nox µg/m3**	**NH3 µg/m3**	**Ar µg/m3**	**Ni µg/m3**	**Bengo-a-pyrine & PAH**		
									Benz{a} Anthracence	**Benzo{a} Fluranthene**	**Benzo {a}Pyrine**
2-1-15	Jayant	92.20	36.65	16.66	22.86	13.17	ND	ND	ND	ND	ND
6-1-15	Jayant	103.60	40.43	17.67	24.84	13.11	ND	ND	ND	ND	ND
9-1-15	Jayant	111.23	47.57	17.81	27.62	9.32	ND	ND	ND	ND	ND
13-1-15	Jayant	97.56	30.29	15.66	26.54	12.35	ND	ND	ND	ND	ND
16-1-15	Jayant	131.02	50.06	31.90	40.72	22.57	ND	ND	ND	ND	ND
20-1-15	Jayant	104.91	40.68	16.54	24.48	14.96	ND	ND	ND	ND	ND
23-1-15	Jayant	88.24	44.98	19.73	15.55	12.19	ND	ND	ND	ND	ND
28-1-15	Jayant	95.41	42.42	14.31	22.00	11.88	ND	ND	ND	ND	ND

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Chief chemist
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Regional Office
M.P. Pollution Control Board Singrauli
National Ambient Air Monitoring Programme (NAMP) Report, STATION CODE 516 Widhan Basti Behind Idbi Bank
Month – January 2015

Parameter											
Date	**Station code - 515**	**PM $_{10}$ µg/m3**	**PM $_{2.5}$ µg/m 3**	**SO2 µg/m 3**	**NOx µg/m 3**	**NH3 µg/m 3**	**Ar µg/ m3**	**Ni µg/m 3**	**Bengo-a-pyrine &PAH**		
									Benz{a} Anthracence	**Benzo{a} fluranthene**	**Benzo {a}Pyrine**
3-1-15	Waidhan	Continuous Rain									
7-1-15	Waidhan	80.24	48.17	14.82	20.57	9.27	ND	ND	ND	ND	ND
10-1-15	Waidhan	104.04	60.94	16.46	20.62	9.24	ND	ND	ND	ND	ND
14-1-15	Waidhan	79.16	36.16	16.60	29.03	10.32	ND	ND	ND	ND	ND
17-1-15	Waidhan	88.25	37.86	13.79	24.45	8.66	ND	ND	ND	ND	ND
24-1-15	Waidhan	107.44	45.22	16.50	25.72	9.65	ND	ND	ND	ND	ND
29-1-15	Waidhan	71.50	42.31	13.27	23.74	9.16	ND	ND	ND	ND	ND
									ND	ND	ND

ND : Not detectable

J.L.A (NAMP)

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MPPCB

Regional Office
M.P. Pollution Control Board Singrauli
National Ambient Air Monitoring Programme (NAMP) Location Station code – 514 NTPC Colony Vindhya nagar
Month - February 2015

Parameter									
Date	**Location Station code - 514**	**PM10 µg/m3**	**PM2.5 µg/m3**	**SO2 µg/m3**	**Nox µg/m3**	**NH3 µg/m3**	**Ar µg/m3**	**Ni µg/m3**	**Bengo-a-pyrine & PAH**
2-2-15	Vidhyanagar	128.20	54.77	20.43	31.73	14.55	ND	0.056	Result A waited
5-2-15	Vidhyanagar	88.84	40.65	11.67	26.68	10.39	ND	ND	Result A waited
9-2-15	Vidhyanagar	122.13	56.17	17.45	29.29	13.88	ND	ND	Result A waited
12-2-15	Vidhyanagar	83.63	38.92	13.31	19.94	10.45	ND	ND	Result A waited
16-2-15	Vidhyanagar	110.73	46.85	16.05	35.75	16.78	ND	ND	Result A waited
19-2-15	Vidhyanagar	116.75	53.78	18.25	26.78	10.95	ND	ND	Result A waited
23-2-15	Vidhyanagar	93.51	36.18	15.91	26.93	9.97	ND	ND	Result A waited
26-2-15	Vidhyanagar	102.90	46.76	13.81	24.68	10.59	ND	ND	Result A waited

Note :Sample send to central laboratories MPPCB Bhopal Bengo-a-pyrine & PAHResult awaited ,will be communicated shortly.

spdubey

J.L.A (NAMP)

Chief chemist
Regional Laboratory
MPPCB

Regional Office
M.P. Pollution Control Board Singrauli
National Ambient Air Monitoring Programme (NAMP) Report Station code – 515 NCL Jayant Expert hostel
Month - February 2015

Parameter									
Date	**Location Station code - 515**	**PM10 µg/m3**	**PM2.5 µg/m3**	**SO2 µg/m3**	**Nox µg/m3**	**NH3 µg/m3**	**Ar µg/m3**	**Ni µg/m3**	**Bengo-a-pyrine & PAH**
3-2-15	Jayant	96.18	42.94	15.85	28.13	12.54	ND	ND	Result A waited
6-2-15	Jayant	88.55	36.91	12.40	28.73	11.97	ND	ND	Result A waited
10-2-15	Jayant	112.58	56.23	11.21	22.13	8.46	ND	ND	Result A waited
13-2-15	Jayant	92.85	46.58	14.97	25.32	10.45	ND	ND	Result A waited
17-2-15	Jayant	121.47	56.01	16.55	23.55	14.09	ND	ND	Result A waited
20-2-15	Jayant	83.49	38.16	14.88	16.28	9.96	ND	ND	Result A waited
24-2-15	Jayant	97.52	36.34	17.12	35.89	11.85	ND	ND	Result A waited
27-2-15	Jayant	103.52	45.20	10.50	22.19	11.80	ND	ND	Result A waited

Note :Sample send to central laboratories MPPCB Bhopal Bengo-a-pyrine & PAHResult awaited, will be communicated shortly

spdubey

J.L.A (NAMP)

Chief chemist
Regional Laboratory
MPPCB

Regional Office
M.P. Pollution Control Board Singrauli
National Ambient Air Monitoring Programme (NAMP) Station code – 516 Waidhan Basti Near IDBI bank
Month – February 2015

Parameter									
Date	**Location Station code - 516**	**PM10 µg/m3**	**PM2.5 µg/m3**	**SO2 µg/m3**	**Nox µg/m3**	**NH3 µg/m3**	**Ar µg/m3**	**Ni µg/m 3**	**Bengo-a-pyrine & PAH**
4-2-15	Waidhan	111.95	47.57	21.24	31.19	9.48	NA	NA	RA
7-2-15	Waidhan	96.20	45.22	12.09	33.44	13.17	NA	NA	RA
11-2-15	Waidhan	102.54	49.50	14.42	20.26	12.45	NA	0.074	RA
14-2-15	Waidhan	86.84	42.25	13.01	26.91	11.06	NA	NA	RA
18-2-15	Waidhan	93.41	36.18	15.41	31.77	11.68	NA	NA	RA
21-2-15	Waidhan	95.91	45.22	19.34	27.07	15.00	NA	NA	RA
25-2-15	Waidhan	78.86	34.61	14.16	23.12	13.28	NA	NA	RA
28-2-15	Waidhan	107.51	49.49	15.99	26.60	11.90	NA	0.05	RA

Note – RA -: Sample send to central laboratories MPPCB Bhopal for Bengo-a-pyrine & PAHResult awaited, will be communicated shortly

spdubey

J.L.A (NAMP)

Chief chemist
Regional Laboratory
MPPCB

Regional Office
M.P. Pollution Control Board Singrauli
National Ambient Air Monitoring Programme (NAMP) Report CODE 514 For The NTPC colony Vindhyanagar
Month - March 2015

Parameter											
Date	**Location Station code - 514**	**PM_{10} µg/m3**	**$PM_{2.5}$ µg/m3**	**SO_2 µg/m3**	**NOx µg/m3**	**NH3 µg/m3**	**Ar µg/m3**	**Ni µg/m3**	**Bengo-a-pyrine & PAH**		
									Benz{a} Anthracence	**Benzo{a} fluranthene**	**Benzo {a}Pyrine**
2-3-15	Vidhyanagar	Continuous Rain									
5-3-15	Vidhyanagar	87.96	33.16	14.57	24.42	11.14	RA	RA	RA	RA	RA
9-3-15	Vidhyanagar	80.94	29.98	17.25	26.91	13.12	RA	RA	RA	RA	RA
12-3-15	Vidhyanagar	91.18	36.37	12.57	25.57	10.23	RA	RA	RA	RA	RA
16-3-15	Vidhyanagar	Continuous Rain									RA
19-3-15	Vidhyanagar	107.52	44.97	18.43	25.36	11.26	RA	RA	RA	RA	RA
23-3-15	Vidhyanagar	76.26	26.46	13.95	29.27	12.46	RA	RA	RA	RA	RA
26-3-15	Vidhyanagar	83.51	38.26	16.48	20.53	11.47	RA	RA	RA	RA	RA
30-3-15	Vidhyanagar	102.50	49.81	15.43	24.28	10.39	RA	RA	RA	RA	RA

ABRRIVATION: , RA= RESULT AWAITED

spdubey

J.L.A (NAMP)

Chief chemist
Regional Laboratory
MPPCB

Regional Office
M.P. Pollution Control Board Singrauli
National Ambient Air Monitoring Programme (NAMP) Report CODE 515 NCL Jayant Expert Hostel
Month - March 2015

Parameter											
Date	**Location Station code - 515**	**PM_{10} µg/m3**	**$PM_{2.5}$ µg/m3**	**SO_2 µg/m3**	**NOx µg/m3**	**NH3 µg/m3**	**Ar µg/m3**	**Ni µg/m3**	**Bengo-a-pyrine & PAH**		
									Benz{a} Anthracence	**Benzo{a} fluranthene**	**Benzo {a}Pyrine**
3-3-15	Jayant	Continuous Rain					RA	RA	RA	RA	RA
6-3-15	Jayant	92.49	41.30	12.01	23.27	13.13	RA	RA	RA	RA	RA
10-3-15	Jayant	107.50	49.19	15.23	25.97	11.63	RA	RA	RA	RA	RA
13-3-15	Jayant	97.15	46.67	12.67	18.86	8.37	RA	RA	RA	RA	RA
17-3-15	Jayant	88.90	33.82	13.32	31.93	10.58	RA	RA	RA	RA	RA
20-3-15	Jayant	105.19	44.35	18.44	25.36	9.35	RA	RA	RA	RA	RA
24-3-15	Jayant	94.50	38.19	12.46	25.40	10.63	RA	RA	RA	RA	RA
27-3-15	Jayant	102.15	42.36	15.48	20.78	11.59	RA	RA	RA	RA	RA
31-3-15	Jayant	98.18	37.10	14.09	22.27	9.64	RA	RA	RA	RA	RA

ABRRIVATION: RA= RESULT AWAITED

spdubey

J.L.A (NAMP)

Chief chemist
Regional Laboratory
MPPCB

Regional Office

M.P. Pollution Control Board Singrauli

National Ambient Air Monitoring Programme (NAMP) Report CODE 516 Widhan Basti Behind Idbi Bank

Month – March 2015

Parameter											
Date	**Station code - 516**	**PM10 µg/m3**	**PM2.5 µg/m3**	**SO2 µg/m3**	**Nox µg/m 3**	**NH3 µg/m 3**	**Ar µg/ m3**	**Ni µg/ m3**	**Bengo-a-pyrine &PAH**		
									Benz{ a} Anthr acenc e	**Benzo{ a} flurant hene**	**Benz o {a}Py rine**
4-3-15	Waidhan	81.94	36.90	14.90	25.30	10.60	RA	RA	RA	R A	RA
7-3-15	Waidhan	95.98	43.13	15.21	18.22	9.09	RA	RA	RA	RA	RA
11-3-15	Waidhan	103.21	54.76	16.11	20.35	10.05	RA	RA	RA	RA	RA
14-3-15	Waidhan	86.63	47.01	16.28	21.07	9.75	RA	RA	RA	RA	RA
18-3-15	Waidhan	88.08	34.60	17.06	25.84	10.54	RA	RA	RA	RA	RA
21-3-15	Waidhan	92.95	35.78	17.60	23.76	10.33	RA	RA	RA	RA	RA
25-3-15	Waidhan	98.24	42.80	18.74	24.64	11.81	RA	RA	RA	RA	RA
28-3-15	Waidhan	105.46	52.58	14.24	24.53	10.60	RA	RA	RA	RA	RA

ABRRIVATION: RA= RESULT AWAITED

spdubey

J.L.A (NAMP)

Chief chemist
Regional Laboratory
MPPCB

UTTAR PRADESH POLLUTION CONTROL BOARD

REGIONAL OFFICE : SONEBHADRA

Table C : Summary of Ambient Air Quality Date Monitored by U.P.P.B. State Pollution Control Board

City :- REN

State :- UTP

S. No.	Sampling Location Address	Station Type*	Station Code	Month and Year	SO_2				NO_x				RSPM					SPM				
					n	A.M.	S.D.	Max.	n	A.M.	S.D.	Max.	n	A.M.	G.M.	S.D.	Max.	n	A.M.	G.M.	S.D.	Max.
1)	Anpara Colony III-50 Anpara Sonebhadra	I	6	DECEMBER 2014	53	18.15	1.3564	19.48	53	9.883	1.0079	33.51	27	143	143	5.9055	157	27	247	247	10.5357	270
2)	Renusagar Colony N-23/10 Renusagar Sonebhadra	I	7	DECEMBER 2014	54	17.77	1.5891	19.78	54	9.913	1.7968	35.13	27	142	142	4.3485	160	27	251	251	13.8879	290
3)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

**-Kindly fill in 'R' if station falls in Residentrial area, I if station falls in Industrial Area, 'S' if station falls in sensitive area.*

Note:- n = Number of observations (in days)
A.M. = Arithmetic mean in µg/m³.
S.D. = Standard Deviation
Max = Maximum value (24 hours average in µg/m³).
GM = Geometric Mean in µg/m³.

06/1/15 M.A.

06/01/15 S.A.

06/01/15 A.S.O.

R.O.

UTTAR PRADESH POLLUTION CONTROL BOARD

REGIONAL OFFICE : SONEBHADRA

Table C : Summary of Ambient Air Quality Date Monitored by U.P.P.B. State Pollution Control Board

City :- REN

State :- UTP

S. No.	Sampling Location Address	Station Type*	Station Code	Month and Year	SO_2				NO_x				RSPM					SPM				
					n	A.M.	S.D.	Max.	n	A.M.	S.D.	Max.	n	A.M.	G.M.	S.D.	Max.	n	A.M.	G.M.	S.D.	Max.
1)	Anpara Colony III-50 Anpara Sonebhadra	I	6	January 2015	46	18.15	1.4238	19.43	46	28.68	6.1084	34.05	24	141	141	6.8868	160	24	247	247	9.4698	270
2)	Renusagar Colony N-23/10 Renusagar Sonebhadra	I	7	January 2015	47	18.01	1.3862	19.78	47	28.48	5.8236	34.53	24	143	142	10.0711	163	24	255	254	14.4014	281
3)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

**-Kindly fill in 'R' if station falls in Residentrial area, I if station falls in Industrial Area, 'S' if station falls in sensitive area.*

Note:- n = Number of observations (In days)
A.M. = Arithmetic mean in µg/m³.
S.D. = Standard Deviation
Max = Maximum value (24 hours average in µg/m³).
GM = Geometric Mean in µg/m³.

07/02/15 — M.A.

07/02/15 — S.A.

07/02/15 — S.O.

R.O.

UTTAR PRADESH POLLUTION CONTROL BOARD

REGIONAL OFFICE : SONEBHADRA

Table C : Summary of Ambient Air Quality Date Monitored by U.P.P.B. State Pollution Control Board

City :- REN

State :- UTP

S. No.	Sampling Location Address	Station Type*	Station Code	Month and Year	SO_2				NO_x				RSPM					SPM				
					n	A.M.	S.D.	Max.	n	A.M.	S.D.	Max.	n	A.M.	G.M.	S.D.	Max.	n	A.M.	G.M.	S.D.	Max.
1)	Anpara Colony III-50 Anpara Sonebhadra	I	6	FEBRUARY 2015	48	19.22	1.2120	19.63	48	38.43	0.6694	34.05	24	138	137	4.7509	150	[illegible]	[illegible]	252	6.4918	270
2)	Renusagar Colony N-23/10 Renusagar Sonebhadra	I	7	FEBRUARY 2015	48	18.15	0.8738	19.78	48	28.82	1.4990	34.59	24	144	144	6.4476	160	[illegible]	[illegible]	265	8.5189	287
3)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

*-Kindly fill in 'R' if station falls in Residential area, I if station falls in Industrial Area, 'S' if station falls in sensitive area.

Note:- n = Number of observations (in days)
A.M. = Arithmetic mean in µg/m³.
S.D. = Standard Deviation
Max = Maximum value (24 hours average in µg/m³).
GM = Geometric Mean in µg/m³.

M.A. S.A. 23/03/15 A.S.O. R.O. 24/3/15

UTTAR PRADESH POLLUTION CONTROL BOARD

REGIONAL OFFICE : SONEBHADRA

Table C : Summary of Ambient Air Quality Date Monitored by U.P.P.B. State Pollution Control Board

City :- REN

State :- UTP

S. No.	Sampling Location Address	Station Type*	Station Code	Month and Year	SO_2				NO_x				RSPM					SPM				
					n	A.M.	S.D.	Max.	n	A.M.	S.D.	Max.	n	A.M.	G.M.	S.D.	Max.	n	A.M.	G.M.	S.D.	Max.
1)	Anpara Colony III-50 Anpara Sonebhadra	I	6	March 2015	52	17.70	0.5e139	19.48	52	27.09	1.7913	33.51	27	132	131	4.1165	153	27	234	232	13.1931	265
2)	Renusagar Colony N-23/10 Renusagar Sonebhadra	I	7	March 2015	50	17.56	0.5654	19.63	50	26.90	1.4715	34.05	27	134	132	15.4015	158	27	244	242	13.4014	285
3)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

**-Kindly fill in 'R' if station falls in Residentrial area, I if station falls in Industrial Area, 'S' if station falls in sensitive area.*

Note:- *n* = *Number of observations (in days)*
A.M. = *Arithmetic mean in µg/m³.*
S.D. = *Standard Deviation*
Max = *Maximum value (24 hours average in µg/m³).*
G.M = *Geometric Mean in µg/m³.*

07/04/15 M.A. | 7/4/15 S.A. | 07/04/15 A.S.O. | 7/4/15 R.O.

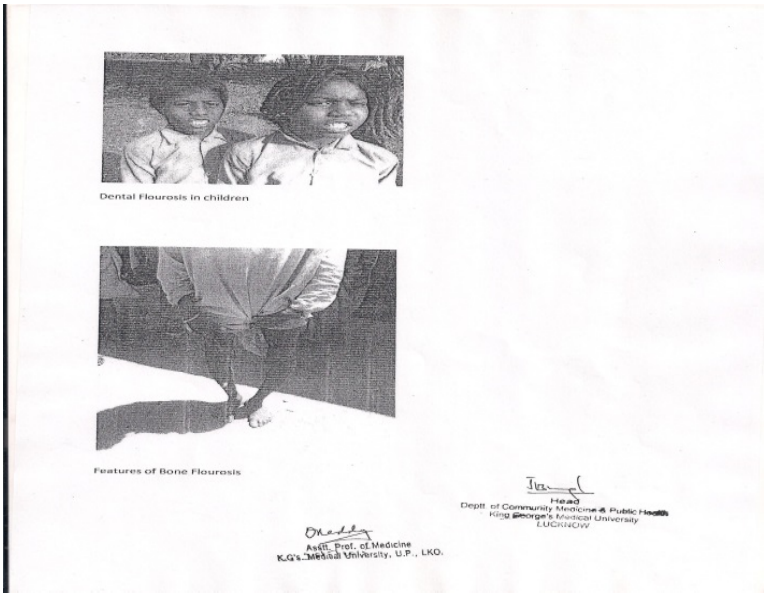
Annexure Ve

Report of Sub- Committee-5 constituted by Hon'ble National Green Tribunal

On

Potential Impact of Pollution on Health

[In the Matter of OA No. 276 of 2013& M.A. No. 59 of 2014 in O.A. No. 20 of 2014) Ashwani Kumar Dubey Vs Union Of India and Ors And Jagat Narayan Viswakarma & Ors. Vs. Union of India & Ors.]



June 2015

Introduction

On 10 November 2014, Outlook manage in its article 'Poisoned Land' highlighted that Obra thermal power plant, NTPC ,Shaktinagr, Renusagar Power Corporation and other industries in Sigrauli and Sonbhadra the coal minding the environment 10 these areas. The two districts are together known as sigrauli area and this area produces nearly 1200 MW/day power. Environmental problems have been reported in this area in the last two decades following industrialization. The industries in this area include aluminium extraction units, thermal power plants, cement factories, stone crushing industries and chemical factories Central Pollution Control Board (CPCB) identified is critically polluted area in 1991.

To study the potential impact of pollution on health the Hon'ble National Green Tribunal in the matter of OA no. 276 of 2013 Ashwani Kumar Dubey Vs Union of India and other and OA no. 20of 2014 of Jagat Narayan Vishwakrma Vs Union of India, constituted subcommittee V (dated aug.25, 2014). The first meeting of the subcommittee, held on 15th December 2014, waschaired by Dr D. Himanshu reddy, asst. prof., King Jeorge Medical University. Lucknow. Other members were Shri Shambhnath, Chief Environmental Officer, UP Pollution Control Board, Lucknow Dr. Sanjeev Kumar, Assistant Professor, All India Institute of Medical Sciences (AIIMS), Bhopal, Dr. A.C. Shukla, Prof. Govt. College Waidhan Singrauli (Social Scientist), Mr. Kashi Ram Thakur, ADO, Zila Panchayat, Sonebhadra, Dr. A.K. Srivastava, Regional Officer MP pollution control board, Singrauli along with other officers of MP pollution control board and UP pollution control board, Chief Medical Officer (CMO) of district Sonebhadra and representative of CMO of district Singruali (who wasn't present himself). The purpose of the committee was to find out health hazards prevailing in this area specifically in relation to exposure of fluoride, mercury, arsenic cadmium and lead.

The terms of reference of the sub-Committee as given as under:

a) Base line data on socio-economic aspects, potential health hazards. Sample survey using standard statistically designed epidemiology Study.
b) On findings of this data, a team of experts comprising of Doctors from **AIIMS**, King Gorge Medical College, Lucknow to visit the area for conducting sample survey on health profiling of residents and workers.
c) A team of experts comprising of Doctors and Social Scientist to develop a questionnaire on health impact. This questionnaire to be used for all the survey.

d) Committee to have atleast one Doctor each from Uttar Pradesh and Madhya Pradesh apart from one Social Scientist from each of the state and involve Panchayati Raj Institutions for collection of primary data.

2.0 As per the terms of reference, the CMO / Panchayat Raj representative and regional officers of UP and MP pollution board of districts of Sonbhadra and Singrauli were requested to share the most recent base line data on socio-economic aspects and current status of selected health indicators. To provide robust scientific basis to associate pollution with poor health status would also need comparison of selected health indicators of districts Singrauli and Sonbhadra with nearby districts which are not exposed to the alleged polluting industries. So, they were requested to share the raw data or district-specific reports of various surveys conducted in recent past such as Annual Health Survey (AHS to District Level Household Survey (DLHS) etc for district Singrauli and 'Sidhi in MP and Sonbhadra and Mirzapur in U.P. (which can be used as comparison district.). The CMO couldn't provide this data till the date of developing this report. A preliminary baseline data on socio-economic aspects and current health status would be the backbone to assess the potential health hazards of pollution among the residents of these districts. A preliminary situation analysis of current socio-economic and health has been tried based on information available in the public domain (ie website of Registrar General of India and liPS Mumbai who conducts AHS and DLHS respectively) and presented in Annexure 1.

The CMO and Regional Officer of UP pollution board provided us the health report of district Sonebhadra along with analysis report of RO Plants and Ground water, report of agriculture department, Map showing industries, rivers and reservoirs in the sonebhadra area.

2.1 CMO Health Report of District Sonebhadra

The study was conducted by CMO of sonebhadra district with the objective to analyse health problems experienced by the villagers around these industries by preparing morbidity profile. It was conducted in 51 most affected villages of two blocks- Choupan and Myorpur of Sonebhadra district. The information was gathered by focus group discussion, visiting schools and affected areas, observation and inte:action with the affected community and through the health camps. The participants in the focus group discussions were the men/women and village leaders. Health camps were organized for check-up and treatment of affected people in the community. The data collection team in each block included the local government functionaries (Doctors, ANMs, Anganwadi workers); TSU staff

at the state, district, block and village levels; the block program managers; and members of panchayat raj institutions. The health camp teams included the care providers (doctors, nurses etc.) from primary health centers, community health centres, sub-centres; members of TSU (DCS & DM&E, eRP); staffs from NHM (DPM & BPM); and ANM, ASHA, AWW and village leaders from the respective areas/ villages. A total of 51 health camps are organized (1 in each selected villages) with the purpose to identify patients suffering from diseases and to provide treatment to them. In these camps total of 1194 people underwent health check-up. Out of them, 779 were found to have different diseases. 382 people had tooth fluorosis, 113 had bone qnd joint fluorosis. None of these were found to have any signs or symptoms of mercury toxicity. They did not look for any signs or symptoms related to lead, arsenic or cadmium toxicity.

This report helped in identifying the health problem prevailing in this area but there were still some lacunae in it. The main reason which came to the notice of this sub-committee was lack of knowledge among the health care providers about the sighs, symptoms and presentation of the diseases.

CMO of Singrauli district did not provide the health report. The reasons given by him were lack of knowledge aboutthe manifestations of the disease as well as lack of manpower to organize the health camps.

3.0 SURVEY FINDINGS

After taking the feedback from Chief Medical Officers (CMO) of District Singrauli and District Sonbhadra, a sample survey was done in different villages. All the villages that were visited in these areas had high percentage of people with bowing of legs and Grade III-IV dental fluorosis. On detailed examination we also found many people with blue lines on gums suggestive of lead toxicity. Many of the people also had neuropsychiatric symptoms which could be due to lead, cadmium or mercury toxicity. However as some of these manifestations such a neuropsychiatric symptoms are nonspecific, a toxicological analysis was required for establishing the diagnosis, but it was not available there. The non-availability of proper infrastructure curtailed the proper diagnosis and management of people.

The CMO, Sonbhadra and Singrauli were required to present the data of

their hospitals if available. The team also requested the data of hospitals of National Thermal Power Corporation (NTPC) Rihandnagar and Renukoot. The Chief Medical Superintendents of these hospitals were requested to provide the Pulmonary Function Test (PH) findings and X-rays of the patients from last one year, so that we could estimate the prevalence of bony fluorosis and lung diseases but these records have not been made available till date.

We did not find any obvious cases of Mercury, Arsenic and Cadmium toxicity, although some of the patients gave history suggestive of Arsenic and Murcury toxicity. According to these patients, there was symptomatic improvement after they stopped eating fish from the nearby reservoir. The local leaders of villages did claim that there was increase in the abortion rate also but we did not have data from adjoining districts for comparision to reach a conclusion. These findings suggest possiblllty of toxicity of these heavy metals, but confirmation requires testing of serum levels for these metals. ,Due to lack of infrastructure it was not done but need to be done in the future to ascertain the magnitude of the problem.

After survey of these places, we went to Shuklamore Area, District Singrauli where we saw that whole area was covered with coal dust due to transportation of coal in that area. On examination of people in the nearby areas, we found crepitation on auscultation in the chest more frequently, which was suggestive of exposure to coal dust. However, a proper work-up of these people including Pulmonary Function Test and Cf-Thorax was necessary to reach a conclusion. As facilities for such investigations are not available at these centres, this has to be done through a large and well resourced study. The villages visited by this team did have RO system installed with hand pump but many of them were not working properly. Further, in some areas, as it takes time for the RO tank to fill and the water to come out (requiring more pumping), villagers resorted to collecting water from the tap proximal to RO tank, thus negating the benefits obtainable from the RO system. There has to be an effort to educate people about proper use of the system and benefits of using it and adverse effects of not using it.

4.0 Conclusion

The Sub Commitee-5 in its survey in Singrauli and Sonebhadra district did find health issues pertaining to toxicity of minerals such as fluoride and

lead.

fluoride- fluorosis appears to be highly prevalent in areas where committee went and especially in the two blocks of chopan and myorpur, that have been surveyed. It was diagnosed on the basis of clinical manifestations.

Proper RO system is required for clean drinking water for people of this region. Subcommittee recommends that maintainance of these RO systems along with education of residents about proper method and benefits of usage needs to be ensured. These patients with clinical manifestations suggestive of fluorosis were also noted to have severe malnutrition, so nutritional support should be ensured. Dental as well as bone fluorosis can be improved, if detected in the early stage.

Lead: There were many patients complaining of bodyache and symptoms suggestive of peripheral neuropathy. Some of them were having blue line on gums, suggestive of lead toxicity. But confirmatory diagnosis of lead toxicity which needs testing of lead levels in serum along with exclusion of other causes of peripheral neuropathy, could not be done because of la-ck of infrastructure for such testing. So on the basis of clinical findings, it can be concluded that there are patients of lead toxicity in the region, which needed to be confirmed with further testing and treated.

Mercury, Arsenic and Cadmium: Arsenic and Cadmium toxicity could not be detected although some of the patients gave history suggestive of Murcury toxicity. But confirmation requires testing of serum levels for these heavy metals. Due to lack of infrastructure it was not done but need to be done in the future O ascertain the magnitude of the problem.

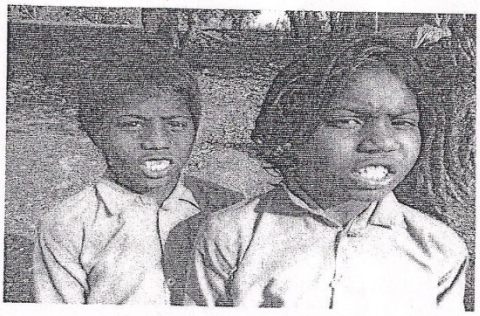
Pneumoconiosis- Though we did hot find many patients with signs and symptoms suggestive of pneumoconiosis in choupan and Myorpur blocks, in Dala JP cement factory area we found people with signs oflung manifestations, probably suggestive of silicosis. it was also found in people residing near the coal transport roads. Provision for PFT (Pulmonary Function Test) machines along with portable X-ray machines would be of help in making provisional diagnosis of these diseases. Although more confirmatory diagnosis will require CT- scan of thorax, which is lacking in most of these areas at present.

Along with provisions described above, we recommend establishment of a

standard toxicological laboratory in the region.

Health care workers including Doctors have to be trained for identifying and treating these problems and diseases. Training centers can be established in KGMU, Lucknow and AIIMS, Bhopal.

Finally, for estimating the magnitude of this problem, a long term project to be planned with proper funding and adequate manpower.



Dental Flourosis in children

Features of Bone Flourosis

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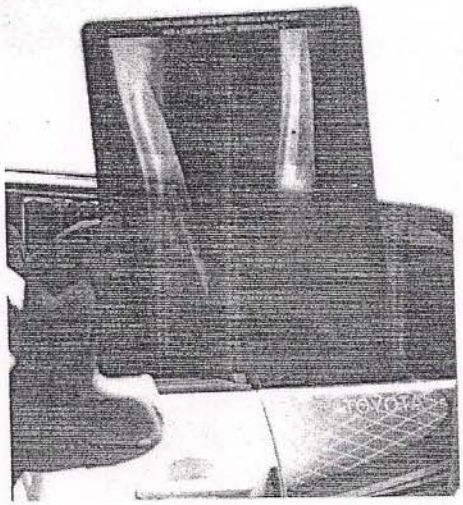
Deptt. of Community Medicine & Public Health
King George's Medical University
LUCKNOW

Asstt. Prof. of Medicine
K.G's Medical University, U.P., LKO.

Features of Bone Flourosis



X-ray changes of Bone Flourosis

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LUCKNOW

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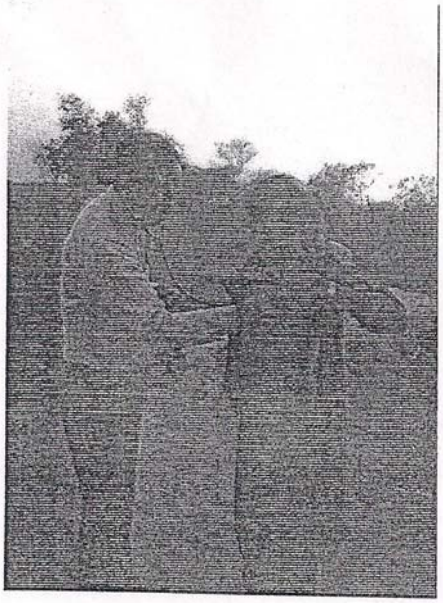
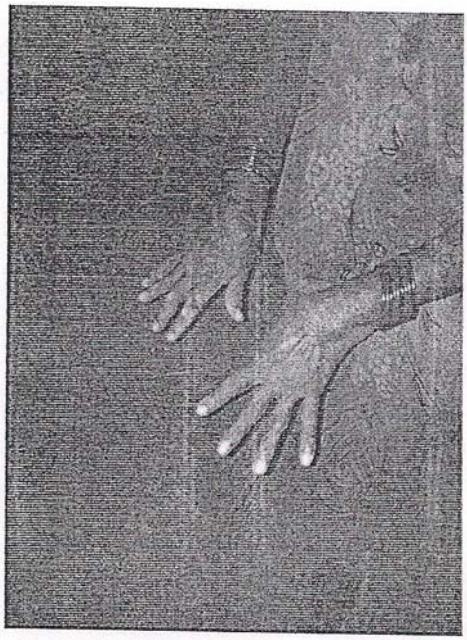
K.G's. Medical University, U.P., LKO.



Auscultation being done near dala cement factory



Bone deformities in a patient of lung disease

near dala cement factory

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K.G.'s Medical University, U.P., LKO.

Questionnaire

Name: Date:

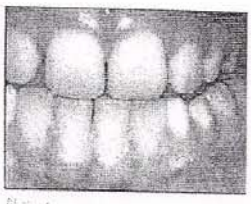
Age: Gender: Occupation:

Height: Weight:

Flourosis

Compare with the picture and tick the one corresponding to patient's teeth

1.



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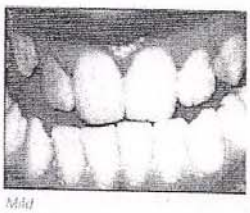
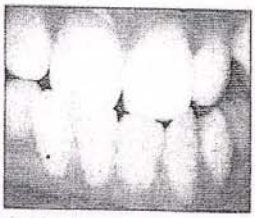
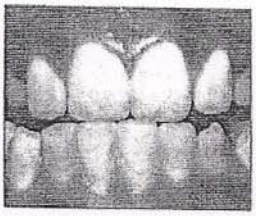


Mild

3.



4.



Sour

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King George's Medical University
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Asstt. Prof. of Medicine
K.G.'s Medical University, U.P., LKO.

2. Any gangrene of the limbs called (Blackfoot disease) Y/N
3. Numbness and tingling in the soles of the feet or hands Y/N
4. Any history of or presently any cancer of the skin, nose, lung, liver, kidney, bladder, and prostate. Y/N
5. Any history of stillbirth or abortion. Y/N

Pneumoconiosis

1. Any complaint of chronic cough?

   Y/N

2. Presence of fine crepitation on auscultation of chest? Y/N

3. Chest X-ray or CT-Thorax suggestive of fibrosis ?

   Y/N

4. Chest X-ray or CT-Thorax suggestive of pulmonary nodules ? Y/N

5. PFT suggestive of Restrictive Lung Disease ?

   Y/N

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4. Stark P. Imaging of occupational lung diseases.Apr. 2014 Available at

URL:http//www.uptodate.com

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K.G's. Medical University, U.P., LKO.
20/5/2015

FINAL REPORT OF THE SUB-COMMITTEE-2

ON

POTENTIAL IMPACT OF POLLUTION ON WATER RESOURCES IN SINGRAULI AREA

NIH **CGWB** **CWC**

SWaRA **UPPCB** **MPPCB**

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CEO, UPPCB	---	Secretary
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Representative of MoWR, RD & GR	---	Member
Representative of State Irrigation Department	---	Member
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PREFACE

Hon'ble National Green Tribunal (NGT) vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013, Ashwani Kumar Dubey Vs Union of India constituted a core committee for monitoring of potential hazards of Industrial Development in Singrauli Area (both UP & MP). Besides, 05 sub-committees have also been constituted. The sub-committee-2 has been constituted under the chairmanship of Director, NIH Roorkee, to investigate the impact of pollution on water resources of Singrauli Area due to industries.

Singrauli Area consists of north District Singrauli of Madhya Pradesh and southern part of Sonebhadra District of Uttar Pradesh. The area is emerging as energy hub of India, due to availability of coal and water. At present Approx. 18000 MW/day power is being generated by the Thermal Power Plants in the whole Singrauli Area. Apart from thermal power plants, the area is having Aluminum industry, Chemical industry, Mining industry, Cement industry and Stone crushers. The total number of industries in the Singrauli area is 359. The industries are having the effluent treatment plants and the treated effluent is discharged in the water bodies, in general Rihand Reservoir. CPCB has identified Singrauli as one of the critically polluted area (CPA) in the year 2010. The quality of groundwater as well as surface water is under constant threat of contamination directly or indirectly.

The 1st meeting of the sub-committee-2 for the assessment of potential impact of pollution on water resources was held in the chamber of Director, NIH, Roorkee on Dec. 24, 2014. Various aspects of the problem were discussed and it was decided that the members of the committee may visit Singrauli area in order to make preliminary assessment of pollution on water resources in the area.

Accordingly, members of the sub-committee-2 under the guidance of Er. R. D. Singh, Director, National Institute of Hydrology, Roorkee visited Singrauli area during Jan. 29-30, 2015 and 22 water and wastewater samples were collected from the various locations. The samples were analyzed in the laboratory of CGWB Lucknow and NIH Roorkee. Based on the analysis of samples and available information, an interim report was prepared and submitted to CPCB. The second and third round of sampling was carried out during April 27-29, 2015 and July 04-05, 2015 respectively and 64 surface and groundwater samples were collected based on the suggestions of sub-committee -2 members. The samples were analyzed for physico-chemical, trace metals and bacteriological parameters in the laboratories of CGWB Lucknow, NIH Roorkee, and CWC Varanasi respectively. Trace metals were not analyzed for the samples collected during July 04-05, 2015 due to non-functional status of instrument. The report has been finalized by the committee through circulation.

(R. D. Singh)
Director, NIH &
Convener, Sub-Committee-2

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EXECUTIVE SUMMARY

Hon'ble National Green Tribunal (NGT) vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013, Ashwani Kumar Dubey Vs Union of India constituted a core committee for monitoring of potential hazards of Industrial Development in Singrauli Area (both UP & MP). Besides the core committee, 05 sub-committees have also been constituted (Annex 1). Sub-committee – 2 is constituted to study the potential impact of pollution on water resources.

The first meeting of sub-committee -2 for the assessment of potential impact of pollution on water resources was held on December 24, 2014 in the chamber of Sri. R. D. Singh, Director, National Institute of Hydrology, Roorkee and the Convener of the sub-committee-2. The various aspect of rampant pollution of water resources by industries in Singrauli region was discussed and the plan to achieve the TOR of the committee was chalked out. It was also decided that the members of the committee may visit Singrauli area in order to make preliminary assessment of pollution on water resources in the area.

The second meeting of the sub-committee-2 for the assessment of pollution on water resources was held on January 29, 2015 in the conference hall of M/s Hindalco Industries Limited, Renukoot and based on the discussions a survey plan was prepared.

The third and fourth meeting of the sub-committee-2 was held on April 27, 2015 in the conference hall of M/s NTPC Shaktinagar, Sonbhadra and June 04, 2015 at 10:00 Hr in the conference hall of M/s NTPC Vindhyanagar, Singrauli for appraising the progress of the sub-committee.

The first, second and third survey of the Singrauli Industrial Area was conducted by the joint team consisting of representatives from NIH, Roorkee; CGWB (NR), Lucknow; UPPCB, Lucknow & Sonbhadra; SWaRA, Lucknow; and MPPCB, Singrauli during January 29-30, 2015, April 27-29, 2015, and July 04-05, 2015. During field survey, 85 surface and groundwater samples were collected from key locations for physico-chemical, trace metals, and bacteriological parameters.

Based on the analysis of the samples, following interferences are drawn-

i. The values of pH, total hardness, fluoride, aluminium, total chromium, iron, manganese, mercury, cadmium and nickel for Kusumha pond were exceeding the acceptable limit prescribed by BIS (2012) for drinking water.

ii. The analysis result of Murdhawa Nala indicates that the value of fluoride are not in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

iii. The analysis result of Dongiya Nala indicates that the value of pH and fluoride are not in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993

under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

iv. The analysis result of samples from Baliya Nala, Dudhichua project ETP, Jayant project ETP and Jayant mine sump indicates that the all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

v. The analysis result of effluents from Jayant Mine ETP indicates that manganese concentration exceeded the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

vi. The analysis result of Jayant STP water indicates that the all the analyzed values except nitrate were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

vii. The analysis result of Surya Nala indicates that all the analyzed values except fluoride, nitrate and iron were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

viii. The analysis result of Janturia Nala indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

ix. The analysis result of NTPC Vindhyanagar and Shaktinagar Ash Dyke Overflow indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

x. The analysis result of Sasan Power Drain indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

xi. The analysis result of Lanco Ash Dyke overflow indicates that the all the analyzed values except fluoride were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

xii. The values of aluminium, iron, manganese, nickel, mercury and nickel for Rihand reservoir were exceeding the acceptable limit prescribed by BIS (2012) for drinking water at several sampling locations. Mercury was detected in all the samples and is a

alarming situation. The concentration of total chromium and cadmium is nearing towards the limit prescribed for drinking water. Total and fecal coliforms were also detected in the reservoir samples and exceed the desirable limit set by MoEF for bathing water.

xiii. The analysis result of Channel flowing below Rihand River Bridge indicates that all the analyzed values except aluminum and iron were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

xiv. The analysis result of Rihand River indicates that all the analyzed values except aluminium, iron, and manganese were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

xv. The analysis result of Renu River indicates that all the analyzed values except aluminium and mercury were in conformity with acceptable limit prescribed by BIS (2012) for drinking water. High concentration of mercury in Renu River is a matter of concern and needs thorough investigation.

xvi. The analysis result of Chilka Lake, Shaktinagar indicates that all the analyzed values except aluminium, iron, lead, and mercury were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

xvii. The analysis result of Ashram Talab, Govindpur indicates that all the analyzed values except aluminium, iron, and fluoride were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

xviii. The quality of groundwater is found deteriorated in terms of trace metals, nitrate and fluoride. Concentration of fluoride exceeded the desirable limit prescribed by BIS (2012) in the samples collected from Govindpur, Kusmaha, Kakri, Harrahwa, Khairi, Naktu, Sirsoti, Chilkadand, Pasavar raja, and Dibulgang. Concentration of mercury exceeded in the samples collected from Kirwani, Parasi, Harrahwa, Naktu, Sirsoti, Chilkadand, Parsavar-raja, Govindpur, Kusmaha, Khairahi, Jayant Colony, Jaitpur, MPCC colony, and Dibulganj.

xix. The treated water from Reverse Osmosis plants installed in Bajrang Nagar, Dibulganj exceeded the permissible limits prescribed by BIS (2012) for aluminium, iron, mercury, cadmium and nickel for the samples collected in January 2015. For samples collected in April 2015, concentration of aluminum exceeded the desirable limit and lead exceeded the permissible limit prescribed by BIS (2012).

The treated water from Reverse Osmosis plants installed in Parsavar-raja village exceeded the permissible limits prescribed by BIS (2012) for aluminium, iron, and mercury.

This indicates that the reverse osmosis plants installed are not suitable/capable of removing the trace metals from the water.

1. Introduction

Hon'ble National Green Tribunal (NGT) vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013, Ashwani Kumar Dubey Vs Union of India constituted a core committee for monitoring of potential hazards of Industrial Development in Singrauli Area (both UP & MP). Besides, 05 sub-committees have also been constituted (Annex 1).

Sub-committee 1:	Quantification of industrial impacts
Sub-committee 2:	Potential impact of pollution on water resources
Sub-committee 3:	Potential impact of pollution on land resources
Sub-committee 4:	Potential impact of pollution on air quality
Sub-committee 5:	Potential impact of pollution on health

The composition and terms of reference of Sub-committee 2 are given below:

Composition

Convener: Director, National Institute of Hydrology, Roorkee
Secretary: Uttar Pradesh Pollution Control Board, Lucknow
Members:

a. Representative of the Central Ground Water Authority having experience in Water Quality
b. Representative of the Ministry of Water Resources having experience in Water Quality
c. Representative of State Irrigation Department having experience in Water Quality
d. Representative of the National Institute of Hydrology from Water Quality Laboratory

Terms of Reference

- Water quality survey of the area
- Appropriate sampling methodology should be adopted to give representative picture of the entire area vis-à-vis location of the industries
- Inventory of sources (surface and groundwater sources) and their utilization status
- Physical, chemical and micro-biological properties of surface and groundwater sources with special reference to concentration of heavy metals including mercury and other hazardous waste, if any.

2. Review of Investigation Reports

2.1 Mercury Pollution in Sonbhadra District of Uttar Pradesh and its Health Impacts, CSE New Delhi (October 2012)

A short term investigation report on "Mercury Pollution in Sonbhadra District of Uttar Pradesh and its Health Impacts" was prepared by Centre for Science and Environment (CSE), New Delhi based on the investigations carried out during May & August 2012. The findings of the study were published in "Toxicological & Environmental Chemistry" in July 2014. Twenty three samples (15 from drinking water sources – 03 Treated water & 12 Groundwater, 3 from surface water sources and 5 from effluents) were collected from selected sites and analyzed. The location of the sampling sites is provided in Annex 2 & 3 and the analytical results are given in Annex 4. The main findings of the study are-

- 3 samples out of 15 drinking water samples were treated water supplied by industries / government and were of good quality conforming drinking water standards. Fluoride was detected in remaining 12 groundwater samples and the concentration exceeded the permissible limit prescribed by BIS at one location (Kusmaha Village). Three samples exceeded the acceptable limit for mercury (1 ppb) prescribed by BIS – Hand Pump at Dibulganj (26 ppb), Dug well at Anpara (8 ppb), and Hand Pump at Chilika Daad (3 ppb).
- Out of 3 surface water samples, 1 sample from Obra Dam contained 1.8 ppm fluoride. Sample from Rihand Dam at Renukut contained 0.01 ppm mercury. 2 samples namely Renuka River at Obra (0.008 ppm) and Obra Dam (0.019 ppm) were found to contain Arsenic.
- Out of 5 effluent samples, 2 samples were having higher concentration of fluoride - Dongiya Nallah (4.5 ppm) and Murdhawa Nallah (1.9 ppm). Sample from Dongiya Nallah was found to contain 0.127 ppm mercury. Water samples from ash pond of Shakti Nagar thermal power plant had 0.020 ppm arsenic whereas sample from Murdhawa Nallah contained 0.170 ppm arsenic.

2.2 Monitoring of Reverse Osmosis Plants Installed in Sonbhadra District, Uttar Pradesh, UPPCB, Sonbhadra (November 2014)

An investigation to monitor the performance of reverse osmosis plants installed by industries and government to provide safe drinking water to the residents has been carried out by Uttar Pradesh Pollution Control Board, Sonbhadra in November 2014. Twenty samples were collected and analyzed for various parameters. The results of the analysis are given in Annex 5. The main findings of the investigation are-

- The TDS of the samples was in the range of 6.6 to 50.6, indicating the unstable nature of water and may lead to gastro-intestinal problems.
- Concentration of iron was higher than the permissible limit prescribed by BIS (IS 10500: 2012) in 12 samples.

- Values of cadmium and lead exceeded the permissible limits prescribed by BIS (IS 10500: 2012) in all samples.
- Mercury concentration in 4 samples exceeded the permissible limits prescribed by BIS (IS 10500: 2012).

2.3 Monitoring of Drinking Water Quality in Sonbhadra District, Uttar Pradesh, UPPCB, Sonbhadra (November 2014)

An investigation to monitor the water quality of drinking water sources in Sonbhadra district of Uttar Pradesh was carried out by Uttar Pradesh Pollution Control Board, Sonbhadra in June, July and November 2014. Fifty eight samples from various drinking water sources including hand pumps and water supply schemes were collected and analyzed for various parameters. The results of the analysis are given in Annex 6. The main findings of the investigation are-

- 41 samples were not in conformity with permissible limit prescribed by BIS (IS 10500: 2012) for iron. Maximum concentration of iron was observed in the sample collected from Hand pump of Village Gobardaha, Choupan (5.06 ppm).
- Concentration of fluoride was higher than the acceptable limit prescribed by BIS (IS 10500: 2012) in 12 samples.
- Concentration of manganese was higher than the acceptable limit prescribed by BIS (IS 10500: 2012) in 32 samples with maximum concentration in the sample from Hand pump at Badwabhatwari, Shaktinagar (1.86 ppm).
- Concentration of cadmium was higher than the acceptable limit prescribed by BIS (IS 10500: 2012) in 17 samples.

2.4 Water Quality Monitoring of Rihand Reservoir in Sonbhadra District, Uttar Pradesh, UPPCB, Sonbhadra (January - November 2014)

Water quality monitoring of samples from upstream and downstream of Rihand reservoir was carried out by Uttar Pradesh Pollution Control Board, Sonbhadra during January to November 2014 for pH, DO, BOD, COD, TDS, sodium, calcium and magnesium. The results of the analysis are given in Annex 7. The main findings of the investigation are-

- pH value of upstream samples were in the range of 5.15 – 8.30 whereas pH value of downstream samples were in the range of 7.12 – 8.26.
- DO values were always more than 7.0 ppm.
- BOD values of upstream and downstream samples were in the range of 2.2 – 8.5 and 2.0 – 2.2 ppm respectively.
- COD values of the collected samples were in the range of 14 – 21 ppm.
- Maximum observed TDS values was 192 ppm.
- Calcium, magnesium, and sodium values were in the range of 5.3 – 10.4, 36.0 – 72.0, and 24.0 – 52.0 ppm respectively.

2.5 Water Quality Monitoring of Drains (Balia Nala, Murdhawa Nala, & Dongiya Nala) in Sonbhadra District, Uttar Pradesh, UPPCB, Sonbhadra (January 2013 - November 2014)

Water quality monitoring of samples from Balia Nala, Murdhawa Nala, & Dongiya Nala was carried out by Uttar Pradesh Pollution Control Board, Sonbhadra during year 2013 & 2014 in terms of pH, BOD, COD, TSS, TDS, TS, and F. The results of the analysis are given in Annex 8. The main findings of the investigation are-

- The samples from Balia Nalla were high in BOD (March, April, June, July, August 2013; May-Sept. 2014), COD (March - April 2013), and TSS (March - April 2013) and were not in conformity with the effluent standards notified vide G.S.R 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.
- The samples from Murdhawa Nalla were high in pH (Feb. & April 2013; June 2014) BOD (Jan., March, April 2013; June 2014), and TSS (March & May 2013) during certain months of year and were not in conformity with the effluent standards notified vide G.S.R 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.
- The samples from Dongiya Nalla were high in pH (Dec. 2013) and TSS (April 2013) and were not in conformity with the effluent standards notified vide G.S.R 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

2.6 Monitoring of Mercury & Fluoride in Groundwater Samples of Singrauli District, Madhya Pradesh, MPPCB, Singrauli (Dec. 2012 & July 2014)

Groundwater samples from the industrial area of Singrauli district was monitored for mercury and fluoride by Madhya Pradesh Pollution Control Board, Singrauli during Dec. 2012 & July 2014. The results of the analysis are given in Annex 9. The main findings of the investigation are-

- Out of 23 samples, 09 samples were detected positive for mercury and 03 samples exceeded the permissible limit for Hg prescribed by BIS (2012).
- Fluoride was absent in all the samples.

2.7 Water Quality Monitoring of Groundwater of Waidhan, Singrauli District, Madhya Pradesh, MPPCB, Singrauli

Groundwater quality of samples from the Waidhan area of Singrauli district was monitored by Madhya Pradesh Pollution Control Board, Singrauli during Dec. 2012 to Aug. 2014. The sampling locations were not clear from the reports and hence, results of the analysis have not been included in the interim report. The main findings of the investigation are-

- Turbidity and Total dissolved solids of all the samples exceeded the acceptable limit but were within the permissible limit as prescribed by BIS (2012).
- Presence of Total Coliform was detected in all the samples and hence, is not suitable for drinking.

2.8 Drinking Water Quality Monitoring for Villages in the vicinity of Mahan Aluminium, Singrauli District, Madhya Pradesh, by Hindalco Industries Limited, Singrauli (July – December, 2014)

Groundwater quality of samples from the villages in the vicinity of Mahan Aluminium located in Singrauli district was monitored by Hindalco Industries Limited (Unit Mahan Aliminium), Singrauli with the help of Ecomen Laboratories Pvt. Ltd., Lucknow during July to December 2014. Samples from 08 villages were collected. The results of the analysis are given in Annex 10. Main findings of the investigation are-

- Fluoride was detected in all the samples but the values were within the acceptable limit prescribed by BIS (2012).
- Samples from Odgari village exceeded the prescribed acceptable limit for TDS, Alkalinity, and Total hardness but were within the prescribed permissible limit.
- Samples from Barokhar village sampled in December 2014 exceeded the prescribed acceptable limit for TDS, Alkalinity, and Total hardness. The samples collected in July & September 2014 exceeded the acceptable limit for TDS and Total hardness. The samples were in conformity with the prescribed permissible limit for drinking water by BIS (2012).
- Fluoride content in the samples from Barainiya village was 1.2 mg/L in July 2014 and 1.0 mg/L in September and December 2014. The samples were in conformity with the prescribed permissible limit for drinking water by BIS (2012).
- Samples from Baghadih village were high in iron content exceeding the permissible limit prescribed by BIS (2012) and should be considered for drinking after suitable treatment.
- Concentration of TDS, Alkalinity, and Total hardness for samples from Bargawan village exceeded the prescribed acceptable limit for TDS, Alkalinity, and Total hardness but were within the prescribed permissible limit.
- The analyzed parameters for samples from Gidhar village were within the prescribed acceptable limits for drinking water.
- The sample collected from Waghadih village exceeded the permissible limit in terms of iron.

3. Description of the Study Area

3.1 General Description

The area in the north eastern part of Singrauli district in the state of Madhya Pradesh and the adjoining southern part of Sonebhadra district of Uttar Pradesh is collectively known as Singrauli. Approximately 4328 sq. km. in district Sonebhadra in U.P. and 5672 sq. km. in disctrict Singrauli in M.P contributes to Singrauli Industrial Area. Geographically, the study area is located between Longitude 82º 34' 27" to 83º 09' 11" E and Latitude 23º 56' 16" to 24º 17' 50" E (Fig. 1). Hydrologically, the study area is a part of the Rihand River basin, a tributary of Sone River, which in turn is a tributary of River Ganga. The DEM of the study area is shown in Fig. 2. The elevation in the study area varies from 268 to about 400 m in the upstream of reservoir.

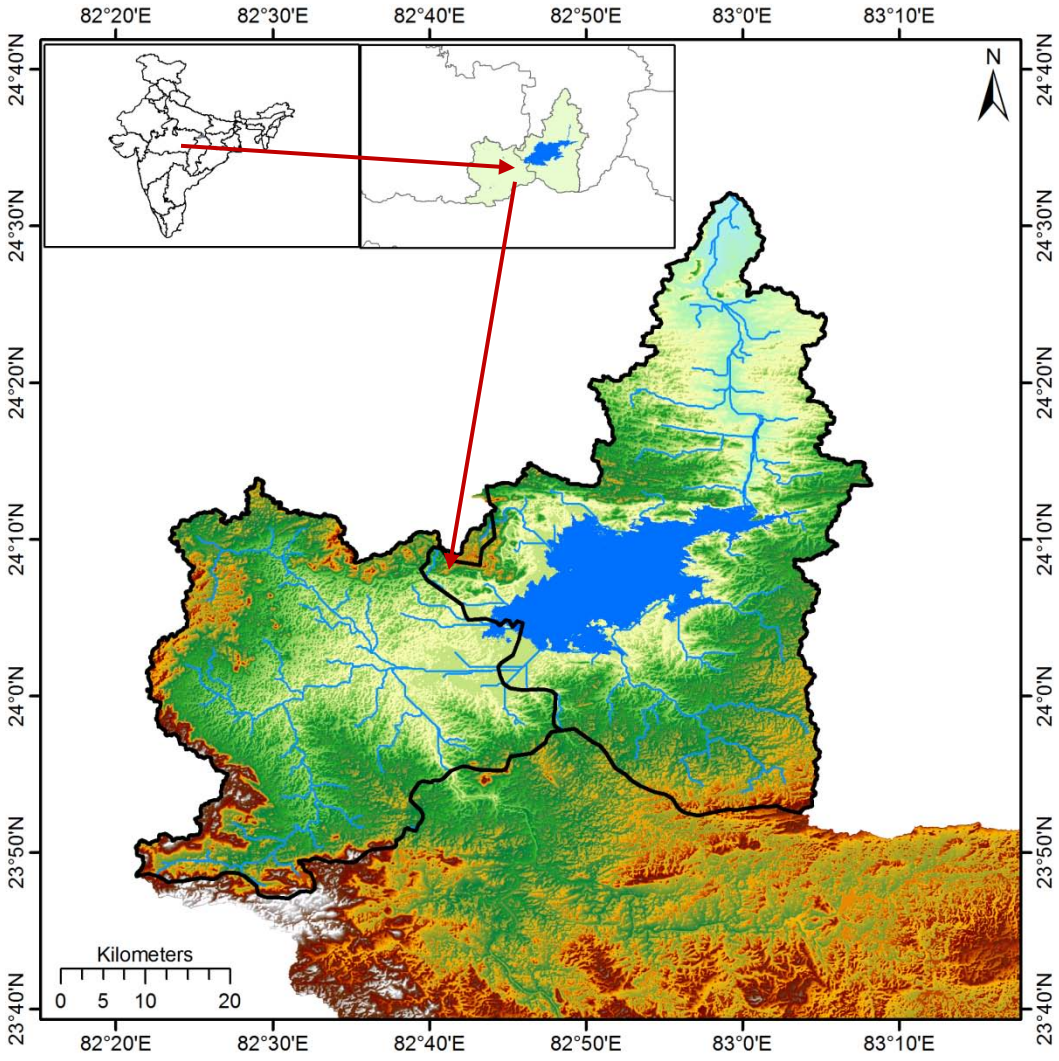

Fig 1. Index Map of the Study Area

The area south and immediately north of the reservoir is formed og low-lying hills of granite gneiss, granite and migmatite of Dudhi Group which are separated from hills of phyllite, schist and quartzite of Bijawer Super Group on the northern side by a E-W trending fault (Dudhi Tectonic Lineament). On the western side of the reservoir, coal bearing sandstone, grit, conglomerate and shale of Gondwana Super Group are exposed while on the eastern side of the reservoir, rocks of Dudhi Group are exposed (Gautam, 1995)

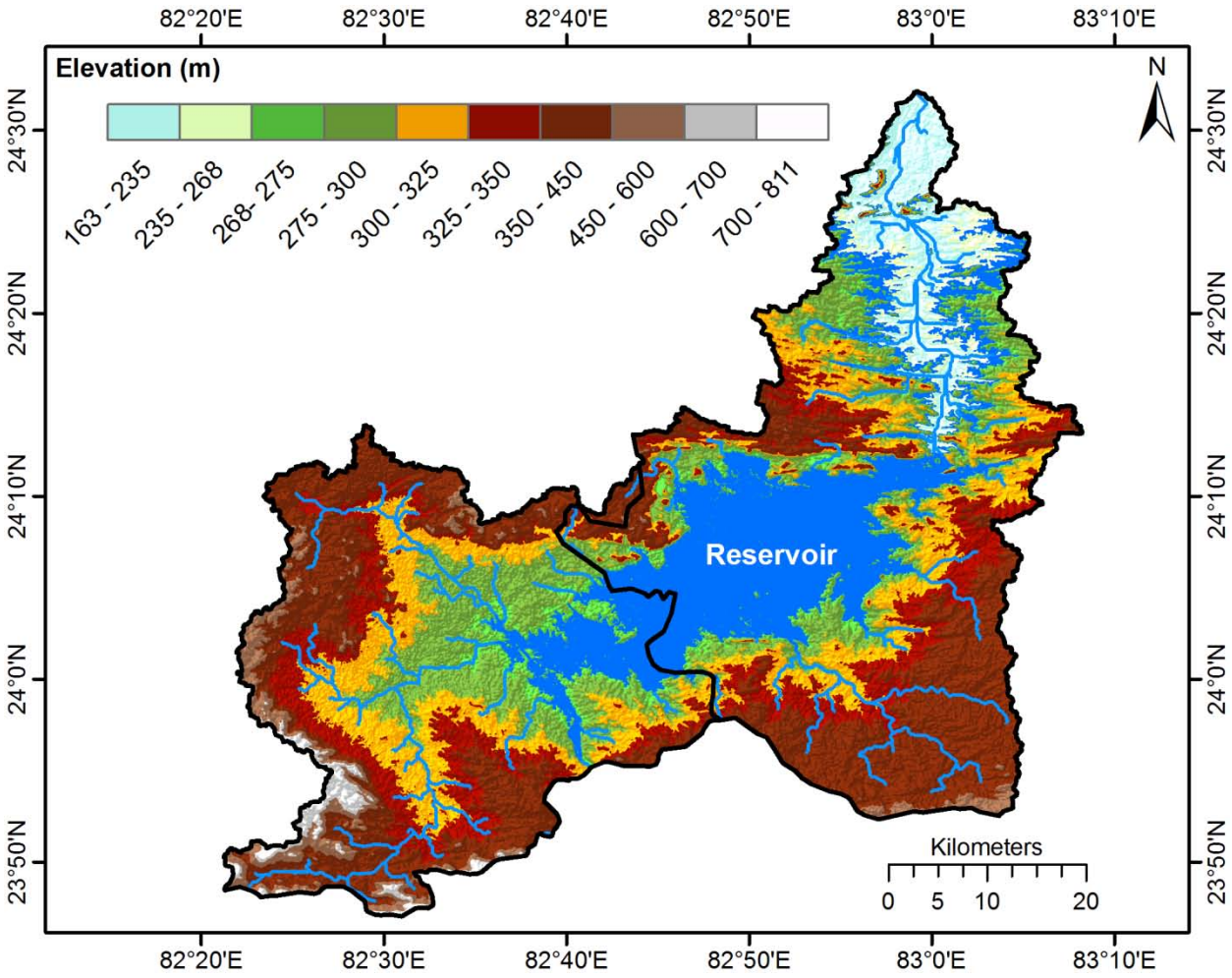

Fig 2. DEM of the Study Area

In the late fifties, a large dam was constructed on the River Rihand known as Govind Vallabh Pant Sagar, inaugurated by Pt. Jawahar Lal Nehru in 1962. The dam proved to be the life line for the fast development of the area. As a result, the region has emerged as energy hub of India due to availability of coal and water. At present Approx. 18000 MW/day power is being generated by the Thermal Power Plants in the whole Singrauli Area out of which 8760 MW installed capacity in MP and rest in UP. A study regarding the Comprehensive Environmental Pollution Index (CEPI) was conducted by the CPCB through IIT Delhi, for the area as a whole. Ministry of Environment and Forest, Govt. of India declared Singrauli as Critically Polluted Industrial Areas/Clusters on 13.01.2010 on the basis of the CEPI (Annex 11).

3.2 Rihand River Basin

Rihand River has catchment area of 13,400 km^2 and originates in Rewa hills in M.P. (Fig. 1). Rihand reservoir, with a storage capacity of 10.60 BCM (billion cubic metre), was commissioned in the year 1962 near village Pipri, District Mirzapur, Uttar Pradesh. The catchment area of Rihand reservoir is 13263 km^2 and Full Reservoir Level is 268.22 m. The Submergence Area of the reservoir is 4608 hectare. This reservoir is the source of water for the industries and irrigation. The drainage map of the Rihand basin shows that major part of the catchment area, feeding Rihand reservoir lies in the southern part (Fig. 3).

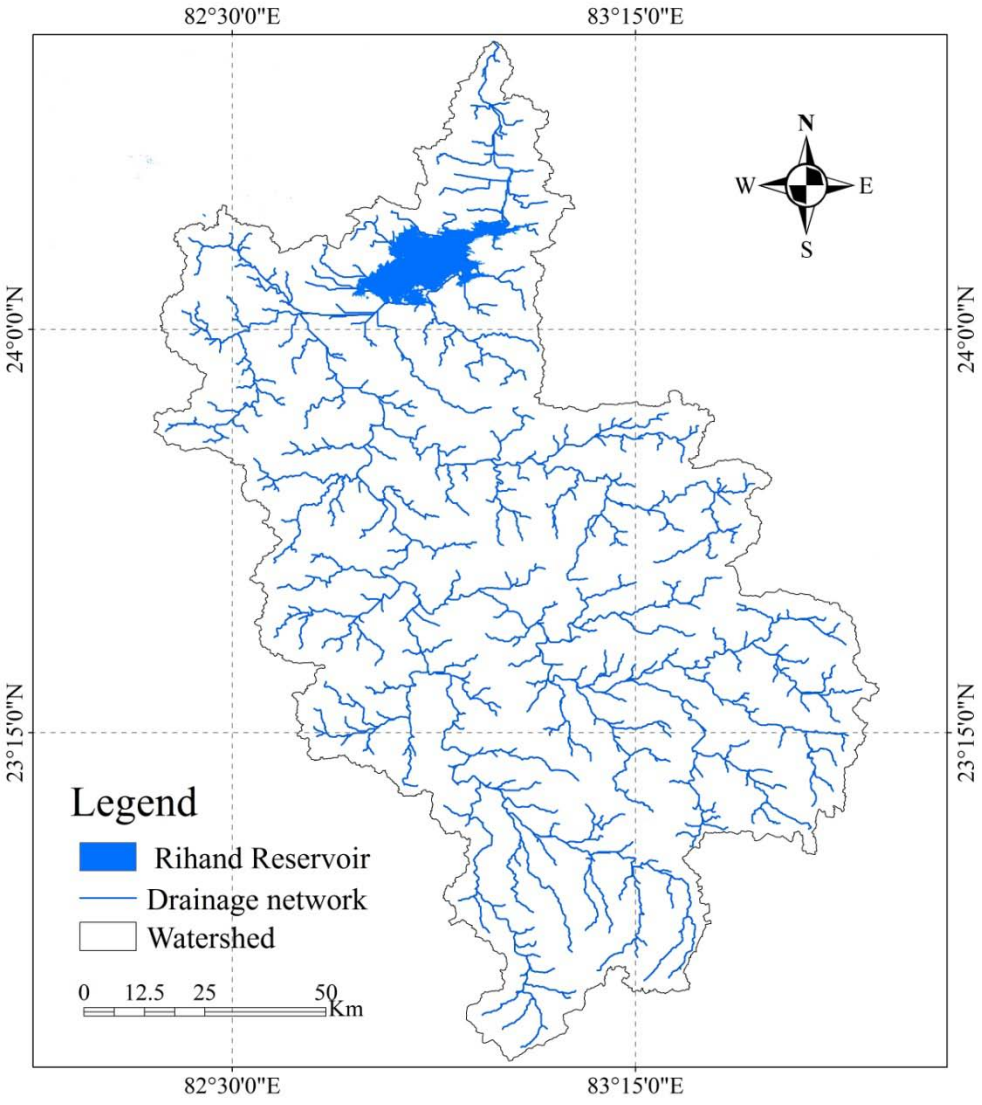

Fig. 3. Rihand River Basin

Rihand River travels a total distance of 322 km before joining Sone river near chopan. It's catchment area lies between latitude 22º 39' to 24º 33' N and longitude 82º 22' E 83º 42' E.

The Rihand River rises in the region south west of Mainpat plateau and has its source in Matringa hills at an elevation of 900 m above mean sea level. The river flows north roughly through the central part of Surguja district in Chattisgarh for 160 km. Its principal tributaries in upper part are Mahan, Ghungata, Moran, Geur, Gagar, Gobri, Piparkachar, Ramdia and Galphuli. In upper reaches the river flows through narrow channels with stable course. In lower reaches, the river flows through thick forests with isolated hilly ranges and patches of inhabited areas.

3.3 Climate

The area may be classified as humid sub-tropical (warm summer). The year may be broadly divided into four seasons. The winter season is from mid-December to February and is followed by summer and pre-monsoon season from March to May. The period from June to September constitutes the monsoon season and the period from October to November is post-monsoon.

During monsoon season the weather is sultry and oppressive. Rainfall is mainly due to south west monsoon. Annual rainfall varies from 1400 mm in upper catchment to 1091 mm in lower catchment. Average annual rainfall observed is 1171 mm. Majority of rainfall (>80%) is received during the monsoon months i.e., from June to September. Average number of rainy days (rainfall > 2.5 mm/day) in a year is 55 out of which 45 rainy days occur during June to September (over 122 days). This means that even during monsoon season, rainfall occurs only over 37% period from June 1st to Sept. 30th and the remaining 63% period of monsoon season is without rains. This aspect has significant impact on water resource availability.

During summers, May is the hottest month with the mean maximum daily temperature and mean minimum daily temperature of 42.1 ºC and 26.9 ºC respectively. An appreciable drop in the mean maximum temperature is recorded with the onset of monsoon. The mean maximum daily temperature during June is observed as 39.1 ºC. By the end of September with the onset of post monsoon season (October), day temperature drops significantly with mean maximum temperature at 31.8 ºC. The winter season starts from November and continues till end of February. December is the coldest month with the mean daily maximum temperature of 8.4 ºC.

Relative humidity during the southwest monsoon is generally over 70%. During the rest of the year, air is normally dry. Relative humidity ranges between 22% and 85%, with mean value of 62% in the morning and 47% in the evening.

Winds are generally light to moderate, except during the south west monsoon season, when these are moderate to strong. Mean wind speed is highest in June (9.2 km/hr) and lowest in November (2.7 km/hr) with an average of 5.4 km/hr.

3.4 Sources of Drinking Water

The demand of water supply is met from reverse osmosis plants installed by industries as well as respective State Government departments, India Mark II and private hand pumps. The IM II hand pumps in the fluoride affected areas are equipped with fluoride removal filters.

3.5 Industries in the Critically Polluted Area – U.P. & M.P.

Singrauli is the major power hub in the country due to availability of coal and water. Present installed capacity of power generation is 12000 MW. Besides Thermal Power Plants, Aluminium industry, chemical industry, Mining industry, Cement plants, and Stone crushers are major industries in Singrauli area. The list of the industries located in Singrauli is given in Table 1.

Table 1: Details of Industries in Singrauli

S. No.	Type of Industry	Sonbhadra (U.P.)	Singrauli (M.P.)	Total
1	Thermal Power Plant	06	04	10
2	Coal Mine	05	11	16
3	Cement Plant	01	00	01
4	Steel / Sponge Iron Mill	00	01	01
5	Explosives (SMS Bulk)	00	08	08
6	Chemical	02	10	12
7	Aluminium	01	01	02
8	Stone Crusher Cluster (Nos.)	01 (264)	00 (45)	309
	Total	**279**	**80**	**359**

The details of the industries located in the critically polluted area are given in Annex 12.

4. Meetings of the Sub-Committee - 2

The first meeting of sub-committee -2 for the assessment of potential impact of pollution on water resources was held on December 24, 2014 in the chamber of Sri. R. D. Singh, Director, National Institute of Hydrology, Roorkee and the Convener of the sub-committee-2. The following members attended the meeting:

1.	Sri. R. D. Singh Director, NIH, Roorkee	Convener
2.	Sri. Y. S. Yadav Member Secretary, UPPCB, Lucknow	Secretary
3.	Dr. S. K. Srivastava Scientist D, CGWB, Lucknow	Representative of CGWA
4.	Sri. Karunesh Kumar Drinking Water Expert State Water Resources Agency, Lucknow	Representative of State Irrigation Department/State Water Resources Agency
5.	Dr. C. K. Jain Scientist G, NIH, Roorkee	Representative of NIH
6.	Sri. Swami Nath CEO, UPPCB, Lucknow	Invitee
7.	Dr. M. K. Sharma Scientist D, NIH, Roorkee	Invitee
8.	Sri. S. K. Mishra Environmental Engineer, UPPCB, Lucknow	Invitee

The various aspect of rampant pollution of water resources by industries in Singrauli region was discussed and the plan to achieve the TOR of the committee was chalked out. It was also decided that the members of the committee may visit Singrauli area in order to make preliminary assessment of pollution on water resources in the area (Annex 13).

The second meeting of the sub-committee-2 for the assessment of pollution on water resources was held on January 29, 2015 in the conference hall of M/s Hindalco Industries Limited, Renukoot. The members discussed about the water quality problems in the region and the efforts initiated by government agencies as well industry to mitigate the problem. After discussions, the survey plan was prepared. The minutes of meeting is given in Annex 14.

The third meeting of the sub-committee-2 was held on April 27, 2015 at 11:00 Hr in the conference hall of M/s NTPC Shaktinagar, Sonbhadra. The members discussed about the water

quality problems in the region and survey plan. After discussions, the survey plan was prepared. The minutes of meeting is given in Annex 15.

The fourth meeting of the sub-committee – 2 for the assessment of pollution on water resources was held on June 04, 2015 at 10:00 Hr in the conference hall of M/s NTPC Vindhyanagar, Singrauli. The members discussed about the gaps and efforts required to complete the task. After discussion, the survey plan was prepared. The minutes of meeting is given in Annex. 16.

5. Survey of the Study Area

The first survey of the Singrauli Industrial Area was conducted by the joint team consisting of representatives from NIH, Roorkee; CGWB (NR), Lucknow; UPPCB, Lucknow & Sonbhadra; SWaRA, Lucknow; and MPPCB, Singrauli during January 29-30, 2015 (Annex 17). The team visited the area, interacted with local residents, and collected 12 wastewater / effluent and ground water samples from key locations for physico-chemical analysis. The snaps of the filed survey are given in Annex 18. The map showing the sampling locations is given in Fig. 4 and details are given in Table 2 and 3. During interaction, following points emerged-

- The sign of fluorosis was observed in the residents of village Govindpur, Kusmaha, and Khairahi. Moreover, some of the IM-II hand pumps were equipped with fluoride removal units indicating contamination of groundwater with fluoride. Samples were collected from the hand pumps of these villages for estimation of fluoride and other drinking water parameters.
- Residents were complaining about the gastrointestinal problems as a result of drinking RO water.
- The operators of the treatment plants lack basic knowledge about the equipments and their operation. Proper training should be provided to the operators for enhancing the efficiency of the treatment plants.

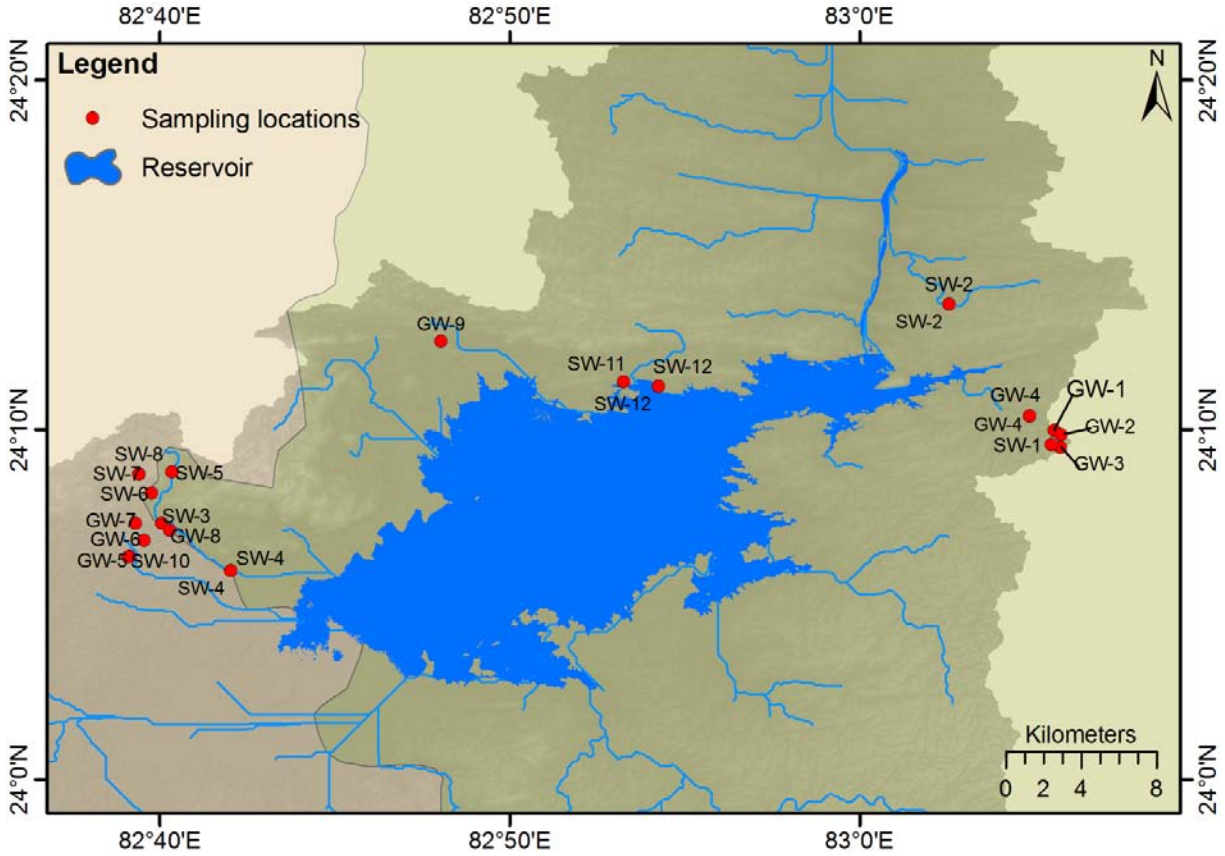

Fig. 4. Sampling Locations (First Survey)

Table 2: Details of Sampling Locations for Surface Water Samples

S. No.	Sample ID	Location	Source	Latitude	Longitude
1	SW-1	Kusumha Pond	Pond	24°09'34"	83°05'29"
2	SW-2	Murdhawa Nala,	Natural Drain	24°13'35"	83°02'34"
3	SW-3	Baliya Nala	Natural Drain	24°07'19"	82°40'03"
4	SW-4	Baliya Nala	Natural Drain	24°05'58"	82°42'02"
5	SW-5	Dudhichua Project, NCL	ETP inlet	24°08'47"	82°40'21"
6	SW-6	Jayant Project, NCL	ETP outlet	24°08'11"	82°39'45"
7	SW-7	Jayant Mine ETP	ETP inlet	24°08'43"	82°39'24"
8	SW-8	Jayant Mine ETP	ETP outlet	24°08'43"	82°39'24"
9	SW-9	Jayant Mine Sump	Mine Water	-----	-----
10	SW-10	Jayant STP Outlet	STP outlet	24°06'22"	82°39'08"
11	SW-11	Lanco Ash Dyke	Dyke Outlet	24°11'22"	82°53'15"
12	SW-12	Rihand Reservoir	Reservoir	24°11'14"	82°54'15"

Table 3: Details of Sampling Locations for Groundwater Samples

S. No.	Sample ID	Location	Source	Latitude	Longitude
1	GW-1	Govindpur Village, Nr. Sukhdevram house	IM-II	24°09'58"	83°05'34"
2	GW-2	Govindpur Village, Nr. Rambhajan house	IM-II	24°09'51"	83°05'46"
3	GW-3	Kusmaha Village, Nr. Devanti house	IM-II	24°09'29"	83°05'45"
4	GW-4	Khairahi Village, Nr. Shivprasad house	IM-II	24°10'23"	83°04'52"
5	GW-5	Jayant Colony	IM-II	24°06'21"	82°39'05"
6	GW-6	Sai ITI College, Jaitpur	IM-II	24°06'49"	82°39'33"
7	GW-7	Jayant Bus Stand	Pvt. HP	24°07'19"	82°39'18"
8	GW-8	MPCC Colony	IM-II	24°07'07"	82°40'17"
9	GW-9	RO Plant inlet, Dibulganj	GW	----	-----
10	GW-10	RO Plant outlet		-----	-----

The second survey of the Singrauli Industrial Area was conducted by the joint team consisting of representatives from NIH, Roorkee; CGWB (NR), Lucknow; CWC, Varanasi; UPPCB, Lucknow & Sonbhadra; SWaRA, Lucknow; and MPPCB, Singrauli during April 27-29, 2015 (Annex 19). The team visited the area, interacted with local residents, and collected 48 surface and ground water samples from key locations for physico-chemical analysis. The snaps of the filed survey are given in Annex 20. The map showing the sampling locations is given in Fig. 5 & 6 and details are given in Table 4 and 5. Based on the field inspections during April 27-29, 2015 and interaction with locals/NGO and others, the general observations of the committee are as follows:

- Some of the IM-II hand pumps in Myorpur Block were equipped with fluoride removal units (FRU), but during field survey it was found that the FRU's were bypassed by villagers. On interaction with villagers it was found that the FRU units were not serviced since long and the flow through the FRU has reduced significantly forcing the villagers to bypass the FRU. Samples were collected from the hand pumps of these villages for estimation of fluoride and other drinking water parameters. One sample from FRU outlet which was in service was also collected. Moreover, sample from Rihand reservoir adjacent to the said area was collected.

- Villagers of other areas indicated that groundwater in their villages is not having any problem except at few locations the water turns red. Moreover, villagers in Haarrhawa village near Sasan UMPP informed that quality of dug well as well as hand pump water has been deteriorated after the commissioning of Sasan UMPP.

- The quality of water flowing in the drains through which the wastewater from industries is discharged in the reservoir is monitored by UPPCB on monthly basis. Continuous measurement of the critical parameters should be practiced. In this regard on line water quality monitoring system need to be installed to monitor some crucial water quality parameters regularly.

- The coal overburden in the mining area was naked and requires eco-restoration to safeguard the water resources of the area.

- Anpara Ash Dyke overflow is discharged in the reservoir which is contaminating it. Construction of ash water recirculation system was in process.

- Discharge from Shaktinagar (NTPC) Ash Dyke into reservoir was observed due to breakage of pipe closure. This should be repaired immediately.

- Overflow from Vindhyanagar (NTPC) Ash Dyke ash water recirculation system was observed. Overflow was probable due to operator negligence and operators should be trained to avoid this type of situation.

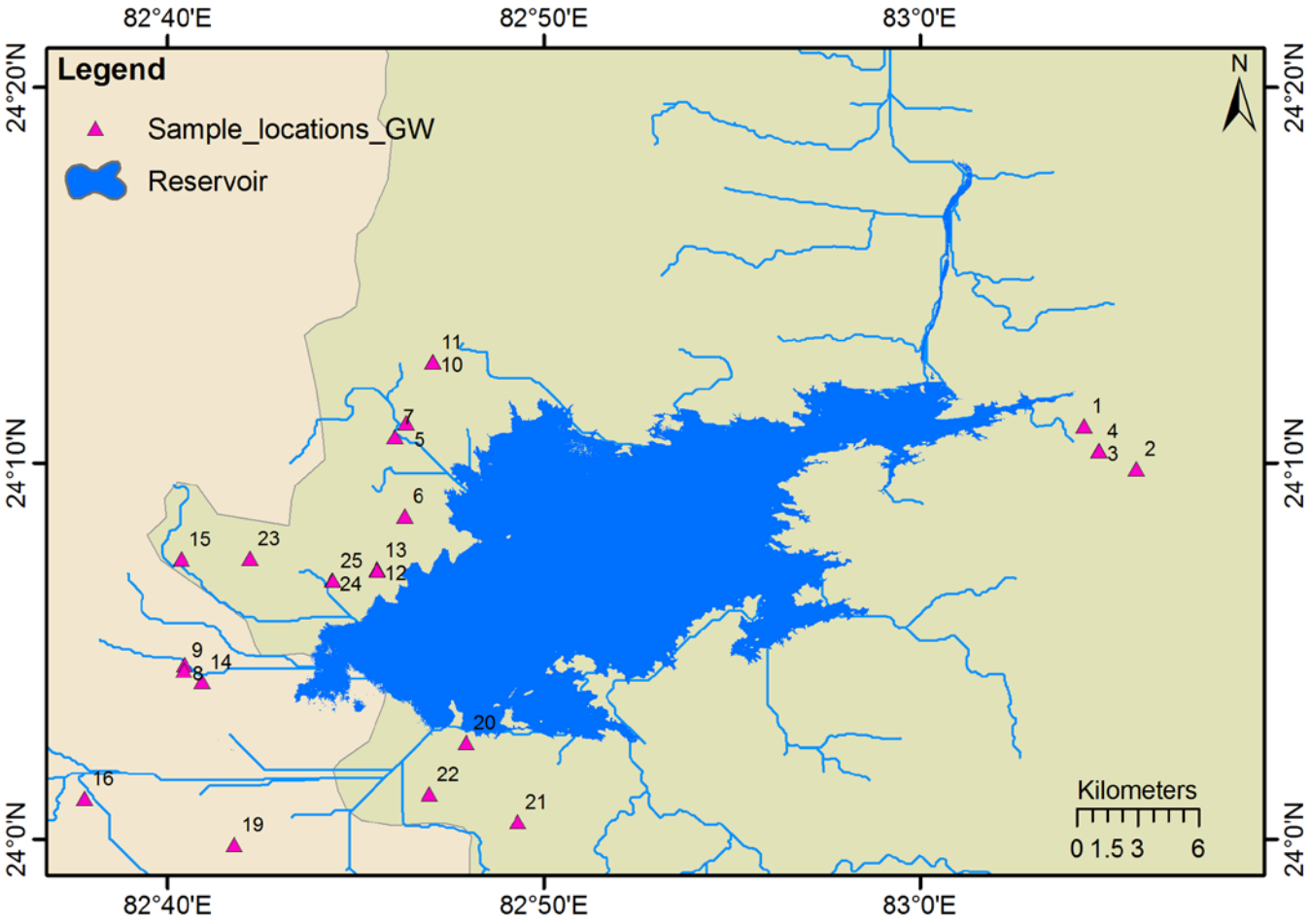

Fig. 5. Surface Water Sampling Locations (Second Survey)

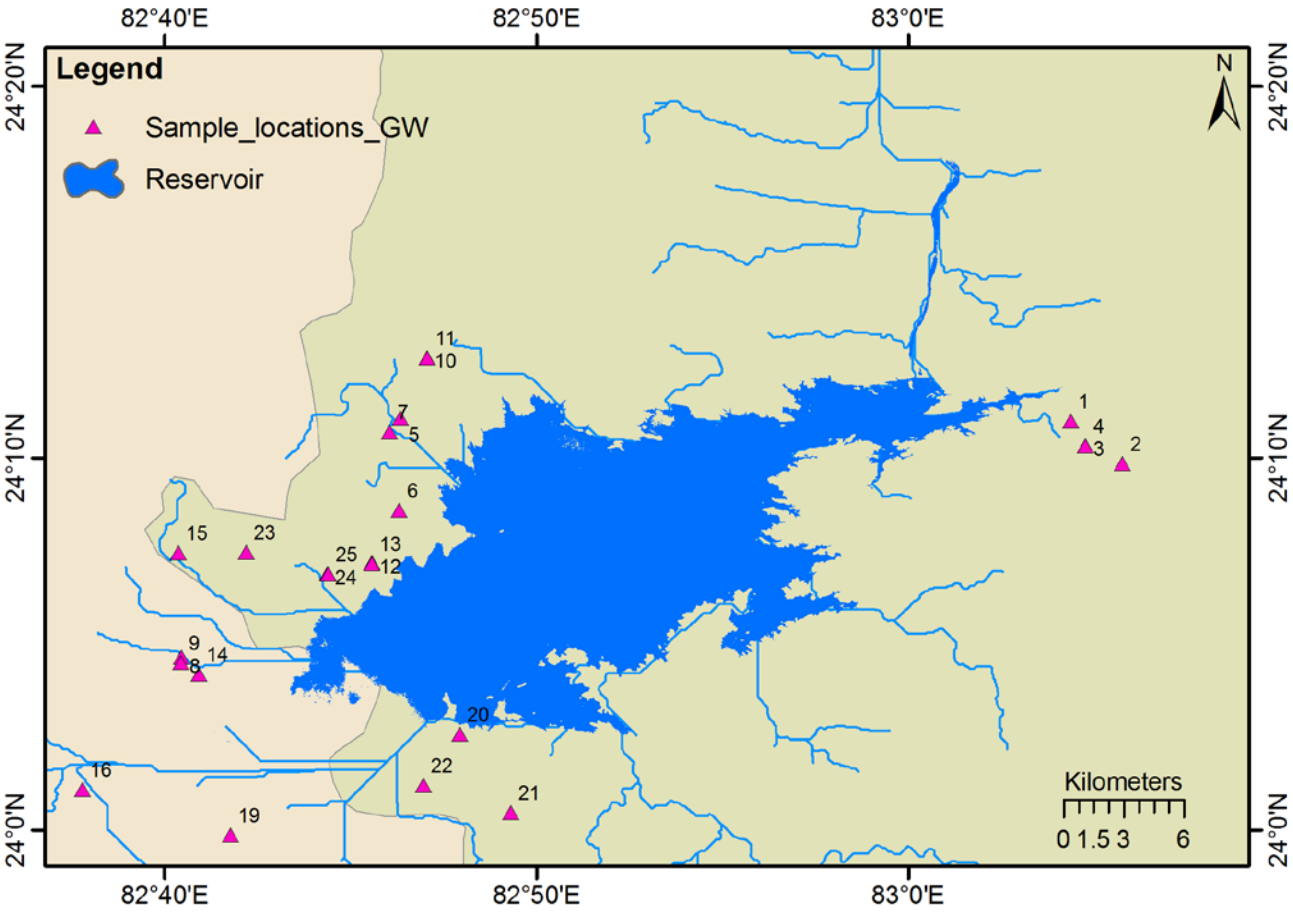

Fig. 6. Ground Water Sampling Locations (Second Survey)

Table 4: Details of Sampling Locations for Surface Water Samples

S. No.	Sample ID	Location	Source	Latitude	Longitude
1	SW-1	Kusmaha Pond, Kusmaha village	Pond	24°09'32"	83°05'27"
2	SW-2	Murdhawan Nala	Drain	24°13'52"	83°02'23"
3	SW-3	Dongiya Nala, Khattal village	Drain	24°11'56"	83°02'37"
4	SW-4	Baliya Nala	Natural Drain	24°05'58"	82°42'02"
5	SW-5	Surya nala, Vindhyanagar	Drain	24°05'01"	82°39'45"
6	SW-6	Surya nala, Vindhyanagar Ash Dyke	Drain	24°04'26"	82°41'34"
7	SW-7	Janturia nala	Drain	24°08'31"	82°46'17"
8	SW-8	Vindhyanagar Ash Dyke overflow	Drain	24°04'22"	82°41'13"
9	SW-9	Shaktinagar Ash Dyke overflow	Drain	24°03'24"	82°43'15"
10	SW-10	Sasan Power drain	Drain	23°59'18"	82°37'54"
11	SW-11	Anpara ash dyke overflow	Drain	24°11'22"	82°53'15"
12	SW-12	Rihand Reservoir	Reservoir	24°11'07"	82°54'14"
13	SW-13	Rihand Reservoir	Reservoir	24°02'56"	82°47'45"
14	SW-14	Rihand Reservoir	Reservoir	24°00'25"	82°46'17"
15	SW-15	Rihand reservoir	Reservoir	24°03'57"	82°43'13"
16	SW-16	Shaktinagar intake, Rihand Reservoir	Reservoir	24°06'08"	82°43'28"
17	SW-17	Rihand Reservoir	Reservoir	24°06'34"	82°45'40"
18	SW-18	Rihand Reservoir	Reservoir	24°11'50"	83°04'04"
19	SW-19	Channel from Sasan Power, Rihand river bridge	Drain	24°00'32"	82°39'52"
20	SW-20	Rihand River	River	24°00'28"	82°39'04"
21	SW-21	Renu river	River	24°12'28"	83°00'15"
22	SW-22	Chilka lake, Shaktinagar	Lake	24° 07'01"	82°41'52"
23	SW-23	Ashram Talab, Govindpur village	Pond	24°09'50"	83°05'14"

Table 5: Details of Sampling Locations for Groundwater Samples

S. No.	Sample ID	Location	Source	Latitude	Longitude
1	GW-1	Rahim, Kirwani village	IM-II	24°10'59"	83°04'22"
2	GW-2	Govindpur Village, Nr. Rambhajan house	IM-II	24°09'51"	83°05'46"
3	GW-3	Harihar Yadav, Khairahi village	IM-II	24°10'19"	83°04'46"
4	GW-4	FRU outlet, Harihar Yadav, Khairahi village	TW	24°10'19"	83°04'46"
5	GW-5	Ramswaroop Bharati, Parasi village	IM-II	24°11'04"	82°46'20"
6	GW-6	Ramnath Yadav, Nr. Janturia Nala	IM-II	24°08'35"	82°46'18"
7	GW-7	Rehta bus stop, Kakari village	IM-II	24°10'42"	82°46'03"
8	GW-8	CISF Mandir gate, Submersible pump	BW	24°04'38"	82°40'27"
9	GW-9	Sh. Devidayal, Gahilgarh village	IM-II	24°04'29"	82°40'26"
10	GW-10	RO inlet, Dibulganj village	BW	24°12'41"	82°47'03"
11	GW-11	RO outlet, Dibulganj village	TW	24°12'41"	82°47'03"
12	GW-12	Primary school, Bhairwa village	IM-II	24°07'11"	82°45'34"
13	GW-13	Shyam Naresh Sharma, Bhairwa village	Dug well	24°07'09"	82°45'34"
14	GW-14	Vindhyanagar ARS pump house	IM-II	24°04'11"	82°40'55"
15	GW-15	Madhyamik Vidyalaya, Chilkadand, Mayorpore	IM-II	24°07'27"	82°40'22"
16	GW-16	Sadabrij Vishwakarma, Tubakhann village	IM-II	24°01'05"	82°37'47"
17	GW-17	Rammilan Vaishya, Harrhawa village	Dug well	23°58'25"	82°38'33"
18	GW-18	Adarsh Vidya Public School, Harrhawa village	IM-II	23°58'28"	82°38'31"
19	GW-19	Ishwar Dayal, Khatkhariya	IM-II	23°59'51"	82°41'46"
20	GW-20	Rajender Yadav, Khairi village	IM-II	24°02'34"	82°47'56"
21	GW-21	Forest office, Naktu village	IM-II	24°00'27"	82°49'18"
22	GW-22	Community building, Sirsoti	IM-II	24°01'12"	82°46'57"
23	GW-23	Cilkadand village	BW	24°07'28"	82°42'11"
24	GW-24	Parsavar-raja village	IM-II	24°06'53"	82°44'23"
25	GW-25	Parsavar-raja village	RO outlet	24°06'52"	82°44'24"

The third survey of the Singrauli Industrial Area was conducted by the joint team consisting of representatives from NIH, Roorkee; CGWB (NR), Lucknow; CWC, Varanasi; UPPCB, Lucknow & Sonbhadra; SWaRA, Lucknow; and MPPCB, Singrauli during July 04-05, 2015 (Annex 21). The team visited the area, interacted with local residents, and collected 16 surface and ground water samples from key locations for physico-chemical analysis. The snaps of the filed survey are given in Annex 22. The details of the sampling locations are given in Table 6.

Table 6: Details of Sampling Locations

S. No.	Sample ID	Location	Source	Latitude	Longitude
1	SW-24	Rihand Reservoir	Reservoir	24°03'42"	82°51'29"
2	SW-25	Kachan River, Nr. Kachani village	River	24°04'29"	82°35'16"
3	SW-26	Mayyar River	River	24°01'54"	82°36'37"
4	SW-27	Moher & Moher Coal Mine, Settling Pit	Drain	24° 06'13"	82°33'38"
5	SW-28	Moher & Moher Coal Mine, Sedimentation pond	Pond	24°07'18"	82°33'24"
6	SW-29	Kavya Nala	Drain	23°58'41"	82°38'16"
7	GW-26	Naugarh-Amlori, Nr. Ramkripal Basur house	IM-II	24°05'18"	82°34'10"
8	GW-27	Amlori Basti, Nr. Ramkrishna house	IM-II	24°05'43"	82°33'01"
9	GW-28	Moher & Moher Coal Mine, Abandoned well	Dugwell	24° 06'13"	82°33'38"
10	GW-29	Harraiya,, Nr. Budhi Rampal house	IM-II	24°07'09"	82°31'29"
11	GW-30	Bargawa, Singrauli	IM-II	24°13'34"	82°28'31"
12	GW-31	Oddgadi, Nr. Ramawadh Kuswaha house	IM-II	24°13'32"	82°25'30"
13	GW-32	Navjevan Vihar, Vindhyanagar	Borewell	24°04'50"	82°39'44"
14	GW-33	Block Colony, Nr. Thana, Widhan	IM-II	24°03'56"	82°37'29"
15	GW-34	Primary School, Jarha village	IM-II	24°00'19"	82°54'08"

6. Analytical Methodology

Water and waste water (Effluent) samples were collected in polyethylene bottles using dip/grab sampling method and preserved by using appropriate reagents as per standard methods (APHA, 1992). All glassware and other containers used for trace element analysis were thoroughly cleaned, soaked in 10% nitric acid for 48 h and finally rinsed with de-ionized water several times prior to use.

The physico-chemical analysis was performed as per Standard Methods for the Examination of Water and Wastewater (APHA, 1992; Jain and Bhatia, 1988). The details of analytical methods and equipment used in the analysis are given in Table 7.

Table 7: Analytical Methods and Equipments used in the Analysis

S.No.	Parameter	Method	Equipment Used
1	pH	Electrometric	pH meter
2	Electrical Conductivity	Electrometric	Conductivity meter
3	Total Hardness	Titration by EDTA	Digital Burette
4	Calcium	Titration by EDTA	Digital Burette
5	Magnesium	Titration by EDTA	Digital Burette
6	Sodium	Flame emission	Flame Photometer
7	Potassium	Flame emission	Flame Photometer
8	Alkalinity	Titration by H_2SO_4	Digital Burette
9	Carbonate	Titration by H_2SO_4	Digital Burette
10	Bicarbonate	Titration by H_2SO_4	Digital Burette
11	Chloride	Titration by $AgNO_3$	Digital Burette
12	Fluoride	SPADNS method	Spectrophotometer
13	Nitrate	Cadmium Reduction Method	Spectrophotometer
14	Sulfate	BaSO4 method	Spectrophotometer
15	Phosphate	Acid Persulfate –Ascorbic Acid method	Spectrophotometer
16	Silica	Silicomolybdate method	Spectrophotometer
17	Total Arsenic	Digestion followed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	ICP-MS
18	Aluminium		
19	Total Chromium		
20	Copper		
21	Iron		
22	Lead		
23	Manganese		
24	Mercury		
25	Cobalt		
26	Cadmium		
27	Nickel		
28	Zinc		

7. Results and Discussion

The Singrauli region spreads across the states of Uttar Pradesh (Sonebhadra district) and Madhya Pradesh (Singrauli district) and has been for a long time promoted as India's energy capital. It is South Asia's biggest industrial area. It hosts 10 thermal power plants, 16 coal mines, 12 chemical units, 8 explosive units, 2 aluminium units, 1 cement plant, 1 sponge iron mill, and 309 stone crushers.

Due to industrialization of the area, huge environmental problems with air/water pollution and solid waste management have been reported since last two decades. The region has been declared critically polluted area (CPA) in the year 2010 based on the detailed environmental study carried out by CPCB, New Delhi. The industries have installed treatment plants to treat the effluent generated during process. The industries are recycling part of the treated effluent for secondary and tertiary applications, and remaining effluent is discharged in the natural drains which finally meets Rihand reservoir.

The quality of groundwater in the region is under constant threat of contamination directly or indirectly. Remarkable high concentration of mercury, cadmium, nickel, aluminum, chromium, and fluoride in some parts of the region is a common feature.

The water and wastewater samples collected from various sites have been analyzed and their characteristics are given in Table 8 to 24. The quality of effluents and water resources were compared with the standards prescribed by Environmental (Protection) Act, 1986 (Annex 23) and Bureau of Indian Standard, 2012 (Annex 24).

7.1 Characteristics of Surface Water / Industrial Effluents

7.1.1 Characteristics of Kusumha Pond

The characteristics of Kusumha pond is given in Table 8.

Table 8: Physico-chemical Characteristics of Kusumha Pond

S. No.	Parameters	Kusumha Pond (SW-1)		IS 10500:2012 Standard	
		Jan. 15	Apr. 15	Acceptable	Permissible
1	pH	**8.8**	7.3	6.5 – 8.5	NR
2	Electrical Conductivity (µS/cm)	532	810	-----	-----
3	Total Hardness as $CaCO_3$ (mg/L)	81	160	200	600
4	Calcium as Ca (mg/L)	14	40	75	200
5	Magnesium as Mg (mg/L)	11	15	30	100
6	Sodium as Na (mg/L)	85	108	-----	-----
7	Potassium as K (mg/L)	5.6	9.1	-----	-----
8	Carbonate as CO_3 (mg/L)	24	----	-----	-----
9	Bicarbonate as HCO_3 (mg/L)	195	268	-----	-----
10	Chloride as Cl (mg/L)	21	50	250	1000
11	Fluoride as F (mg/L)	**1.6**	**3.4**	1.0	1.5
12	Nitrate as NO_3 (mg/L)	0.65	13	45	NR
13	Sulfate as SO_4 (mg/L)	41	108	200	400
14	Phosphate as PO_4 (mg/L)	ND	0.02	-----	-----
15	Silica as SiO_2 (mg/L)	7.9	18	-----	-----
16	Total Arsenic as As (mg/L)	0.0025	0.0013	0.010	0.05
17	Aluminium as Al (mg/L)	**1.494**	**2.802**	0.030	0.20
18	Total Chromium as Cr (mg/L)	**0.0503**	0.0323	0.050	NR
19	Copper as Cu (mg/L)	0.0105	0.0122	0.050	1.50
20	Iron as Fe (mg/L)	**1.506**	**2.800**	0.300	NR
21	Lead as Pb (mg/L)	0.0095	0.0074	0.010	NR
22	Manganese as Mn (mg/L)	**0.2393**	**0.2136**	0.100	0.30
23	Mercury as Hg (mg/L)	**0.0011**	0.0008	0.001	NR
24	Cobalt as Co (mg/L)	0.0012	0.0032	-----	-----
25	Cadmium as Cd (mg/L)	**0.0052**	0.00015	0.0030	NR
26	Nickel as Ni (mg/L)	**0.0276**	**0.0217**	0.020	NR
27	Zinc as Zn (mg/L)	0.1254	0.0099	5.00	15.0
28	Selenium as Se (mg/L)	NA	0.00247	0.01	NR
29	Dissolved Oxygen (mg/L)	----	5.3	----	----
30	BOD (mg/L)	----	7.7	----	----
31	COD (mg/L)	----	39	----	----
32	Fecal Coliform (MPN/100 ml)	-----	1400	Absent	NR
33	Total Coliform (MPN/100 ml)	-----	3900	Absent	NR

NR – No Relaxation

From the above results, it is evident that the values of fluoride, aluminium, iron, manganese, and nickel were exceeding the acceptable limit prescribed by BIS (2012) for drinking water for both the samples.

For samples collected in January 2015, pH, total hardness, fluoride, aluminium, total chromium, iron, manganese, mercury, cadmium and nickel for Kusumha pond were exceeding the acceptable limit prescribed by BIS (2012) for drinking water. An increase in dissolved solids, fluoride, aluminium and iron and reduction in trace metal concentration was observed for sample collected in April 2015.

The water from the pond is utilized for irrigation as well as drinking water for domestic animals. High concentration of trace metals, especially mercury is a concern.

7.1.2 Characteristics of Murdhawa Nala

The characteristics of Murdhawa Nala are given in Table 9.

Table 9: Physico-chemical Characteristics of Murdhawa Nala

S. No.	Parameters	Murdhawa Nala (SW-2)		Effluent Standards
		Jan. 15	Apr. 15	
1	pH	7.8	7.1	5.5-9.0
2	Electrical Conductivity (µS/cm)	415	600	-----
3	Total Hardness as $CaCO_3$ (mg/L)	95	120	-----
4	Calcium as Ca (mg/L)	26	36	-----
5	Magnesium as Mg (mg/L)	7.3	7	-----
6	Sodium as Na (mg/L)	50	81	-----
7	Potassium as K (mg/L)	4.3	7.5	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	98	159	-----
10	Chloride as Cl (mg/L)	32	57	-----
11	Fluoride as F (mg/L)	**6.0**	**4.05**	2.0
12	Nitrate as NO_3-N (mg/L)	ND	5	10
13	Sulfate as SO_4 (mg/L)	75	71	-----
14	Phosphate as P (mg/L)	ND	ND	5.0
15	Silica as SiO_2 (mg/L)	11	21	-----
16	Total Arsenic as As (mg/L)	0.0057	0.0059	0.20
17	Aluminium as Al (mg/L)	5.011	8.513	-----
18	Total Chromium as Cr (mg/L)	0.0473	0.0357	2.0
19	Copper as Cu (mg/L)	0.3605	0.0134	3.0
20	Iron as Fe (mg/L)	1.159	1.266	3.0
21	Lead as Pb (mg/L)	0.9694	0.0091	0.1
22	Manganese as Mn (mg/L)	0.3055	0.2641	2.0
23	Mercury as Hg (mg/L)	0.0025	0.0008	0.01
24	Cobalt as Co (mg/L)	0.0021	0.0019	-----

25	Cadmium as Cd (mg/L)	0.0028	0.0003	2.0
26	Nickel as Ni (mg/L)	0.2963	0.0224	3.0
27	Zinc as Zn (mg/L)	2.1591	0.0591	5.0
28	Selenium as Se (mg/L)	NA	0.00069	0.05
29	Dissolved Oxygen (mg/L)	----	2.9	----
30	BOD (mg/L)	----	12.8	30
31	COD (mg/L)	----	33	250
32	Fecal Coliform (MPN/100 ml)	-----	1100	-----
33	Total Coliform (MPN/100 ml)	-----	2700	-----

The analysis result of Murdhawa Nala indicates that the value of fluoride is not in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water. Fluoride in surface water is unusual phenomenon and calls for prolonged monitoring of the drains at various location to find out the source.

7.1.3 Characteristics of Dongiya Nala

The characteristics of Dongiya Nala are given in Table 10.

Table 10: Physico-chemical Characteristics of Dongiya Nala

S. No.	Parameters	Dongiya Nala (SW-3)	Effluent Standards
		Apr. 15	
1	pH	**10.9**	5.5-9.0
2	Electrical Conductivity (µS/cm)	4400	-----
3	Total Hardness as $CaCO_3$ (mg/L)	90	-----
4	Calcium as Ca (mg/L)	32	-----
5	Magnesium as Mg (mg/L)	2.4	-----
6	Sodium as Na (mg/L)	950	-----
7	Potassium as K (mg/L)	3.6	-----
8	Carbonate as CO_3 (mg/L)	84	-----
9	Hydroxyl as OH (mg/L)	51	-----
10	Chloride as Cl (mg/L)	1170	-----
11	Fluoride as F (mg/L)	**16**	2.0
12	Nitrate as NO_3-N (mg/L)	5.4	10
13	Sulfate as SO_4 (mg/L)	86	-----
14	Phosphate as P (mg/L)	ND	5.0
15	Silica as SiO_2 (mg/L)	15	-----
16	Total Arsenic as As (mg/L)	0.0068	0.20
17	Aluminium as Al (mg/L)	1.0354	-----
18	Total Chromium as Cr (mg/L)	0.0200	2.0
19	Copper as Cu (mg/L)	0.0115	3.0
20	Iron as Fe (mg/L)	0.4184	3.0
21	Lead as Pb (mg/L)	0.0044	0.1

22	Manganese as Mn (mg/L)	0.0732	2.0
23	Mercury as Hg (mg/L)	0.0062	0.01
24	Cobalt as Co (mg/L)	0.0013	-----
25	Cadmium as Cd (mg/L)	0.0002	2.0
26	Nickel as Ni (mg/L)	0.0113	3.0
27	Zinc as Zn (mg/L)	0.0088	5.0
28	Selenium as Se (mg/L)	0.0020	0.05
29	Dissolved Oxygen (mg/L)	3.7	----
30	BOD (mg/L)	17.8	30
31	COD (mg/L)	71.0	250
32	Fecal Coliform (MPN/100 ml)	100	-----
33	Total Coliform (MPN/100 ml)	500	-----

The analysis result of Dongiya Nala indicates that the value of pH and fluoride are not in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.4 Characteristics of Baliya Nala

The characteristics of Baliya Nala are given in Table 11.

Table 11: Physico-chemical Characteristics of Baliya Nala

S. No.	Parameters	Baliya Nala			Effluent Standards
		SW-3	SW-4		
		Jan. 15	Jan. 15	Apr. 15	
1	pH	8.19	7.9	7.3	5.5-9.0
2	Electrical Conductivity (µS/cm)	620	345	250	-----
3	Total Hardness as $CaCO_3$ (mg/L)	230	115	100	-----
4	Calcium as Ca (mg/L)	66	32	24	-----
5	Magnesium as Mg (mg/L)	22	8.5	10	-----
6	Sodium as Na (mg/L)	38	22	15	-----
7	Potassium as K (mg/L)	10	4.4	4.3	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	134	128	85	-----
10	Chloride as Cl (mg/L)	21	18	25	-----
11	Fluoride as F (mg/L)	0.54	0.45	0.59	2.0
12	Nitrate as NO_3-N (mg/L)	1.0	ND	0.7	10
13	Sulfate as SO_4 (mg/L)	180	35	28	-----
14	Phosphate as P (mg/L)	ND	0.3	ND	5.0
15	Silica as SiO_2 (mg/L)	20	26	13	-----
16	Total Arsenic as As (mg/L)	0.0011	0.0008	0.0017	0.20
17	Aluminium as Al (mg/L)	1.614	0.416	0.703	-----
18	Total Chromium as Cr (mg/L)	0.0116	0.0478	0.0339	2.0

19	Copper as Cu (mg/L)	0.0361	0.0041	0.0118	3.0
20	Iron as Fe (mg/L)	0.523	0.551	0.5793	3.0
21	Lead as Pb (mg/L)	0.0827	0.0056	0.0064	0.1
22	Manganese as Mn (mg/L)	0.4546	0.0529	0.0751	2.0
23	Mercury as Hg (mg/L)	0.0028	0.0035	0.0015	0.01
24	Cobalt as Co (mg/L)	0.0051	0.0006	0.0016	-----
25	Cadmium as Cd (mg/L)	0.0009	0.0030	0.0005	2.0
26	Nickel as Ni (mg/L)	0.0392	0.0236	0.0212	3.0
27	Zinc as Zn (mg/L)	0.2371	0.0987	0.0150	5.0
28	Selenium as Se (mg/L)	----	----	0.0011	0.05
29	Dissolved Oxygen (mg/L)	----	----	8.2	----
30	BOD (mg/L)	----	----	2.4	30
31	COD (mg/L)	----	----	7.3	250
32	Fecal Coliform (MPN/100 ml)	----	----	900	-----
33	Total Coliform (MPN/100 ml)	----	----	3100	-----

The analysis result of Baliya Nala indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.5 Characteristics of Effluents of Dudhichua & Jayant Projects

The characteristics of effluents of Dudhichua & Jayant Projects are given in Table 12.

Table 12: Physico-chemical Characteristics of Dudhichua & Jayant Project

Sr. No.	Parameters	Dudhichua ETP Inlet (SW-5)	Jayant ETP Outlet (SW-6)	Effluent Standards
		Jan. 15	Jan. 15	
1	pH	7.8	8.2	5.5-9.0
2	Electrical Conductivity (µS/cm)	360	350	-----
3	Total Hardness as $CaCO_3$ (mg/L)	120	145	-----
4	Calcium as Ca (mg/L)	30	46	-----
5	Magnesium as Mg (mg/L)	11	7.3	-----
6	Sodium as Na (mg/L)	26	12	-----
7	Potassium as K (mg/L)	3.2	3.6	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	140	49	-----
10	Chloride as Cl (mg/L)	18	11	-----
11	Fluoride as F (mg/L)	0.47	0.41	2.0
12	Nitrate as NO_3-N (mg/L)	ND	ND	10
13	Sulfate as SO_4 (mg/L)	35	120	-----
14	Phosphate as P (mg/L)	ND	ND	5.0
15	Silica as SiO_2 (mg/L)	17	8.8	-----
16	Total Arsenic as As (mg/L)	0.0006	0.0004	0.20

17	Aluminium as Al (mg/L)	5.696	1.727	-----
18	Total Chromium as Cr (mg/L)	0.0475	0.0462	2.0
19	Copper as Cu (mg/L)	0.0024	0.0011	3.0
20	Iron as Fe (mg/L)	1.040	0.669	3.0
21	Lead as Pb (mg/L)	0.0046	0.0031	0.1
22	Manganese as Mn (mg/L)	0.187	0.0591	2.0
23	Mercury as Hg (mg/L)	0.0011	0.0008	0.01
24	Cobalt as Co (mg/L)	0.0016	0.0007	-----
25	Cadmium as Cd (mg/L)	0.0002	0.0003	2.0
26	Nickel as Ni (mg/L)	0.0254	0.0223	3.0
27	Zinc as Zn (mg/L)	0.0203	0.0180	5.0

The analysis result of effluents from Dudhichua & Jayant Projects indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.6 Characteristics of Effluents of Jayant Mine ETP

The characteristics of effluents of Jayant Mine ETP are given in Table 13.

Table 13: Physico-chemical Characteristics of Jayant Mine ETP

S. No.	Parameters	Jayant Mine ETP Inlet (SW-7)	Jayant Mine ETP Outlet (SW-8)	Effluent Standards
		Jan. 15	Jan. 15	
1	pH	8.0	7.96	5.5-9.0
2	Electrical Conductivity (µS/cm)	820	825	-----
3	Total Hardness as $CaCO_3$ (mg/L)	340	340	-----
4	Calcium as Ca (mg/L)	80	80	-----
5	Magnesium as Mg (mg/L)	34	34	-----
6	Sodium as Na (mg/L)	33	33	-----
7	Potassium as K (mg/L)	21	21	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	92	92	-----
10	Chloride as Cl (mg/L)	21	21	-----
11	Fluoride as F (mg/L)	0.29	0.31	2.0
12	Nitrate as NO_3-N (mg/L)	ND	ND	10
13	Sulfate as SO_4 (mg/L)	320	320	-----
14	Phosphate as P (mg/L)	ND	ND	5.0
15	Silica as SiO_2 (mg/L)	14	14	-----
16	Total Arsenic as As (mg/L)	0.0002	0.0001	0.20
17	Aluminium as Al (mg/L)	0.465	0.482	-----
18	Total Chromium as Cr (mg/L)	0.0420	0.0447	2.0

19	Copper as Cu (mg/L)	0.0015	0.0029	3.0
20	Iron as Fe (mg/L)	0.897	0.726	3.0
21	Lead as Pb (mg/L)	0.0029	0.0029	0.1
22	Manganese as Mn (mg/L)	1.8375	**2.7103**	2.0
23	Mercury as Hg (mg/L)	0.0056	0.0029	0.01
24	Cobalt as Co (mg/L)	0.3594	0.0658	-----
25	Cadmium as Cd (mg/L)	0.0001	0.0003	2.0
26	Nickel as Ni (mg/L)	0.0639	0.1006	3.0
27	Zinc as Zn (mg/L)	0.0164	0.0187	5.0

The analysis result of effluents from Jayant Mine ETP indicates that all the analyzed values except manganese were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.7 Characteristics of Effluents of Jayant Mine Sump & Jayant STP

The characteristics of effluents of Jayant Mine Sump & Jaynat STP are given in Table 14.

Table 14: Physico-chemical Characteristics of Jayant Mine Sump & Jayant STP

Sr. No.	Parameters	Jayant Mine Sump (SW-9)	Jayant STP Outlet (SW-10)	Effluent Standards
		Jan. 15	Jan. 15	
1	pH	7.81	7.5	5.5-9.0
2	Electrical Conductivity (µS/cm)	900	550	-----
3	Total Hardness as $CaCO_3$ (mg/L)	335	155	-----
4	Calcium as Ca (mg/L)	78	50	-----
5	Magnesium as Mg (mg/L)	34	7.3	-----
6	Sodium as Na (mg/L)	32	44	-----
7	Potassium as K (mg/L)	19	11	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	98	153	-----
10	Chloride as Cl (mg/L)	14	39	-----
11	Fluoride as F (mg/L)	0.17	0.64	2.0
12	Nitrate as NO_3-N (mg/L)	ND	**10.4**	10
13	Sulfate as SO_4 (mg/L)	330	40	-----
14	Phosphate as P (mg/L)	ND	ND	5.0
15	Silica as SiO_2 (mg/L)	23	23	-----
16	Total Arsenic as As (mg/L)	0.0002	0.0007	0.20
17	Aluminium as Al (mg/L)	0.361	0.294	-----
18	Total Chromium as Cr (mg/L)	0.0459	0.0404	2.0
19	Copper as Cu (mg/L)	0.0069	0.0027	3.0
20	Iron as Fe (mg/L)	0.735	0.582	3.0
21	Lead as Pb (mg/L)	0.0258	0.0119	0.1

22	Manganese as Mn (mg/L)	0.5129	0.1252	2.0
23	Mercury as Hg (mg/L)	0.0022	0.0015	0.01
24	Cobalt as Co (mg/L)	0.0066	0.0008	-----
25	Cadmium as Cd (mg/L)	0.0028	0.0002	2.0
26	Nickel as Ni (mg/L)	0.0297	0.0204	3.0
27	Zinc as Zn (mg/L)	0.7431	0.0267	5.0

The analysis result of Jayant Mine Sump water indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

The analysis result of Jayant STP water indicates that all the analyzed values except nitrate were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.8 Characteristics of Effluents of Surya Nala

The characteristics of effluents of Surya Nala are given in Table 15.

Table 15: Physico-chemical Characteristics of Surya Nala

S.No.	Parameters	Surya Nala (Apr. 15)		Effluent Standards
		SW-5	SW-6	
1	pH	6.6	7.1	5.5-9.0
2	Electrical Conductivity (µS/cm)	354	344	-----
3	Total Hardness as $CaCO_3$ (mg/L)	120	150	-----
4	Calcium as Ca (mg/L)	36	48	-----
5	Magnesium as Mg (mg/L)	7	7	-----
6	Sodium as Na (mg/L)	25	37	-----
7	Potassium as K (mg/L)	4.6	6.2	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	85	140	-----
10	Chloride as Cl (mg/L)	28	28	-----
11	Fluoride as F (mg/L)	**5.0**	Nil	2.0
12	Nitrate as NO_3-N (mg/L)	**10.2**	4.3	10
13	Sulfate as SO_4 (mg/L)	36	10	-----
14	Phosphate as P (mg/L)	1	ND	5.0
15	Silica as SiO_2 (mg/L)	15	22	-----
16	Total Arsenic as As (mg/L)	0.0029	0.0026	0.20
17	Aluminium as Al (mg/L)	0.4626	0.7668	-----
18	Total Chromium as Cr (mg/L)	0.0339	0.0358	2.0
19	Copper as Cu (mg/L)	0.0159	0.0156	3.0
20	Iron as Fe (mg/L)	**3.2027**	1.5442	3.0

21	Lead as Pb (mg/L)	0.0104	0.0088	0.1
22	Manganese as Mn (mg/L)	0.7184	0.6069	2.0
23	Mercury as Hg (mg/L)	0.0009	0.0009	0.01
24	Cobalt as Co (mg/L)	0.0032	0.0033	-----
25	Cadmium as Cd (mg/L)	0.0006	0.0003	2.0
26	Nickel as Ni (mg/L)	0.0231	0.0251	3.0
27	Zinc as Zn (mg/L)	0.1087	0.0658	5.0
28	Selenium as Se (mg/L)	0.0018	0.0015	0.05
29	Dissolved Oxygen (mg/L)	8.6	5.9	----
30	BOD (mg/L)	3.1	2.9	30
31	COD (mg/L)	19	12	250
32	Fecal Coliform (MPN/100 ml)	1100	100	-----
33	Total Coliform (MPN/100 ml)	3500	400	-----

The analysis result of Surya Nala indicates that all the analyzed values except fluoride, nitrate and iron were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

Fluoride, nitrate, and iron were also reduced to acceptable values after traveling some distance. This may be due to precipitation and adsorption of fluoride and iron, and denitrification of nitrate.

7.1.9 Characteristics of Janturia Nala

The characteristics of Janturia Nala are given in Table 16.

Table 16: Physico-chemical Characteristics of Janturia Nala

S. No.	Parameters	Janturia Nala (SW-7)	Effluent Standards
		Apr. 15	
1	pH	7.2	5.5-9.0
2	Electrical Conductivity (µS/cm)	250	-----
3	Total Hardness as $CaCO_3$ (mg/L)	60	-----
4	Calcium as Ca (mg/L)	20	-----
5	Magnesium as Mg (mg/L)	2	-----
6	Sodium as Na (mg/L)	30	-----
7	Potassium as K (mg/L)	8.9	-----
8	Carbonate as CO_3 (mg/L)	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	49	-----
10	Chloride as Cl (mg/L)	14	-----
11	Fluoride as F (mg/L)	0.55	2.0
12	Nitrate as NO_3-N (mg/L)	2.1	10
13	Sulfate as SO_4 (mg/L)	60	-----

14	Phosphate as P (mg/L)	ND	5.0
15	Silica as SiO_2 (mg/L)	30	-----
16	Total Arsenic as As (mg/L)	0.0011	0.20
17	Aluminium as Al (mg/L)	0.7711	-----
18	Total Chromium as Cr (mg/L)	0.0328	2.0
19	Copper as Cu (mg/L)	0.0099	3.0
20	Iron as Fe (mg/L)	1.5397	3.0
21	Lead as Pb (mg/L)	0.0059	0.1
22	Manganese as Mn (mg/L)	0.1109	2.0
23	Mercury as Hg (mg/L)	0.0009	0.01
24	Cobalt as Co (mg/L)	0.0095	-----
25	Cadmium as Cd (mg/L)	0.0003	2.0
26	Nickel as Ni (mg/L)	0.0290	3.0
27	Zinc as Zn (mg/L)	0.0716	5.0
28	Selenium as Se (mg/L)	0.0008	0.05
29	Dissolved Oxygen (mg/L)	5.7	----
30	BOD (mg/L)	3.5	30
31	COD (mg/L)	21	250
32	Fecal Coliform (MPN/100 ml)	1400	-----
33	Total Coliform (MPN/100 ml)	3500	-----

The analysis result of Janturia Nala indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.10 Characteristics of Vindhyanagar Ash Dyke Overflow

The characteristics of Vindhyanagar Ash Dyke Overflow are given in Table 17.

Table 17: Physico-chemical Characteristics of Vindhyanagar Ash Dyke Overflow

S. No.	Parameters	V. N. Ash Dyke (SW-8)	Effluent Standards
		Apr. 15	
1	pH	7.4	5.5-9.0
2	Electrical Conductivity (µS/cm)	471	-----
3	Total Hardness as $CaCO_3$ (mg/L)	170	-----
4	Calcium as Ca (mg/L)	28	-----
5	Magnesium as Mg (mg/L)	24	-----
6	Sodium as Na (mg/L)	45	-----
7	Potassium as K (mg/L)	9	-----
8	Carbonate as CO_3 (mg/L)	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	214	-----
10	Chloride as Cl (mg/L)	50	-----
11	Fluoride as F (mg/L)	ND	2.0

12	Nitrate as NO_3-N (mg/L)	0.8	10
13	Sulfate as SO_4 (mg/L)	30	-----
14	Phosphate as P (mg/L)	ND	5.0
15	Silica as SiO_2 (mg/L)	27	-----
16	Total Arsenic as As (mg/L)	0.0101	0.20
17	Aluminium as Al (mg/L)	2.1359	-----
18	Total Chromium as Cr (mg/L)	0.0408	2.0
19	Copper as Cu (mg/L)	0.0121	3.0
20	Iron as Fe (mg/L)	1.0922	3.0
21	Lead as Pb (mg/L)	0.0357	0.1
22	Manganese as Mn (mg/L)	0.1857	2.0
23	Mercury as Hg (mg/L)	0.0009	0.01
24	Cobalt as Co (mg/L)	0.0026	-----
25	Cadmium as Cd (mg/L)	0.0007	2.0
26	Nickel as Ni (mg/L)	0.0293	3.0
27	Zinc as Zn (mg/L)	0.0284	5.0
28	Selenium as Se (mg/L)	0.0097	0.05
29	Dissolved Oxygen (mg/L)	4.9	----
30	BOD (mg/L)	2.4	30
31	COD (mg/L)	6	250
32	Fecal Coliform (MPN/100 ml)	100	-----
33	Total Coliform (MPN/100 ml)	500	-----

The analysis result of Vindhyanagar Ash Dyke Overflow indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.11 Characteristics of Shaktinagar Ash Dyke Overflow

The characteristics of Shaktinagar Ash Dyke Overflow are given in Table 18.

Table 18: Physico-chemical Characteristics of Shaktinagar Ash Dyke Overflow

S. No.	Parameters	S. N. Ash Dyke (SW-9)	Effluent Standards
		Apr. 15	
1	pH	7.2	5.5-9.0
2	Electrical Conductivity (µS/cm)	241	-----
3	Total Hardness as $CaCO_3$ (mg/L)	100	-----
4	Calcium as Ca (mg/L)	24	-----
5	Magnesium as Mg (mg/L)	10	-----
6	Sodium as Na (mg/L)	16	-----
7	Potassium as K (mg/L)	5.3	-----

8	Carbonate as CO_3 (mg/L)	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	98	-----
10	Chloride as Cl (mg/L)	21	-----
11	Fluoride as F (mg/L)	ND	2.0
12	Nitrate as NO_3-N (mg/L)	0.1	10
13	Sulfate as SO_4 (mg/L)	30	-----
14	Phosphate as P (mg/L)	ND	5.0
15	Silica as SiO_2 (mg/L)	19	-----
16	Total Arsenic as As (mg/L)	0.0069	0.20
17	Aluminium as Al (mg/L)	2.6363	-----
18	Total Chromium as Cr (mg/L)	0.0329	2.0
19	Copper as Cu (mg/L)	0.0154	3.0
20	Iron as Fe (mg/L)	0.9834	3.0
21	Lead as Pb (mg/L)	0.0172	0.1
22	Manganese as Mn (mg/L)	0.0642	2.0
23	Mercury as Hg (mg/L)	0.0009	0.01
24	Cobalt as Co (mg/L)	0.0023	-----
25	Cadmium as Cd (mg/L)	0.0006	2.0
26	Nickel as Ni (mg/L)	0.0255	3.0
27	Zinc as Zn (mg/L)	0.0395	5.0
28	Selenium as Se (mg/L)	0.0066	0.05
29	Dissolved Oxygen (mg/L)	7.5	----
30	BOD (mg/L)	1.6	30
31	COD (mg/L)	6	250
32	Fecal Coliform (MPN/100 ml)	ND	-----
33	Total Coliform (MPN/100 ml)	ND	-----

The analysis result of Shaktinagar Ash Dyke Overflow indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.12 Characteristics of Sasan Power Drain

The characteristics of Sasan Power Drain are given in Table 19.

Table 19: Physico-chemical Characteristics of Sasan Power Drain

S. No.	Parameters	Sasan Power Drain (SW-10)	Effluent Standards
		Apr. 15	
1	pH	7.8	5.5-9.0
2	Electrical Conductivity (µS/cm)	632	-----
3	Total Hardness as $CaCO_3$ (mg/L)	190	-----
4	Calcium as Ca (mg/L)	56	-----
5	Magnesium as Mg (mg/L)	12	-----
6	Sodium as Na (mg/L)	78	-----
7	Potassium as K (mg/L)	9.7	-----
8	Carbonate as CO_3 (mg/L)	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	268	-----
10	Chloride as Cl (mg/L)	57	-----
11	Fluoride as F (mg/L)	ND	2.0
12	Nitrate as NO_3-N (mg/L)	1.5	10
13	Sulfate as SO_4 (mg/L)	60	-----
14	Phosphate as P (mg/L)	0.1	5.0
15	Silica as SiO_2 (mg/L)	36	-----
16	Total Arsenic as As (mg/L)	0.0021	0.20
17	Aluminium as Al (mg/L)	0.7464	-----
18	Total Chromium as Cr (mg/L)	0.0299	2.0
19	Copper as Cu (mg/L)	0.0102	3.0
20	Iron as Fe (mg/L)	0.6262	3.0
21	Lead as Pb (mg/L)	0.0039	0.1
22	Manganese as Mn (mg/L)	0.1215	2.0
23	Mercury as Hg (mg/L)	0.0009	0.01
24	Cobalt as Co (mg/L)	0.0009	-----
25	Cadmium as Cd (mg/L)	0.0004	2.0
26	Nickel as Ni (mg/L)	0.0208	3.0
27	Zinc as Zn (mg/L)	0.0198	5.0
28	Selenium as Se (mg/L)	0.0019	0.05
29	Dissolved Oxygen (mg/L)	7.5	----
30	BOD (mg/L)	2.6	30
31	COD (mg/L)	11	250
32	Fecal Coliform (MPN/100 ml)	200	-----
33	Total Coliform (MPN/100 ml)	900	-----

The analysis result of Sasan Power Drain indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.13 Characteristics of Effluents of Lanco/Anpara Ash Dyke

The characteristics of effluents of Lanco/Anpara Ash Dyke are given in Table 20.

Table 20: Physico-chemical Characteristics of Lanco/Anpara Ash Dyke

S.No.	Parameters	Lanco Ash Dyke (SW-11)		Effluent Standards
		Jan. 15	Apr. 15	
1	pH	8.0	7.3	5.5-9.0
2	Electrical Conductivity (µS/cm)	265	235	-----
3	Total Hardness as $CaCO_3$ (mg/L)	100	90	-----
4	Calcium as Ca (mg/L)	30	24	-----
5	Magnesium as Mg (mg/L)	6.1	7	-----
6	Sodium as Na (mg/L)	9.2	11	-----
7	Potassium as K (mg/L)	4.6	4.6	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	31	61	-----
10	Chloride as Cl (mg/L)	7.1	14	-----
11	Fluoride as F (mg/L)	**3.25**	**3.4**	2.0
12	Nitrate as NO_3-N (mg/L)	ND	ND	10
13	Sulfate as SO_4 (mg/L)	80	42	-----
14	Phosphate as P (mg/L)	0.5	ND	5.0
15	Silica as SiO_2 (mg/L)	21	19	-----
16	Total Arsenic as As (mg/L)	0.0343	0.0295	0.20
17	Aluminium as Al (mg/L)	5.546	4.9462	-----
18	Total Chromium as Cr (mg/L)	0.0530	0.0312	2.0
19	Copper as Cu (mg/L)	0.0084	0.0133	3.0
20	Iron as Fe (mg/L)	2.559	1.6626	3.0
21	Lead as Pb (mg/L)	0.0120	0.0138	0.1
22	Manganese as Mn (mg/L)	0.0942	0.0576	2.0
23	Mercury as Hg (mg/L)	0.0017	0.0014	0.01
24	Cobalt as Co (mg/L)	0.0037	0.0039	-----
25	Cadmium as Cd (mg/L)	0.0035	0.0005	2.0
26	Nickel as Ni (mg/L)	0.0375	0.0290	3.0
27	Zinc as Zn (mg/L)	0.0423	0.0284	5.0
28	Selenium as Se (mg/L)	NA	0.0123	0.05
29	Dissolved Oxygen (mg/L)	-----	8.2	----
30	BOD (mg/L)	-----	1.0	30
31	COD (mg/L)	-----	3.0	250

32	Fecal Coliform (MPN/100 ml)	-----	ND	-----
33	Total Coliform (MPN/100 ml)	-----	400	-----

The analysis result of Lanco Ash Dyke overflow indicates that the all the analyzed values except fluoride were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.14 Characteristics of Rihand Reservoir

The characteristics of Rihand Reservoir are given in Table 21.

Table 21: Physico-chemical Characteristics of Rihand Reservoir

Sr. No.	Parameters	Jan. 15	April 15				
		SW-12	SW-12	SW-13	SW-14	SW-15	SW-16
1	pH	8.14	7.7	7.6	7.3	7.5	7.8
2	Electrical Conductivity (µS/cm)	180	147	146	175	159	162
3	Total Hardness as $CaCO_3$ (mg/L)	65	50	55	75	70	70
4	Calcium as Ca (mg/L)	16	20	20	24	16	16
5	Magnesium as Mg (mg/L)	3.1	ND	1.2	3.6	9.6	7.2
6	Sodium as Na (mg/L)	7.0	8.6	8.5	8	11	11
7	Potassium as K (mg/L)	2.0	2.3	2.3	2.8	3.0	3.1
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
9	Bicarbonate as HCO_3 (mg/L)	73	49	61	79	67	67
10	Chloride as Cl (mg/L)	7.1	14	7	14	21	21
11	Fluoride as F (mg/L)	0.39	0.53	0.43	0.6	ND	ND
12	Nitrate as NO_3 (mg/L)	ND	ND	1.1	1.6	0.7	0.5
13	Sulfate as SO_4 (mg/L)	14	12	13	10	ND	ND
14	Phosphate as PO_4 (mg/L)	ND	ND	ND	ND	ND	0.04
15	Silica as SiO_2 (mg/L)	49	17	11	11	17	17
16	Total Arsenic as As (mg/L)	0.0005	0.0011	0.0012	0.0017	0.0014	0.0010
17	Aluminium as Al (mg/L)	**0.238**	**0.2069**	**0.3169**	**0.6058**	**0.5716**	**0.2071**
18	Total Chromium as Cr (mg/L)	**0.0448**	0.0323	0.0339	0.0352	0.0339	0.0323
19	Copper as Cu (mg/L)	0.0060	0.0076	0.0090	0.0146	0.0093	0.0075
20	Iron as Fe (mg/L)	**0.764**	0.2387	**0.4197**	**0.7274**	**0.5967**	0.2667
21	Lead as Pb (mg/L)	0.0083	0.0042	0.0034	**0.0127**	0.0058	0.0037
22	Manganese as Mn (mg/L)	**0.2617**	0.0178	0.0554	**0.1611**	0.0595	0.0247
23	Mercury as Hg (mg/L)	**0.012**	**0.0010**	**0.00099**	0.0008	0.0008	0.0008
24	Cobalt as Co (mg/L)	0.0009	0.0005	0.0008	0.0009	0.0008	0.0005
25	Cadmium as Cd (mg/L)	**0.0029**	0.0002	0.0003	0.0010	0.0002	0.0002
26	Nickel as Ni (mg/L)	**0.0228**	0.0184	0.0193	**0.0208**	0.0186	0.0172
27	Zinc as Zn (mg/L)	0.0609	0.0104	0.0280	0.0295	0.0140	0.0079
28	Selenium as Se (mg/L)	-----	0.0008	0.0007	0.0007	0.0009	0.0007
29	Dissolved Oxygen (mg/L)	-----	8.4	7.8	8.4	8.0	7.8
30	BOD (mg/L)	-----	2.2	1.8	2.0	1.8	2.7

31	COD (mg/L)	-----	11	8	11	7	11
32	Fecal Coliform (MPN/100 ml)	-----	**200**	**100**	**300**	**300**	**200**
33	Total Coliform (MPN/100 ml)	-----	**900**	**500**	**800**	**1700**	**1500**

NR – No Relaxation

Table 21: Contd.

Sr. No.	Parameters	April 15		July 15	IS 10500:2012 Standard	
		SW-17	SW-18	SW-24	Acceptable	Permissible
1	pH	7.8	7.6	8.2	6.5 – 8.5	NR
2	Electrical Conductivity (µS/cm)	247	184	164	-----	-----
3	Total Hardness as $CaCO_3$ (mg/L)	100	70	60	200	600
4	Calcium as Ca (mg/L)	32	20	12	75	200
5	Magnesium as Mg (mg/L)	4.8	4.9	7.3	30	100
6	Sodium as Na (mg/L)	12	9.7	9.2	-----	-----
7	Potassium as K (mg/L)	3	2.4	3.0	-----	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	-----	-----
9	Bicarbonate as HCO_3 (mg/L)	85	49	49	-----	-----
10	Chloride as Cl (mg/L)	21	28	11	250	1000
11	Fluoride as F (mg/L)	ND	0.4	0.6	1.0	1.5
12	Nitrate as NO_3 (mg/L)	ND	ND	7.7	45	NR
13	Sulfate as SO_4 (mg/L)	30	11	23	200	400
14	Phosphate as PO_4 (mg/L)	ND	0.2	ND	-----	-----
15	Silica as SiO_2 (mg/L)	24	15	16	-----	-----
16	Total Arsenic as As (mg/L)	0.0018	0.0008	-----	0.010	0.05
17	Aluminium as Al (mg/L)	**0.3069**	**0.1558**	-----	0.030	0.20
18	Total Chromium as Cr (mg/L)	0.0336	0.0325	-----	0.050	NR
19	Copper as Cu (mg/L)	0.0079	0.0070	-----	0.050	1.50
20	Iron as Fe (mg/L)	**0.3956**	0.2478	-----	0.300	NR
21	Lead as Pb (mg/L)	0.0031	0.0058	-----	0.010	NR
22	Manganese as Mn (mg/L)	0.0355	0.0513	-----	0.100	0.30
23	Mercury as Hg (mg/L)	0.0008	0.0008	-----	0.001	NR
24	Cobalt as Co (mg/L)	0.0006	0.0005	-----	-----	-----
25	Cadmium as Cd (mg/L)	0.0001	0.0002	-----	0.0030	NR
26	Nickel as Ni (mg/L)	0.0181	0.0180	-----	0.020	NR
27	Zinc as Zn (mg/L)	0.0127	0.0061	-----	5.00	15.0
28	Selenium as Se (mg/L)	0.0008	0.0009	-----	0.01	NR
29	Dissolved Oxygen (mg/L)	7.8	8.4	8.0	-----	-----
30	BOD (mg/L)	2.4	2.4	1.4	-----	-----
31	COD (mg/L)	10	11	12.3	-----	-----
32	Fecal Coliform (MPN/100 ml)	**300**	**300**	**200**	Absent	NR
33	Total Coliform (MPN/100 ml)	**1400**	**1100**	**900**	Absent	NR

NR – No Relaxation

From the above results, it is evident that the values of aluminium in all the samples exceeded the acceptable limit prescribed by BIS (2012) for drinking water. The values exceeded the permissible limit for 87% samples.

The values of iron were exceeding the acceptable limit prescribed by BIS (2012) for drinking water in 62% samples. The values of manganese exceeded the acceptable limit in two samples, but the values were within the permissible limit. Concentration of nickel also exceeded the acceptable limit for few samples and for other samples, the concentration is nearing towards the acceptable limit.

The values of mercury were higher in the reservoir samples near the ash dykes. The samples collected from reservoir (in proximity to Lanco/Anpara Ash Dyke) were high in mercury concentration exceeding the acceptable limit prescribed by BIS (2012) for drinking water. Mercury was detected in all the samples and the concentration is nearing to the prescribed limit and is a matter of concern.

Total and fecal coliforms were also detected in the reservoir water. The water should be used for drinking water supplies after proper disinfection.

7.1.15 Characteristics of a Channel below Rihand River Bridge

The characteristics of Channel flowing below Rihand River Bridge are given in Table 22.

Table 22: Physico-chemical Characteristics of Channel below Rihand Reservoir

Sr. No.	Parameters	April 15	IS 10500:2012 Standard	
		SW-19	Acceptable	Permissible
1	pH	7.9	6.5 – 8.5	NR
2	Electrical Conductivity (µS/cm)	900	-----	-----
3	Total Hardness as $CaCO_3$ (mg/L)	320	200	600
4	Calcium as Ca (mg/L)	76	75	200
5	Magnesium as Mg (mg/L)	32	30	100
6	Sodium as Na (mg/L)	73	-----	-----
7	Potassium as K (mg/L)	11	-----	-----
8	Carbonate as CO_3 (mg/L)	Nil	-----	-----
9	Bicarbonate as HCO_3 (mg/L)	250	-----	-----
10	Chloride as Cl (mg/L)	74	250	1000
11	Fluoride as F (mg/L)	3.3	1.0	1.5
12	Nitrate as NO_3 (mg/L)	4.5	45	NR
13	Sulfate as SO_4 (mg/L)	178	200	400
14	Phosphate as PO_4 (mg/L)	ND	-----	-----
15	Silica as SiO_2 (mg/L)	24	-----	-----
16	Total Arsenic as As (mg/L)	0.0018	0.010	0.05
17	Aluminium as Al (mg/L)	**0.2270**	0.030	0.20
18	Total Chromium as Cr (mg/L)	0.0284	0.050	NR
19	Copper as Cu (mg/L)	0.0074	0.050	1.50
20	Iron as Fe (mg/L)	**0.4199**	0.300	NR
21	Lead as Pb (mg/L)	0.0070	0.010	NR
22	Manganese as Mn (mg/L)	0.0283	0.100	0.30

23	Mercury as Hg (mg/L)	0.0009	0.001	NR
24	Cobalt as Co (mg/L)	0.00070	-----	-----
25	Cadmium as Cd (mg/L)	0.0001	0.0030	NR
26	Nickel as Ni (mg/L)	0.0162	0.020	NR
27	Zinc as Zn (mg/L)	0.0199	5.00	15.0
28	Selenium as Se (mg/L)	0.0011	0.01	NR
29	Dissolved Oxygen (mg/L)	6.7	-----	-----
30	BOD (mg/L)	2.9	-----	-----
31	COD (mg/L)	17	-----	-----
32	Fecal Coliform (MPN/100 ml)	**200**	Absent	NR
33	Total Coliform (MPN/100 ml)	**800**	Absent	NR

NR – No Relaxation

From the above results, it is evident that the values of aluminium and iron for the channel flowing below Rihand River Bridge were exceeding the acceptable limit prescribed by BIS (2012) for drinking water.

7.1.16 Characteristics of Rihand & Renu River

The characteristics of Rihand & Renu River are given in Table 23.

Table 23: Physico-chemical Characteristics of Rihand & Renu River

Sr. No.	Parameters	April 15		IS 10500:2012 Standard	
		SW-20	SW-21	Acceptable	Permissible
1	pH	7.9	7.9	6.5 – 8.5	NR
2	Electrical Conductivity (µS/cm)	170	200	-----	-----
3	Total Hardness as $CaCO_3$ (mg/L)	70	70	200	600
4	Calcium as Ca (mg/L)	20	12	75	200
5	Magnesium as Mg (mg/L)	4.9	9.7	30	100
6	Sodium as Na (mg/L)	9.3	8	-----	-----
7	Potassium as K (mg/L)	3.0	2.3	-----	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	-----	-----
9	Bicarbonate as HCO_3 (mg/L)	85	61	-----	-----
10	Chloride as Cl (mg/L)	7	21	250	1000
11	Fluoride as F (mg/L)	0.3	0.6	1.0	1.5
12	Nitrate as NO_3 (mg/L)	0.8	0.4	45	NR
13	Sulfate as SO_4 (mg/L)	12	11	200	400
14	Phosphate as PO_4 (mg/L)	ND	ND	-----	-----
15	Silica as SiO_2 (mg/L)	16	16	-----	-----
16	Total Arsenic as As (mg/L)	0.0008	0.0008	0.010	0.05
17	Aluminium as Al (mg/L)	**0.1508**	**0.1438**	0.030	0.20
18	Total Chromium as Cr (mg/L)	0.0329	0.0292	0.050	NR

19	Copper as Cu (mg/L)	0.0089	0.0064	0.050	1.50
20	Iron as Fe (mg/L)	**0.2998**	0.2028	0.300	NR
21	Lead as Pb (mg/L)	0.0033	0.0035	0.010	NR
22	Manganese as Mn (mg/L)	**0.1022**	0.0175	0.100	0.30
23	Mercury as Hg (mg/L)	0.0009	**0.0015**	0.001	NR
24	Cobalt as Co (mg/L)	0.0006	0.0005	-----	-----
25	Cadmium as Cd (mg/L)	0.0001	0.0001	0.0030	NR
26	Nickel as Ni (mg/L)	0.0172	0.0165	0.020	NR
27	Zinc as Zn (mg/L)	0.0164	0.0093	5.00	15.0
28	Selenium as Se (mg/L)	0.0005	0.0013	0.01	NR
29	Dissolved Oxygen (mg/L)	8.2	7.1	-----	-----
30	BOD (mg/L)	2.2	1.8	-----	-----
31	COD (mg/L)	8	12	-----	-----
32	Fecal Coliform (MPN/100 ml)	**200**	**100**	Absent	NR
33	Total Coliform (MPN/100 ml)	**700**	**600**	Absent	NR

NR – No Relaxation

From the above results, it is evident that the values of aluminium, iron, and manganese for Rihand River were exceeding the acceptable limit prescribed by BIS (2012) for drinking water.

For Renu River, concentration of aluminium and mercury were exceeding the acceptable limit prescribed by BIS (2012) for drinking water.

7.1.17 Characteristics of Chilka Lake, Shaktinagar & Ashram Talab, Govindpur

The characteristics of Chilka lake & Ashram Talab are given in Table 24.

Table 24: Physico-chemical Characteristics of Chilka lake & Ashram Talab

Sr. No.	Parameters	April 15		IS 10500:2012 Standard	
		SW-22	SW-23	Acceptable	Permissible
1	pH	7.4	8.9	6.5 – 8.5	NR
2	Electrical Conductivity (µS/cm)	310	525	-----	-----
3	Total Hardness as $CaCO_3$ (mg/L)	100	60	200	600
4	Calcium as Ca (mg/L)	24	12	75	200
5	Magnesium as Mg (mg/L)	9.7	7.3	30	100
6	Sodium as Na (mg/L)	30	94	-----	-----
7	Potassium as K (mg/L)	3.9	4.5	-----	-----
8	Carbonate as CO_3 (mg/L)	Nil	54	-----	-----
9	Bicarbonate as HCO_3 (mg/L)	122	122	-----	-----
10	Chloride as Cl (mg/L)	28	35	250	1000

11	Fluoride as F (mg/L)	0.6	**3.6**	1.0	1.5
12	Nitrate as NO_3 (mg/L)	1.8	8.8	45	NR
13	Sulfate as SO_4 (mg/L)	25	20	200	400
14	Phosphate as PO_4 (mg/L)	ND	ND	-----	-----
15	Silica as SiO_2 (mg/L)	20	10	-----	-----
16	Total Arsenic as As (mg/L)	0.0018	0.0019	0.010	0.05
17	Aluminium as Al (mg/L)	**0.1404**	**0.3342**	0.030	0.20
18	Total Chromium as Cr (mg/L)	0.0320	0.0311	0.050	NR
19	Copper as Cu (mg/L)	0.0091	0.0078	0.050	1.50
20	Iron as Fe (mg/L)	**0.4001**	**0.3045**	0.300	NR
21	Lead as Pb (mg/L)	**0.0351**	0.0042	0.010	NR
22	Manganese as Mn (mg/L)	0.0722	0.0642	0.100	0.30
23	Mercury as Hg (mg/L)	**0.0011**	0.0009	0.001	NR
24	Cobalt as Co (mg/L)	0.0005	0.0007	-----	-----
25	Cadmium as Cd (mg/L)	0.0008	0.0001	0.0030	NR
26	Nickel as Ni (mg/L)	0.0184	0.0185	0.020	NR
27	Zinc as Zn (mg/L)	0.0138	0.0118	5.00	15.0
28	Selenium as Se (mg/L)	0.0009	0.0015	0.01	NR
29	Dissolved Oxygen (mg/L)	8.6	8.2	-----	-----
30	BOD (mg/L)	2.2	7.7	-----	-----
31	COD (mg/L)	11	39	-----	-----
32	Fecal Coliform (MPN/100 ml)	200	1400	Absent	NR
33	Total Coliform (MPN/100 ml)	700	3900	Absent	NR

NR – No Relaxation

From the above results, it is evident that the values of aluminium, iron, lead, and mercury for Chilka Lake were exceeding the acceptable limit prescribed by BIS (2012) for drinking water.

For Ashram Talab, concentration of aluminium, iron and fluoride were exceeding the acceptable limit prescribed by BIS (2012) for drinking water.

7.1.18 Characteristics of Kachan & Mayyar River

The characteristics of Kachan & Mayyar River are given in Table 25.

Table 25: Physico-chemical Characteristics of Kachan & Mayyar River

Sr. No.	Parameters	July 15		IS 10500:2012 Standard	
		SW-25	SW-26	Acceptable	Permissible
1	pH	8.1	8.2	6.5 – 8.5	NR
2	Electrical Conductivity (µS/cm)	430	360	-----	-----
3	Total Hardness as $CaCO_3$ (mg/L)	140	120	200	600

4	Calcium as Ca (mg/L)	40	36	75	200
5	Magnesium as Mg (mg/L)	10	7.3	30	100
6	Sodium as Na (mg/L)	40	32	-----	-----
7	Potassium as K (mg/L)	2.7	4.4	-----	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	-----	-----
9	Bicarbonate as HCO_3 (mg/L)	195	183	-----	-----
10	Chloride as Cl (mg/L)	21	18	250	1000
11	Fluoride as F (mg/L)	0.5	0.6	1.0	1.5
12	Nitrate as NO_3 (mg/L)	1.6	2.0	45	NR
13	Sulfate as SO_4 (mg/L)	34	11	200	400
14	Phosphate as PO_4 (mg/L)	ND	ND	-----	-----
15	Silica as SiO_2 (mg/L)	23	26	-----	-----
16	Total Arsenic as As (mg/L)	-----	-----	0.010	0.05
17	Aluminium as Al (mg/L)	-----	-----	0.030	0.20
18	Total Chromium as Cr (mg/L)	-----	-----	0.050	NR
19	Copper as Cu (mg/L)	-----	-----	0.050	1.50
20	Iron as Fe (mg/L)	-----	-----	0.300	NR
21	Lead as Pb (mg/L)	-----	-----	0.010	NR
22	Manganese as Mn (mg/L)	-----	-----	0.100	0.30
23	Mercury as Hg (mg/L)	-----	-----	0.001	NR
24	Cobalt as Co (mg/L)	-----	-----	-----	-----
25	Cadmium as Cd (mg/L)	-----	-----	0.0030	NR
26	Nickel as Ni (mg/L)	-----	-----	0.020	NR
27	Zinc as Zn (mg/L)	-----	-----	5.00	15.0
28	Selenium as Se (mg/L)	-----	-----	0.01	NR
29	Dissolved Oxygen (mg/L)	7.5	7.1	-----	-----
30	BOD (mg/L)	1.8	1.9	-----	-----
31	COD (mg/L)	17.8	6.0	-----	-----
32	Fecal Coliform (MPN/100 ml)	**300**	**200**	Absent	NR
33	Total Coliform (MPN/100 ml)	**1200**	**900**	Absent	NR

NR – No Relaxation

From the above results for Kachan & Mayyar River, it is evident that all the analyzed parameters except TC and FC were well within the acceptable limit prescribed by BIS (2012) for drinking water.

7.1.19 Characteristics of Drain from Settling Pit & Sedimentation Pond of Moher & Moher Coal Mine

The characteristics of drain from settling pit & sedimentation pond of Moher & Moher Coal Mine are given in Table 26.

Table 26: Physico-chemical Characteristics of Settling Pit & sedimentation Pond of Moher & Moher Coal Mine

Sr. No.	Parameters	July 15		Effluent Standards
		SW-27	SW-28	
1	pH	7.4	8.8	5.5-9.0
2	Electrical Conductivity (µS/cm)	1620	456	-----
3	Total Hardness as $CaCO_3$ (mg/L)	320	110	-----
4	Calcium as Ca (mg/L)	108	32	-----
5	Magnesium as Mg (mg/L)	12	7.3	-----
6	Sodium as Na (mg/L)	240	47	-----
7	Potassium as K (mg/L)	11	7.1	-----
8	Carbonate as CO_3 (mg/L)	Nil	24	-----
9	Bicarbonate as HCO_3 (mg/L)	79	12	-----
10	Chloride as Cl (mg/L)	355	46	-----
11	Fluoride as F (mg/L)	0.6	1.8	2.0
12	Nitrate as NO_3 (mg/L)	5.8	1.9	10
13	Sulfate as SO_4 (mg/L)	267	102	-----
14	Phosphate as PO_4 (mg/L)	ND	ND	5.0
15	Silica as SiO_2 (mg/L)	14	8	-----
16	Total Arsenic as As (mg/L)	-----	-----	0.20
17	Aluminium as Al (mg/L)	-----	-----	-----
18	Total Chromium as Cr (mg/L)	-----	-----	2.0
19	Copper as Cu (mg/L)	-----	-----	3.0
20	Iron as Fe (mg/L)	-----	-----	3.0
21	Lead as Pb (mg/L)	-----	-----	0.1
22	Manganese as Mn (mg/L)	-----	-----	2.0
23	Mercury as Hg (mg/L)	-----	-----	0.01
24	Cobalt as Co (mg/L)	-----	-----	-----
25	Cadmium as Cd (mg/L)	-----	-----	2.0
26	Nickel as Ni (mg/L)	-----	-----	3.0
27	Zinc as Zn (mg/L)	-----	-----	5.0
28	Selenium as Se (mg/L)	-----	-----	0.05
29	Dissolved Oxygen (mg/L)	-----	-----	----
30	BOD (mg/L)	-----	-----	30
31	COD (mg/L)	23.8	13.6	250
32	Fecal Coliform (MPN/100 ml)	-----	-----	-----
33	Total Coliform (MPN/100 ml)	-----	-----	-----

NR – No Relaxation

The analysis result of settling pit & Sedimentation pond of Moher & Moher Coal Mine indicates that the all the analyzed were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7.1.20 Characteristics of Kavya Nala

The characteristics of Kavya Nala are given in Table 27.

Table 27: Physico-chemical Characteristics of Kavya Nala

Sr. No.	Parameters	July 15	Effluent Standards
		SW-29	
1	pH	8.1	5.5-9.0
2	Electrical Conductivity (µS/cm)	635	-----
3	Total Hardness as $CaCO_3$ (mg/L)	220	
4	Calcium as Ca (mg/L)	56	-----
5	Magnesium as Mg (mg/L)	19	-----
6	Sodium as Na (mg/L)	60	-----
7	Potassium as K (mg/L)	1.2	-----
8	Carbonate as CO_3 (mg/L)	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	207	-----
10	Chloride as Cl (mg/L)	43	-----
11	Fluoride as F (mg/L)	1.9	2.0
12	Nitrate as NO_3 (mg/L)	1.4	10
13	Sulfate as SO_4 (mg/L)	108	-----
14	Phosphate as PO_4 (mg/L)	ND	5.0
15	Silica as SiO_2 (mg/L)	34	-----
16	Total Arsenic as As (mg/L)	-----	0.20
17	Aluminium as Al (mg/L)	-----	-----
18	Total Chromium as Cr (mg/L)	-----	2.0
19	Copper as Cu (mg/L)	-----	3.0
20	Iron as Fe (mg/L)	-----	3.0
21	Lead as Pb (mg/L)	-----	0.1
22	Manganese as Mn (mg/L)	-----	2.0
23	Mercury as Hg (mg/L)	-----	0.01
24	Cobalt as Co (mg/L)	-----	-----
25	Cadmium as Cd (mg/L)	-----	2.0
26	Nickel as Ni (mg/L)	-----	3.0
27	Zinc as Zn (mg/L)	-----	5.0
28	Selenium as Se (mg/L)	-----	0.05
29	Dissolved Oxygen (mg/L)	7.5	----
30	BOD (mg/L)	0.8	30

31	COD (mg/L)	5.3	250
32	Fecal Coliform (MPN/100 ml)	100	-----
33	Total Coliform (MPN/100 ml)	700	-----

NR – No Relaxation

The analysis result of Kavya Nala indicates that the all the analyzed were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water. The fluoride concentration in the drain was nearing towards the discharge limit.

7.2 Characteristics of Groundwater Samples

In order to see the impact of various industrial activities on the groundwater quality, ten groundwater samples (G-1 to G-10) were collected and analyzed for various physico-chemical parameters and metal ions (Table 28) in January 2015. In April 2015, another 25 groundwater samples (GW-1 to GW-25) were collected (Table 29) and 15 samples (GW-26 to GW-34) were collected in July 2015 (Table 30). Samples collected in July 2015 were not analyzed for trace metals due to non working condition of the instrument (ICP-MS). Drinking water specifications prescribed by BIS are given in Annex 24. The values indicated in blue colors exceed the desirable limit and the values in red exceeded the permissible limit for drinking water.

Table 28: Physico-chemical Characteristics of Groundwater (January 2015)

S. No.	Parameters	G-1	G-2	G-3	G-4	G-5	G-6
1	pH	7.8	7.7	7.4	7.5	7.6	7.6
2	Electrical Conductivity (µS/cm)	975	500	745	900	830	820
3	Total Hardness as $CaCO_3$ (mg/L)	**255**	90	**265**	**320**	**295**	**330**
4	Calcium as Ca (mg/L)	64	34	60	**90**	70	**80**
5	Magnesium as Mg (mg/L)	23	1.2	28	23	29	**32**
6	Sodium as Na (mg/L)	109	80	60	79	50	28
7	Potassium as K (mg/L)	2.6	0.5	1.6	3.5	3.7	1.1
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
9	Bicarbonate as HCO_3 (mg/L)	421	262	256	464	421	415
10	Chloride as Cl (mg/L)	50	14	46	50	18	28
11	Fluoride as F (mg/L)	**3.1**	**6.7**	**1.5**	0.68	0.84	0.76
12	Nitrate as NO_3 (mg/L)	**50**	3.8	**45**	9.1	11	ND
13	Sulfate as SO_4 (mg/L)	45	17	70	34	22	20
14	Phosphate as PO_4 (mg/L)	ND	ND	ND	ND	ND	ND
15	Silica as SiO_2 (mg/L)	66	49	40	25	32	39
16	Total Arsenic as As (mg/L)	0.0045	0.0017	0.0072	0.0053	0.0004	0.0030
17	Aluminium as Al (mg/L)	**0.421**	**0.707**	**0.539**	**0.672**	**0.374**	**0.786**
18	Total Chromium as Cr (mg/L)	**0.0500**	**0.0593**	**0.0501**	0.0461	**0.0534**	**0.0514**
19	Copper as Cu (mg/L)	0.0168	0.0172	0.0096	0.0173	0.0151	0.0056
20	Iron as Fe (mg/L)	**1.004**	**1.158**	**1.705**	**2.149**	**1.713**	**1.913**
21	Lead as Pb (mg/L)	**0.0105**	**0.0110**	**0.0107**	**0.0158**	**0.0145**	**0.0497**
22	Manganese as Mn (mg/L)	**0.401**	**0.149**	0.0812	**1.0202**	**0.1687**	**0.1504**
23	Mercury as Hg (mg/L)	**0.0197**	**0.0038**	**0.0012**	**0.0013**	**0.0018**	**0.0017**
24	Cobalt as Co (mg/L)	0.0009	0.0008	0.0009	0.0013	0.0008	0.0013
25	Cadmium as Cd (mg/L)	**0.0053**	**0.0065**	**0.0084**	0.0007	0.0005	0.0014
26	Nickel as Ni (mg/L)	**0.0208**	**0.0241**	**0.0257**	**0.0252**	**0.0258**	**0.0254**
27	Zinc as Zn (mg/L)	0.0829	0.0758	0.4245	0.2915	0.4923	1.0758

Table 28: Contd.

S. No.	Parameters	G-7	G-8	G-9	G-10	Permissible Limit - BIS
1	pH	7.5	7.6	7.4	6.9	6.5-8.5
2	Electrical Conductivity (µS/cm)	780	680	1730	200	-----
3	Total Hardness as $CaCO_3$ (mg/L)	**265**	**270**	**450**	40	600
4	Calcium as Ca (mg/L)	**88**	**98**	**104**	10	200
5	Magnesium as Mg (mg/L)	11	6.1	**46**	3.6	100
6	Sodium as Na (mg/L)	53	24	188	25	-----
7	Potassium as K (mg/L)	0.6	0.6	0.6	0.02	-----
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	Nil	-----
9	Bicarbonate as HCO_3 (mg/L)	397	342	616	73	-----
10	Chloride as Cl (mg/L)	18	18	124	14	1000
11	Fluoride as F (mg/L)	0.64	0.52	**3.65**	0.45	1.5
12	Nitrate as NO_3 (mg/L)	ND	ND	25	1.0	45
13	Sulfate as SO_4 (mg/L)	25	25	40	10	400
14	Phosphate as PO_4 (mg/L)	ND	ND	ND	ND	-----
15	Silica as SiO_2 (mg/L)	39	25	16	15	-----
16	Total Arsenic as As (mg/L)	0.0016	0.0008	0.0007	ND	0.05
17	Aluminium as Al (mg/L)	**0.898**	**0.416**	**0.503**	**0.315**	0.20
18	Total Chromium as Cr (mg/L)	**0.0504**	0.0478	**0.0500**	0.0476	0.050
19	Copper as Cu (mg/L)	0.0035	0.0041	0.0030	0.0005	1.50
20	Iron as Fe (mg/L)	**2.282**	**0.551**	**0.778**	**0.342**	0.300
21	Lead as Pb (mg/L)	0.0104	0.0056	0.0032	0.0033	0.010
22	Manganese as Mn (mg/L)	0.0756	**0.9551**	**0.2637**	0.0279	0.30
23	Mercury as Hg (mg/L)	0.0007	**0.0035**	**0.0018**	**0.0039**	0.001
24	Cobalt as Co (mg/L)	0.0013	0.0006	0.0009	0.0005	-----
25	Cadmium as Cd (mg/L)	0.0002	**0.0031**	**0.0030**	**0.0032**	0.0030
26	Nickel as Ni (mg/L)	**0.0256**	**0.0236**	**0.0229**	**0.0231**	0.020
27	Zinc as Zn (mg/L)	0.3901	0.0987	0.0165	0.0204	15.0

Table 29: Physico-chemical Characteristics of Groundwater (April 2015)

S. No.	Parameters	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6
1	pH	7.5	8.1	7.5	7.5	7.9	6.9
2	Electrical Conductivity (µS/cm)	840	552	850	743	1020	242
3	Total Hardness as $CaCO_3$ (mg/L)	**240**	90	160	90	**400**	100
4	Calcium as Ca (mg/L)	56	28	44	32	**88**	28
5	Magnesium as Mg (mg/L)	24	4.9	12	2.4	44	**7.3**
6	Sodium as Na (mg/L)	85	89	119	130	58	7.4
7	Potassium as K (mg/L)	1.9	0.7	2.9	3.2	0.7	5
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
9	Bicarbonate as HCO_3 (mg/L)	232	268	500	268	207	122
10	Chloride as Cl (mg/L)	142	14	14	21	142	14
11	Fluoride as F (mg/L)	0.8	**7.8**	0.9	0.1	0.7	0.3
12	Nitrate as NO_3 (mg/L)	24	7.4	ND	ND	**70**	ND
13	Sulfate as SO_4 (mg/L)	29	16	8.9	127	88	4.8
14	Phosphate as PO_4 (mg/L)	0.1	0.3	0.2	0.1	0.1	ND
15	Silica as SiO_2 (mg/L)	68	58	31	7.8	36	22
16	Total Arsenic as As (mg/L)	0.0005	0.0003	0.0003	0.0003	0.0006	0.0006
17	Aluminium as Al (mg/L)	**0.1485**	**0.1051**	**0.0949**	**2.670**	**0.0967**	**0.0819**
18	Total Chromium as Cr (mg/L)	0.0317	0.0288	0.0300	0.0295	0.0255	0.0419
19	Copper as Cu (mg/L)	0.0108	0.0119	0.0089	0.0082	0.0145	0.0621
20	Iron as Fe (mg/L)	**0.4263**	**0.2955**	**1.3671**	**0.5495**	**0.7216**	**25.556**
21	Lead as Pb (mg/L)	**0.0104**	0.0091	0.0099	0.0081	0.0029	**0.0435**
22	Manganese as Mn (mg/L)	**0.3140**	0.0670	**0.1041**	0.0778	0.0993	**0.2553**
23	Mercury as Hg (mg/L)	**0.0010**	0.0009	0.0008	0.0008	**0.0011**	0.0008
24	Cobalt as Co (mg/L)	0.0008	0.0004	0.0005	0.0005	0.0007	0.0024
25	Cadmium as Cd (mg/L)	0.0004	0.0002	0.0002	0.0002	0.0001	0.0003
26	Nickel as Ni (mg/L)	0.0176	0.0153	0.0171	**0.0210**	0.0139	**0.0322**
27	Zinc as Zn (mg/L)	0.0317	0.0235	0.2183	0.3657	0.0469	0.7067
28	Selenium as Se (mg/L)	0.0008	0.0008	0.0009	0.0008	0.0007	0.0005
29	COD (mg/L)	6	8	5	8	9	5

Table 29: Contd. (April 2015)

S. No.	Parameters	GW-7	GW-8	GW-9	GW-10	GW-11	GW-12
1	pH	7.5	7.5	7.8	7.6	7.0	7.5
2	Electrical Conductivity (µS/cm)	1010	424	529	1600	207	592
3	Total Hardness as $CaCO_3$ (mg/L)	**290**	195	**240**	**350**	30	**260**
4	Calcium as Ca (mg/L)	**80**	28	48	64	8	72
5	Magnesium as Mg (mg/L)	22	**30**	29	**46**	2.4	19
6	Sodium as Na (mg/L)	94	55	50	213	35	67
7	Potassium as K (mg/L)	2.2	1	2.1	0.8	0.2	3.5
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
9	Bicarbonate as HCO_3 (mg/L)	427	268	238	586	85	281
10	Chloride as Cl (mg/L)	21	21	43	128	14	28
11	Fluoride as F (mg/L)	**1.8**	ND	ND	**3.6**	0.5	ND
12	Nitrate as NO_3 (mg/L)	21	ND	19	26	7.1	4
13	Sulfate as SO_4 (mg/L)	108	ND	50	97	6.8	50
14	Phosphate as PO_4 (mg/L)	0.3	0.2	0.1	0.2	ND	ND
15	Silica as SiO_2 (mg/L)	34	39	36	50	13	36
16	Total Arsenic as As (mg/L)	0.0004	0.0004	0.0006	0.0006	0.0003	0.0004
17	Aluminium as Al (mg/L)	**0.1030**	**0.6134**	**0.1446**	**0.1522**	**0.0899**	**0.0821**
18	Total Chromium as Cr (mg/L)	0.0280	0.0295	0.0388	0.0273	0.0327	0.0287
19	Copper as Cu (mg/L)	0.0068	0.0099	0.0092	0.0063	0.0072	0.0075
20	Iron as Fe (mg/L)	**0.6374**	**0.6108**	**0.7904**	**0.3351**	0.1891	**1.2184**
21	Lead as Pb (mg/L)	0.0052	0.0063	**0.0116**	0.0037	**0.0152**	0.0061
22	Manganese as Mn (mg/L)	0.0117	0.0519	0.0192	**0.1306**	0.0142	0.0193
23	Mercury as Hg (mg/L)	0.0007	0.0008	0.0007	0.0009	0.0007	0.0008
24	Cobalt as Co (mg/L)	0.0005	0.0008	0.0007	0.0007	0.0004	0.0005
25	Cadmium as Cd (mg/L)	0.0001	0.0002	0.0001	0.0001	0.0001	0.0005
26	Nickel as Ni (mg/L)	0.0152	0.0169	**0.0211**	0.0142	0.0177	0.0149
27	Zinc as Zn (mg/L)	0.0092	0.0340	0.0148	0.0044	0.0040	0.0907
28	Selenium as Se (mg/L)	0.0005	0.0005	0.0005	0.0012	0.0005	0.0007
29	COD (mg/L)	6	5	7	10	7	6

Table 29: Contd. (April 2015)

S. No.	Parameters	GW-13	GW-14	GW-15	GW-16	GW-17	GW-18
1	pH	7.7	7.7	7.9	7.8	7.8	7.5
2	Electrical Conductivity (µS/cm)	1166	591	732	679	680	740
3	Total Hardness as $CaCO_3$ (mg/L)	**255**	160	**210**	**240**	190	**305**
4	Calcium as Ca (mg/L)	28	**48**	24	**76**	**48**	**72**
5	Magnesium as Mg (mg/L)	44	9.6	36	12	17	**30**
6	Sodium as Na (mg/L)	117	88	106	59	73	48
7	Potassium as K (mg/L)	4	1.1	0.6	1.4	0.4	1.0
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
9	Bicarbonate as HCO_3 (mg/L)	329	256	427	238	183	256
10	Chloride as Cl (mg/L)	142	78	35	71	64	43
11	Fluoride as F (mg/L)	ND	ND	ND	ND	ND	**3.2**
12	Nitrate as NO_3 (mg/L)	4.2	ND	2.9	42	**80**	**87**
13	Sulfate as SO_4 (mg/L)	40	30	40	40	40	68
14	Phosphate as PO_4 (mg/L)	0.1	ND	0.1	ND	0.1	ND
15	Silica as SiO_2 (mg/L)	28	30	51	39	67	39
16	Total Arsenic as As (mg/L)	0.0009	0.0014	0.0006	0.0007	0.0007	0.0009
17	Aluminium as Al (mg/L)	**0.1712**	**0.1124**	**0.1525**	**0.1087**	**0.1128**	**0.1160**
18	Total Chromium as Cr (mg/L)	0.0261	0.0330	0.0282	0.0266	0.0294	0.0299
19	Copper as Cu (mg/L)	0.0067	0.0143	0.0134	0.0097	0.0069	0.0111
20	Iron as Fe (mg/L)	**0.3659**	**53.898**	**0.3961**	**1.1458**	0.2745	**0.8844**
21	Lead as Pb (mg/L)	0.0024	0.0073	**0.0304**	0.0058	0.0065	0.0073
22	Manganese as Mn (mg/L)	0.0737	**0.2338**	0.0319	0.0182	0.0079	0.0120
23	Mercury as Hg (mg/L)	0.0009	0.0009	0.0009	0.0009	0.0009	**0.0010**
24	Cobalt as Co (mg/L)	0.0006	0.0026	0.0006	0.0006	0.0005	0.0005
25	Cadmium as Cd (mg/L)	0.0001	0.0002	0.0002	0.0002	0.0001	0.0008
26	Nickel as Ni (mg/L)	0.0137	**0.0217**	0.0160	0.0145	0.0160	0.0165
27	Zinc as Zn (mg/L)	0.0091	0.0561	0.1578	0.0209	0.0083	0.1049
28	Selenium as Se (mg/L)	0.0014	0.0010	0.0011	0.0019	0.0011	0.0012
29	COD (mg/L)	15	2	4	4	5	4

Table 29: Contd. (April 2015)

S. No.	Parameters	GW-19	GW-20	GW-21	GW-22	GW-23	GW-24
1	pH	7.3	7.0	7.3	7.7	6.8	7.2
2	Electrical Conductivity (µS/cm)	1110	445	530	585	1010	925
3	Total Hardness as $CaCO_3$ (mg/L)	**390**	195	**205**	**220**	**360**	**360**
4	Calcium as Ca (mg/L)	**84**	56	64	44	**104**	**132**
5	Magnesium as Mg (mg/L)	**44**	13	11	27	24	7.3
6	Sodium as Na (mg/L)	100	20	39	46	72	44
7	Potassium as K (mg/L)	1.5	3.2	2.2	1.7	8.9	4.5
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	Nil	Nil	Nil
9	Bicarbonate as HCO_3 (mg/L)	415	232	323	323	323	354
10	Chloride as Cl (mg/L)	32	21	14	14	92	103
11	Fluoride as F (mg/L)	**2.2**	**1.0**	**6.0**	**4.9**	**1.1**	0.4
12	Nitrate as NO_3 (mg/L)	12	0.10	1.1	2.0	**67**	6.2
13	Sulfate as SO_4 (mg/L)	**210**	16	4.6	26	66	24
14	Phosphate as PO_4 (mg/L)	ND	ND	ND	ND	ND	ND
15	Silica as SiO_2 (mg/L)	37	37	34	41	41	29
16	Total Arsenic as As (mg/L)	0.0005	0.0008	0.0008	0.0011	0.0024	0.0027
17	Aluminium as Al (mg/L)	**0.1097**	**0.2176**	**0.1060**	**0.2847**	**0.2727**	**0.1581**
18	Total Chromium as Cr (mg/L)	0.0208	0.0340	0.0317	0.0304	0.0290	0.0286
19	Copper as Cu (mg/L)	0.0060	0.0105	0.0482	0.0109	0.0119	0.0229
20	Iron as Fe (mg/L)	**0.7753**	**4.2787**	**1.1286**	**0.6392**	**0.3728**	**0.8622**
21	Lead as Pb (mg/L)	0.0033	0.0087	0.0032	**0.0150**	0.0064	0.0047
22	Manganese as Mn (mg/L)	**0.1385**	**0.2013**	**0.1207**	0.0206	0.0344	0.0598
23	Mercury as Hg (mg/L)	0.0009	0.0009	**0.0010**	**0.0011**	**0.0033**	**0.0067**
24	Cobalt as Co (mg/L)	0.0008	0.0105	0.0006	0.0006	0.0012	0.0008
25	Cadmium as Cd (mg/L)	0.0001	0.0002	0.0008	0.0009	0.0005	0.0015
26	Nickel as Ni (mg/L)	0.0119	0.0194	0.0187	0.0176	0.0193	0.0171
27	Zinc as Zn (mg/L)	0.0186	0.0662	0.0160	0.0950	0.0585	0.0620
28	Selenium as Se (mg/L)	0.0011	0.0005	0.0004	0.0006	0.0015	0.0024
29	COD (mg/L)	3	2	3	10	3	6

Table 29: Contd. (April 2015)

S. No.	Parameters	GW-25	IS 10500:2012 Standard	
			Acceptable	Permissible
1	pH	6.4	6.5 – 8.5	NR
2	Electrical Conductivity (µS/cm)	60	-----	-----
3	Total Hardness as $CaCO_3$ (mg/L)	10	200	600
4	Calcium as Ca (mg/L)	4.0	75	200
5	Magnesium as Mg (mg/L)	Nil	30	100
6	Sodium as Na (mg/L)	8.5	-----	-----
7	Potassium as K (mg/L)	Nil	-----	-----
8	Carbonate as CO_3 (mg/L)	Nil	-----	-----
9	Bicarbonate as HCO_3 (mg/L)	9.2	-----	-----
10	Chloride as Cl (mg/L)	11	250	1000
11	Fluoride as F (mg/L)	ND	1.0	1.5
12	Nitrate as NO_3 (mg/L)	5.2	45	NR
13	Sulfate as SO_4 (mg/L)	2.4	200	400
14	Phosphate as PO_4 (mg/L)	ND	-----	-----
15	Silica as SiO_2 (mg/L)	2.7	-----	-----
16	Total Arsenic as As (mg/L)	0.0078	0.010	0.05
17	Aluminium as Al (mg/L)	**0.2029**	0.030	0.20
18	Total Chromium as Cr (mg/L)	0.0288	0.050	NR
19	Copper as Cu (mg/L)	0.0118	0.050	1.50
20	Iron as Fe (mg/L)	**0.3738**	0.300	NR
21	Lead as Pb (mg/L)	0.0074	0.010	NR
22	Manganese as Mn (mg/L)	0.0444	0.100	0.30
23	Mercury as Hg (mg/L)	**0.0238**	0.001	NR
24	Cobalt as Co (mg/L)	0.0005	-----	-----
25	Cadmium as Cd (mg/L)	0.0005	0.0030	NR
26	Nickel as Ni (mg/L)	0.0181	0.020	NR
27	Zinc as Zn (mg/L)	0.0321	5.00	15.0
28	Selenium as Se (mg/L)	0.0034	0.01	NR
29	COD (mg/L)	4	-----	-----

Table 30: Physico-chemical Characteristics of Groundwater (July 2015)

S. No.	Parameters	GW-26	GW-27	GW-28	GW-29	GW-30
1	pH	7.4	7.7	7.8	7.4	8.2
2	Electrical Conductivity (µS/cm)	790	769	2500	1600	749
3	Total Hardness as $CaCO_3$ (mg/L)	**250**	90	**585**	**250**	**280**
4	Calcium as Ca (mg/L)	**76**	24	**136**	40	**92**
5	Magnesium as Mg (mg/L)	15	7.3	**60**	**36**	12
6	Sodium as Na (mg/L)	81	152	310	270	60
7	Potassium as K (mg/L)	1.9	2.2	2.7	0.8	4.2
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	Nil	Nil
9	Bicarbonate as HCO_3 (mg/L)	415	403	299	683	305
10	Chloride as Cl (mg/L)	39	32	**518**	170	57
11	Fluoride as F (mg/L)	0.41	0.46	0.86	**1.7**	**2.0**
12	Nitrate as NO_3 (mg/L)	6.6	0.78	3.0	2.1	35
13	Sulfate as SO_4 (mg/L)	30	33	**264**	16	42
14	Phosphate as PO_4 (mg/L)	ND	ND	ND	ND	ND
15	Silica as SiO_2 (mg/L)	25	22	21	29	43
16	Total Arsenic as As (mg/L)	AP	AP	AP	AP	AP
17	Aluminium as Al (mg/L)	AP	AP	AP	AP	AP
18	Total Chromium as Cr (mg/L)	AP	AP	AP	AP	AP
19	Copper as Cu (mg/L)	AP	AP	AP	AP	AP
20	Iron as Fe (mg/L)	AP	AP	AP	AP	AP
21	Lead as Pb (mg/L)	AP	AP	AP	AP	AP
22	Manganese as Mn (mg/L)	AP	AP	AP	AP	AP
23	Mercury as Hg (mg/L)	AP	AP	AP	AP	AP
24	Cobalt as Co (mg/L)	AP	AP	AP	AP	AP
25	Cadmium as Cd (mg/L)	AP	AP	AP	AP	AP
26	Nickel as Ni (mg/L)	AP	AP	AP	AP	AP
27	Zinc as Zn (mg/L)	AP	AP	AP	AP	AP
28	Selenium as Se (mg/L)	AP	AP	AP	AP	AP
29	COD (mg/L)	2	3	19	4	3

AP – Analysis pending

Table 30: Contd. (July 2015)

S. No.	Parameters	GW-31	GW-32	GW-33	GW-34
1	pH	7.9	7.9	7.8	7.1
2	Electrical Conductivity (µS/cm)	775	1185	716	290
3	Total Hardness as $CaCO_3$ (mg/L)	**270**	**340**	**300**	100
4	Calcium as Ca (mg/L)	**80**	**92**	**100**	32
5	Magnesium as Mg (mg/L)	17	27	12	4.9
6	Sodium as Na (mg/L)	70	143	26	25
7	Potassium as K (mg/L)	5.7	1.3	0.4	1.9
8	Carbonate as CO_3 (mg/L)	Nil	Nil	Nil	Nil
9	Bicarbonate as HCO_3 (mg/L)	262	384	207	146
10	Chloride as Cl (mg/L)	50	149	89	14
11	Fluoride as F (mg/L)	**2.2**	0.5	0.5	**1.9**
12	Nitrate as NO_3 (mg/L)	41	1.6	22	0.9
13	Sulfate as SO_4 (mg/L)	94	107	44	10
14	Phosphate as PO_4 (mg/L)	ND	ND	ND	ND
15	Silica as SiO_2 (mg/L)	55	31	26	59
16	Total Arsenic as As (mg/L)	AP	AP	AP	AP
17	Aluminium as Al (mg/L)	AP	AP	AP	AP
18	Total Chromium as Cr (mg/L)	AP	AP	AP	AP
19	Copper as Cu (mg/L)	AP	AP	AP	AP
20	Iron as Fe (mg/L)	AP	AP	AP	AP
21	Lead as Pb (mg/L)	AP	AP	AP	AP
22	Manganese as Mn (mg/L)	AP	AP	AP	AP
23	Mercury as Hg (mg/L)	AP	AP	AP	AP
24	Cobalt as Co (mg/L)	AP	AP	AP	AP
25	Cadmium as Cd (mg/L)	AP	AP	AP	AP
26	Nickel as Ni (mg/L)	AP	AP	AP	AP
27	Zinc as Zn (mg/L)	AP	AP	AP	AP
28	Selenium as Se (mg/L)	AP	AP	AP	AP
29	COD (mg/L)	9	3	3	8

AP – Analysis pending

7.2.1 General Characteristics

The pH values in the collected ground water samples of study area fall within the range 6.8 to 8.2. The pH values for almost all the samples were well within the limits prescribed by BIS (2012) and WHO (2011) for various uses of water including drinking and other domestic supplies.

The electrical conductivity and dissolved salt concentrations are directly related to the concentration of ionized substance in water and may also be related to problems of excessive hardness and/or other mineral contamination. The conductivity values in the ground water samples of the study area vary from 242 to 2500 µS/cm.

Alkalinity in natural water is mainly due to presence of carbonates, bicarbonates and hydroxides. Bicarbonates represent the major form since they are formed in considerable amount from the action of carbonates upon the basic materials in the soil. The alkalinity value in the ground water of study area varies from 97 to 559 mg/L. None of the samples exceeded the maximum permissible limit of 600 mg/L.

Hardness of water is due to carbonates, sulphates and chlorides of calcium and magnesium. A limit of 200 mg/L as desirable limit and 600 mg/L as permissible limit has been recommended for drinking water (BIS, 2012). The total hardness values in the study area ranges from 90 to 585 mg/L.

The concentration of sodium and potassium in the study area varies from 7-310 mg/L and 0.4-8.9 mg/L respectively. The Bureau of Indian Standards has not included sodium and potassium in drinking water standards. Potassium is an essential element for humans, plants and animals and derived in food chain mainly from vegetation and soil. The main sources of potassium in ground water include rain water, weathering of potash silicate minerals, use of potash fertilizers and use of surface water for irrigation. The concentration of potassium in ground water of the study area varies

The concentration of chloride varied from 14 to 518 mg/L. None of the samples except the abandoned dug well at Moher & Moher coal mine exceeded the desirable limit of 250 mg/L. The limits of chloride have been laid down primarily from taste considerations. A limit of 250 mg/L chloride has been recommended as desirable limit and 1000 mg/L as the permissible limit for drinking water (BIS, 2012). However, no adverse health effects on humans have been reported from intake of waters containing even higher content of chloride.

The concentration of sulfate in the study area varies from 5 to 264 mg/L. Bureau of Indian standard has prescribed 200 mg/L as the desirable limit and 400 mg/L as the permissible limit for sulfate in drinking water. The sulfate content in ground water generally occurs as soluble salts of calcium, magnesium and sodium.

Nitrate content in drinking water is considered important for its adverse health effects and moderately toxicity. A limit of 45 mg/L has been prescribed by BIS (2012) for drinking water supplies. Its concentration above 45 mg/L may prove detriment to human health. In higher

concentrations, nitrate may produce a disease known as methaemoglobinaemia (blue baby syndrome) which generally affects bottle-fed infants. Repeated heavy doses of nitrates on ingestion may also cause carcinogenic diseases. The nitrate content in the study area varies from 0 to 87 mg/L. The samples collected from handpumps of Chilkadanad, Harrahawa, Parasi, Govindpur and Kusmaha village exceeded the permissible limit for nitrogen prescribed by BIS (2012).

The presence of fluoride in ground water may be attributed to the localized effects of natural sources. The fluoride is present in soil strata due to the presence of geological formations like fluorspar, fluorapatite, ampheboles such as hornblinde, trimolite and mica. Weathering of alkali, silicate, igneous and sedimentary rocks especially shales contribute a major portion of fluorides to ground waters. In addition to natural sources, considerable amount of fluorides may be contributed due to man's activities. Fluoride salts are commonly used in steel, aluminium, bricks and tile-industries. The fluoride containing insecticides and herbicides may be contributed through agricultural runoff. Phosphatic fertilizers, which are extensively used, often contain fluoride as impurity and these may increase levels of fluoride in soil. The accumulation of fluoride in soil eventually results in its leaching due to percolating water, thus increase fluoride concentration in ground water. The fluoride content in the ground water of the study area varies 0 to 7.8 mg/L. Eleven samples (Sirsoti, Naktu, Khatkhariya, Harrahwa, Kakari, Dibulgang, Govindpur, Kusmaha, Harriya, Bargawa, Oddgadi, and Jarha) exceeded the maximum permissible limit of 1.5 mg/L which may be attributed to localized geogenic/anthropogenic activities.

7.2.2 Heavy Metals

Heavy metals in ground water have a considerable significance due to their toxicity and adsorption behavior. Heavy metals are not biodegradable and enter the food chain through a number of pathways causing progressive toxicity due to the accumulation in human and animal organs during their life span on long term exposure to contaminated environments. Despite the presence of trace concentrations of Cr, Mn, Co, Cu and Zn in the aquatic environment, which is essential to a number of life processes, high concentrations of these metals become toxic. The major sources of heavy metals in ground water include weathering of rock minerals, discharge of sewage and other waste effluents on land and runoff water. The toxic effects of these elements and extent of their contamination in ground water is discussed in the following sections.

Arsenic (As): The concentration of Arsenic in the ground water of the study area ranges from 0.0003 to 0.0072 mg/L. The Bureau of Indian Standards has recommended 0.010 mg/L as the as desirable limit and 0.050 mg/L as the permissible limit for drinking water (BIS, 2012). It is evident from the results that all samples of the study area were within the desirable limit.

Arsenic is usually present in natural waters at concentrations of less than 1–2 µg/L. However, in waters, particularly groundwaters, where there are sulfide mineral deposits and sedimentary deposits deriving from volcanic rocks, the concentrations can be significantly elevated. Arsenic has not been demonstrated to be essential in humans. The acute toxicity of arsenic compounds in humans is predominantly a function of their rate of removal from the body. Arsine is considered to be the most toxic form, followed by the arsenites, the arsenates and

organic arsenic compounds. Signs of chronic arsenicism, including dermal lesions such as hyperpigmentation and hypopigmentation, peripheral neuropathy, skin cancer, bladder and lung cancers and peripheral vascular disease, have been observed in opulations ingesting arsenic-contaminated drinking-water.

Aluminium (Al): The concentration of Aluminum in the ground water of the study area ranges from 0.089 to 0.898 mg/L. The Bureau of Indian Standards has recommended 0.030 mg/L as the as desirable limit and 0.20 mg/L as the permissible limit for drinking water (BIS, 2012). It is evident from the results that all samples of the study area exceeded the permissible limit.

Aluminium is the most abundant metallic element and constitutes about 8% of Earth's crust. High residual concentrations may ensue undesirable color and turbidity. There is little indication that orally ingested aluminium is acutely toxic to humans despite the widespread occurrence of the element in foods, drinking-water and many antacid preparations. It has been hypothesized that aluminium exposure is a risk factor for the development or acceleration of onset of Alzheimer disease in humans.

Chromium (Cr): The concentration of chromium in the ground water of the study area ranges from 0.0208 to 0.0419 mg/L. The Bureau of Indian Standards has recommended 0.050 mg/L as the permissible limit for drinking water (BIS, 2012). It is evident from the results that all samples of the study area except two samples (Khairahi village and MPCC colony) exceeded the permissible limit.

Chromium is widely distributed in Earth's crust. It can exist in valences of +2 to +6. Chromium (III) is an essential nutrient. IARC has classified chromium (VI) in Group 1 (human carcinogen) and chromium (III) in Group 3 (not classifiable as to its carcinogenicity to humans). Chromium (VI) compounds are active in a wide range of in vitro and in vivo genotoxicity tests, whereas chromium (III) compounds are not.

Copper (Cu): The concentration of copper ranges from 0.0030 to 0.0621 mg/L. The Bureau of Indian Standards has recommended 0.05 mg/L as the desirable limit and 1.5 mg/L as the permissible limit in the absence of alternate source (BIS, 2012). In the study area, all of the samples fall in the desirable limit of 0.05 mg/L except one sample (Nr. Janturia Nala).

Copper is both an essential nutrient and a drinking-water contaminant. It is used to make pipes, valves and fittings and is present in alloys and coatings. Beyond 0.05 mg/L the water imparts astringent taste and cause discoloration and corrosion of pipes, fittings and utensils. Recent studies have delineated the threshold for the effects of copper in drinking-water on the gastrointestinal tract, but there is still some uncertainty regarding the long-term effects of copper on sensitive populations, such as carriers of the gene for Wilson disease and other metabolic disorders of copper homeostasis.

Iron (Fe): The concentration of iron in the ground water of the study area ranges from 0.2745 to 53.898 mg/L. The Bureau of Indian Standards has recommended 0.3 mg/L as the as the maximum permissible limit for iron in drinking water (BIS, 2012). It is evident from the results

that all samples of the study area exceed the maximum permissible limit except two samples (Govindpur and Harrahwa).

It is a known fact that iron in trace amounts is essential for nutrition. High concentrations of iron generally cause inky flavor, bitter and astringent taste to water. Well water containing soluble iron remain clear while pumped out, but exposure to air causes precipitation of iron due to oxidation, with a consequence of rusty color and turbidity. The objection to iron in the distribution system is not due to health reason but to staining of laundry and plumbing fixtures and appearance. Taste and odor problems may be caused by filamentous organism that prey on iron compounds (frenothrix, gallionella and leptothrix are called iron bacteria), originating another consumer's objection (red water). The presence of iron bacteria may clog well screens or develop in the distribution system, particularly when sulfate compounds in addition to iron may be subjected to chemical reduction.

Lead (Pb): The concentration of Lead in the ground water of the study area ranges from 0.0024 to 0.0435 mg/L. The Bureau of Indian Standards has recommended 0.010 mg/L as the as the maximum permissible limit for lead in drinking water (BIS, 2012). It is evident from the results that the samples from Govindpur village, Kusmaha village, Khairahi village, Jayant Colony, Sai ITI College, Jayant bus stand, Kirwani village, Janturia Nala, CISG Mandir Gate Vindhyanagar, Tubakhann village, and Sirsoti exceeded the maximum permissible limit.

Lead is used principally in the production of lead-acid batteries, solder and alloys. The organ lead compounds tetraethyl and tetramethyl lead have also been used extensively as antiknock and lubricating agents in petrol, although their use for these purposes in many countries has largely been phased out. Owing to the decreasing use of lead- containing additives in petrol and of lead-containing solder in the food processing industry, concentrations in air and food are declining; in most countries, lead levels in blood are also declining unless there are specific sources, such as dust from leaded paint or household recycling of lead-containing materials. Lead is rarely present in tap water as a result of its dissolution from natural sources; rather, its presence is primarily from corrosive water effects on household plumbing systems containing lead in pipes, solder, fittings or the service connections to homes. Exposure to lead is associated with a wide range of effects, including various neurodevelopmental effects, mortality (mainly due to cardiovascular diseases), impaired renal function, hypertension, impaired fertility and adverse pregnancy outcomes.

Manganese (Mn): The concentration of manganese ranges from 0.0079 to 1.0202 mg/L. Manganese is an essential trace nutrient for plants and animals, which does not occur naturally as a metal but is found in various salts and minerals frequently in association with iron compounds. Manganese may gain entry into the body by inhalation, consumption of food and through drinking water. A concentration of 0.1 mg/L has been recommended as a desirable limit and 0.3 mg/L as the permissible limit for drinking water (BIS, 2012). It is evident from the results that sixteen samples of the study area fall within the desirable limit of 0.1 mg/L and four samples exceeds the maximum permissible limit of 0.3 mg/L. The presence of manganese above permissible limit of drinking water often imparts alien taste to water. It also has adverse effects on domestic uses and water supply structures.

Mercury (Hg): The concentration of Mercury in the ground water of the study area ranges from 0.0007 to 0.0197 mg/L. The Bureau of Indian Standards has recommended 0.001 mg/L as the permissible limit for drinking water (BIS, 2012). It is evident from the results that out of 32 samples, 16 samples of the study area fall within the permissible limit of 0.01 mg/L.

The toxic effects of inorganic mercury compounds are seen mainly in the kidney in both humans and laboratory animals following short-term and long-term exposure. In humans, acute oral poisoning results primarily in hemorrhagic gastritis and colitis; the ultimate damage is to the kidney. The overall weight of evidence is that mercury (II) chloride has the potential to increase the incidence of some benign tumours at sites where tissue damage is apparent and that it possesses weak genotoxic activity but does not cause point mutations.

Cadmium (Cd): The concentration of Cadmium in the ground water of the study area ranges from 0.0001 to 0.0084 mg/L. The Bureau of Indian Standards has recommended 0.003 mg/L as the permissible limit for drinking water (BIS, 2012). It is evident from the results that cadmium concentration in five samples exceeded the permissible limit of 0.003 mg/L.

Cadmium is released to the environment in wastewater, and diffuse pollution is caused by contamination from fertilizers and local air pollution. Contamination in drinking-water may also be caused by impurities in the zinc of galvanized pipes and solders and some metal fittings. Absorption of cadmium compounds is dependent on the solubility of the compounds. Cadmium accumulates primarily in the kidneys and has a long biological half-life in humans of 10–35 years. There is evidence that cadmium is carcinogenic by the inhalation route, and IARC has classified cadmium and cadmium compounds in Group 2A (probably carcinogenic to humans).

Nickel (Ni): The concentration of Nickel in the ground water of the study area ranges from 0.0119 to 0.0257 mg/L. The Bureau of Indian Standards has recommended 0.020 mg/L as the permissible limit for drinking water (BIS, 2012). It is evident from the results that nickel concentration in 12 samples exceeded the permissible limit of 0.020 mg/L.

Zinc (Zn): The concentration of Zinc in the ground water of the study area ranges from 0.0044 to 1.0758 mg/L. The Bureau of Indian Standards has recommended 5.0 mg/L as the desirable and 15.0 mg/L as the maximum permissible limit for drinking water (BIS, 2012). It is evident from the results that zinc concentration in all the samples were well within the desirable limit of 5.0 mg/L.

Selenium (Se): The concentration of Selenium in the ground water of the study area ranges from 0.0004 to 0.0024 mg/L. The Bureau of Indian Standards has recommended 0.01 mg/L as the maximum permissible limit for drinking water (BIS, 2012). It is evident from the results that selenium concentrations in all the samples were well within the permissible limit of 0.01 mg/L.

8. Concluding Remarks

Based on the preliminary survey of the Singrauli Area and available information, the following conclusions are drawn:

1. The values of pH, total hardness, fluoride, aluminium, total chromium, iron, manganese, mercury, cadmium and nickel for Kusumha pond were exceeding the acceptable limit prescribed by BIS (2012) for drinking water.

2. The analysis result of Murdhawa Nala indicates that the value of fluoride are not in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water. Hindalco Aluminium should immediately install an online fluoride monitoring analyzer in the discharge from the industry and the control should be with the CPCB/SPCB.

3. The analysis result of Dongiya Nala indicates that the value of pH and fluoride are not in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water. Aditya Birla Chemical Company should immediately install an online fluoride/contaminant monitoring system in the discharge from the industry and the control should be with the CPCB/SPCB.

4. The analysis result of samples from Baliya Nala, Dudhichua project ETP, Jayant project ETP and Jayant mine sump indicates that the all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

5. The analysis result of effluents from Jayant Mine ETP indicates that manganese concentration exceeded the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

6. The analysis result of Jayant STP water indicates that the all the analyzed values except nitrate were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

7. The analysis result of Surya Nala indicates that all the analyzed values except fluoride, nitrate and iron were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water. An online contaminant monitoring system should be installed by the industries and the control should be with CPCB/MPPCB.

8. The analysis result of Janturia Nala indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993

under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

9. The analysis result of NTPC Vindhyanagar and Shaktinagar Ash Dyke Overflow indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water. The industries should make arrangement to stop the overflow from the Ash Dykes.

10. The analysis result of Sasan Power Drain indicates that all the analyzed values were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

11. The analysis result of Lanco Ash Dyke overflow indicates that the all the analyzed values except fluoride were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water. The continuous overflow from the ash dykes should be stopped immediately to avoid the contamination of Rihand Reservoir.

12. The values of aluminium, iron, manganese, nickel, mercury and nickel for Rihand reservoir were exceeding the acceptable limit prescribed by BIS (2012) for drinking water at several sampling locations. Mercury was detected in all the samples and is an alarming situation. The concentration of total chromium and cadmium is nearing towards the limit prescribed for drinking water. Total and fecal coliforms were also detected in the reservoir samples and exceed the desirable limit set by MoEF for bathing water.

13. Although the concentration of the contaminants in the overflow from ash dykes were in conformity with discharge standards, but the quantity is sufficient to elevate the concentration of mercury and other trace metals to a level which can be a potential risk to human life. A detailed investigation on the quantity of these contaminates reaching reservoir is required.

14. All the Ash Dykes in this area are in the vicinity of the reservoir. They are constructed in such way that the wall is shared by Reservoir and Ash Dyke. This should be avoided. Moreover, the upcoming industries in the area should construct Ash Dykes at least 5 Km away from the reservoir preferably at a higher elevation than the location of the power plant/industry. This will reduce the pumping cost of overflow from the ash dyke as well as easy monitoring by the monitoring agencies.

15. The analysis result of Channel flowing below Rihand River Bridge indicates that all the analyzed values except aluminum and iron were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

16. The analysis result of Rihand River indicates that all the analyzed values except aluminium, iron, and manganese were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

17. The analysis result of Renu River indicates that all the analyzed values except aluminium and mercury were in conformity with acceptable limit prescribed by BIS (2012) for drinking water. High concentration of mercury in Renu River is a matter of concern and needs thorough investigation.

18. The analysis result of Chilka Lake, Shaktinagar indicates that all the analyzed values except aluminium, iron, lead, and mercury were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

19. The analysis result of Ashram Talab, Govindpur indicates that all the analyzed values except aluminium, iron, and fluoride were in conformity with acceptable limit prescribed by BIS (2012) for drinking water.

20. From the above results for Kachan & Mayyar River, it is evident that all the analyzed parameters except TC and FC were well within the acceptable limit prescribed by BIS (2012) for drinking water.

21. The analysis result of settling pit & Sedimentation pond of Moher & Moher Coal Mine indicates that the all the analyzed were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water.

22. The analysis result of Kavya Nala indicates that the all the analyzed were in conformity with the effluent standards notified vide G.S.R. 422(E) dated 19.05.1993 under Environment (Protection) Act, 1986 for discharge of effluents into inland surface water. The fluoride concentration in the drain was nearing towards the discharge limit.

23. The quality of groundwater is found deteriorated in terms of trace metals, nitrate and fluoride. Concentration of fluoride exceeded the desirable limit prescribed by BIS (2012) in the samples collected from Govindpur, Kusmaha, Kakri, Harrahwa, Khairi, Naktu, Sirsoti, Chilkadand, Pasavar raja, and Dibulgang. Concentration of mercury exceeded in the samples collected from Kirwani, Parasi, Harrahwa, Naktu, Sirsoti, Chilkadand, Parsavar-raja, Govindpur, Kusmaha, Khairahi, Jayant Colony, Jaitpur, MPCC colony, and Dibulganj.

    The fluoride removal units installed in the handpumps in the fluoride affected area has not been regenerated / serviced since long and is non operational. Immediate action is required in this aspect by the local administration.

24. The abandoned dug well water at Moher & Moher coal mine was found contaminated and curative measures by the industry should be initiated immediately to avoid the contamination of shallow aquifer.

25. The treated water from Reverse Osmosis plants installed in Bajrang Nagar, Dibulganj exceeded the permissible limits prescribed by BIS (2012) for aluminium, iron, mercury, cadmium and nickel for the samples collected in January 2015. For samples collected in April 2015, concentration of aluminum exceeded the desirable limit and lead exceeded the permissible limit prescribed by BIS (2012).

    The treated water from Reverse Osmosis plants installed in Parsavar-raja village exceeded the permissible limits prescribed by BIS (2012) for aluminium, iron, and mercury.

    This indicates that the reverse osmosis plants installed are not suitable/capable of removing the trace metals from the water.
    Moreover, the conductivity of RO treated water is very low and a calcite filter should be installed to make the water fit for drinking.

26. The coal overburden in the mining area was naked and requires eco-restoration to safeguard the water resources of the area and avoid causalities in the monsoon. Moreover, the slopes should be reduced and safety measures should be practiced.

27. In view of the field surveys and water analysis results, committee recommends following studies for arriving at clear picture-

    - Spatial and temporal variation (pattern) of water quality in the Rihand Reservoir
    - Spatial and temporal variation of chemical characteristics of sediments in the Rihand Reservoir.
    - Identification of source of origin of fluoride in Mayorpur Block – Anthropogenic or geogenic.
    - Spatial and temporal variation of groundwater quality in Singrali Area
    - Pilot study for evaluation of membranes of different make for removal of trace metals from the water and arrive at suitable water treatment scheme.
    - Third party evaluation of the Zero Liquid Discharge Schemes installed byvarious industries in the region.
    - Third party inspection/performance evaluation of the installed ETPs/STPs in the Singrauli area.

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Annexure 1

BEFORE THE NATIONAL GREEN TRIBUNAL,
PRINCIPAL BENCH, NEW DELHI

Original Application No.276 of 2013
And
M.A. No.59 of 2014
In
Original Application No.20 of 2014

Ashwani Kumar Dubey Vs. Union of India & Ors.
And
Jagat Narayan Viswakarma and Ors. Vs. Union of India & Ors

CORAM : HON'BLE MR. JUSTICE SWATANTER KUMAR, CHAIRPERSON
HON'BLE MR. JUSTICE M.S. NAMBIAR, JUDICIAL MEMBER
HON'BLE MR. DR. D.K. AGRAWAL, EXPERT MEMBER
HON'BLE PROF. A.R. YOUSUF, EXPERT MEMBER
HON'BLE DR. R.C. TRIVEDI, EXPERT MEMBER

Present:	**Applicant:**	**Mr. M.Z. Choudhary, Mr. Avinnash Prasad and Mr. Ashwini K. Dubey, Advocates**
	Respondent No. 1:	**Mr. Vikas Malhotra and Mr. M.P. Sahay, Advocates & Ms. Seema Rao**
	Respondent No.3:	**Mr. Raman Yadav**
	Respondent No.4:	**Mr. Rajul Shrivastav, Advocatr for MPPCB**
	Respondent No.6&9:	**Mr. Raman Yadav & Mr. Atifsuh Rawardy, Advocates**
	Respondent No.7:	**Mr. Daleep Kumar Dhayani, Advocate and Mr. Vikas Singh, Advocate**
	Respondent No.10 to 12:	**Mr. Bharat Sangal, Advocate**
	Respondent No.13,15, 16 & 21:	**Mr. Syed Shahid, Advocate & Mr. Parag P. Tripathi, Senior Advocate**
	Respondent No.19&20:	**Mr. Pradeep Misra, Advocate**
	Respondent No.22	**Mr. Rajat Jariwal and Ms. Anisha Somal**
	Respondent No.23&27:	**Mr. Pawan Upadhyay and Mr. Sarvjit P. Singh**
	Respondent No.24:	**Mr. Harsh Sethi for VHS Legal**

	Date and Remarks	**Orders of the Tribunal**
	Item No. 17 & 18 August 25, 2014	None of the parties have filed any objection / suggestions to the proposed Committees and the ToR. The only prayer made is that the Chairman, Central Pollution Control Board be permitted to be substituted by the Member-Secretary of the CPCB. Ordered accordingly. Therefore we constitute the following Committees with the ToR as indicated as below. **Monitoring of potential hazards of Industrial Development in Singrauli Area** **Core Team:** **a.** Member Secretary, Central Pollution Control Board **b.** Member Secretary, Madhya Pradesh Pollution Control Board **c.** Member Secretary, Uttar Pradesh Pollution Control Board

d. Director of Indian Agricultural Research Institute
e. Director of Indian Council of Forestry Research and Education
f. Director of National Institute of Hydrology
g. Director of Indian Institute of Toxicology Research
h. Dr.I. M Mishra, Chemical Engineering, Department, IIT Roorkee
i. Dr.Vinod Tare, Professor Environmental Engineering, IIT Kanpur
j. Dr. T. Chakrabarti, Visvesvaraya National Institute of Technology, Nagpur.
k. Porf.KanchanChopra, Institute of Economic Growth.
l. Nominee of Director, All India Institute ofMedical Sciences
m. Nominee of Director, National Institute of Occupational Health, Ahemdabad.
n. Joint Director, EIADivision, Ministry of Environment and Forests.

Terms of Reference:

a) Conducting survey/s of all the industries (thermal power plants, coal mines, etc.) to assess the pollution caused by them as a result of their activities.
b) Synthesis of data compiled by Sub-Committee 1 to 5 for identifying causative factors- industry wise.
c) Suggesting remedial measures that are required for restoration of the environment and prevention of pollution in the area (both Uttar Pradesh & Madhya Pradesh)- industry wise.
d) To guide each of the sub-committee and seek progress of work on fortnightly basis. The core - team may nominate members of core-team based on their subject expertise to look into day to day affairs of sub-committees.
e) The Committee shall submit its final report directly to NGT within 3 months;

Note:
a. The expenditure in conducting the inspection, survey and studies will be met by the respective State Governments for the region and they may be permitted to recover it from the industrial units, thermal power and coal mines on pro-rata basis.
b. The non-Government members be given the sitting fees for the meetings/inspections, actual travelling expenses incurred by them as may be decided by the core-team.

Quantification of Industrial impacts
Sub-Committee-1

Terms of Reference:

- Inventory of existing industries – industry wise:
  a. Production: in terms of each product either per day or per month basis.
  b. Raw material used: In terms of each raw material including fuel and water per day & its source.
- Pollution load generation:
  a. Water- quantity of each of the significant pollutant per day before & after treatment.
  b. Air- quantity emission in terms of each pollutant per day.

c. Fly-ash-quantity per day.
d. Hazardous waste-quantity & type/day.
e. Others, if any – specify & quantify

- Compliance Status:
  a. Environmental Clearance conditions
  b. Forest Clearance conditions
  c. Consent conditions
- Adequacy of each of the pollution control measure/s.
- Daily basis Vehicular traffic census especially in and around residential clusters. Ambient air quality should also be monitored in the above residential areas.
- Vehicular census and their usages data to be used for quantification of pollution load generation from the vehicles (petrol and diesel driven separately).
- Overall working and deficiency, if any.

Team:

a. Zonal Officer of the Central Pollution Control Board, Lucknow and Bhopal.
b. Regional Officer of Madhya Pradesh State Pollution Control Board and Uttar Pradesh State Pollution Control Board.
c. Indian Institute of Toxicology Research, Lucknow.
d. Expert on Environmental Issues from Indian School Mines.
e. Regional Officer, Ministry of Environment and Forests Bhopal and Lucknow.
f. Member Secretary, Central Pollution Control Board to co-ordinate the entire work as per the ToR and follow Standard Sampling Methodology.

Potential impact of pollution on water resources
Sub-Committee-2

Terms of Reference:

- Water Quality Survey of the area
- Appropriate sampling methodology should be adopted to give representative picture of the entire area vis-à-vis location of industries.
- Inventory of sources (surface and groundwater sources) and their utilization status.
- Physical, chemical and micro-biological properties of surface and ground water sources with special reference to concentrationof heavy metals including mercury, and other hazardous waste, if any.

Team:

a. Representative of the Central Ground Water Authority having experience in Water Quality
b. Representative of the Ministry of Water Resources having experience in Water Quality
c. Representative of State Irrigation Department having experience in Water Quality
d. Representative of National Institute of Hydrology from Water Quality Laboratory

Potential impact of pollution on land resources
Sub-Committee-3

Terms of Reference:

- Representative samples of soil should be collected from areas reasonably away from the industries cluster apart from sampling in and around industries giving due regard to land use.
- General Types of Soil with specific reference to dumping sites and discharge point of effluent/s, nearby agriculture fields and forests.
- Physical and chemical properties of soil with emphasis on mercury and other relevant heavy metals, and soil fertility.

Team:

a. Representative of Indian Institute of Toxicology Research, Lucknow.
b. Representative of Central Pollution Control Board, Madhya PradeshState Pollution Control Board and Uttar Pradesh State Pollution Control Board not below the rank of Regional Officer.
c. An Expert of Soil Science from Indian Institute of Soil Science, Bhopal.
d. An Expert on ForestSoil from Indian Council of Forestry Research and Education, Dehradun.

Potential Impact of pollution on air quality
Sub-Committee- 4

Terms of Reference:

- Ambient air quality sampling (PM2.5, PM10,SOx, NOx, CO, Hg) in the project area based on appropriately designed sampling methodology as per the guidelines of CPCB.

Team:

a) Representative of the Central Pollution Control Board,
b) Representative of the Madhya Pradesh Pollution Control Board
c) Representative of the Uttar Pradesh Pollution Control Board
d) An expert on Air Quality from National Environmental Engineering Research Institute, Nagpur.
e) An expert on Air Quality from IIT, Kanpur.

Potential Impact of Pollution on Health
Sub-Committee-5

Terms of Reference And Team:

a) Base line data on socio-economic aspects, potential health hazards. Sample survey using standard statistically designed epidemiology Study.
b) On findings of this data, a team of experts comprising of Doctors from AIIMS, King Gorge Medical College, Lucknow to visit the area for conducting sample survey on health profiling of residents and workers.
c) A team of experts comprising of Doctors and Social Scientist to develop a questionnaire on health impact. This questionnaire to be used for all the survey.

d) Committee to have atleastone Doctor each from Uttar Pradesh and Madhya Pradesh apart from one Social Scientist from each of the state and involvePanchayati Raj Institutions for collection of primary data.

The above Committee shall submit its report to the Tribunal within one month from today. If the final report is not possible to be submitted on record, then place the interim report before the Tribunal for further directions on the next date of hearing.

List the matter for hearing on 26th September, 2014.

.....,CP
(Swatanter Kumar)

.....,JM
(M.S. Nambiar)

.....,EM
(Dr. D.K. Agrawal)

.....,EM
(Prof. A.R. Yousuf)

.....,EM
(Dr. R.C. Trivedi)

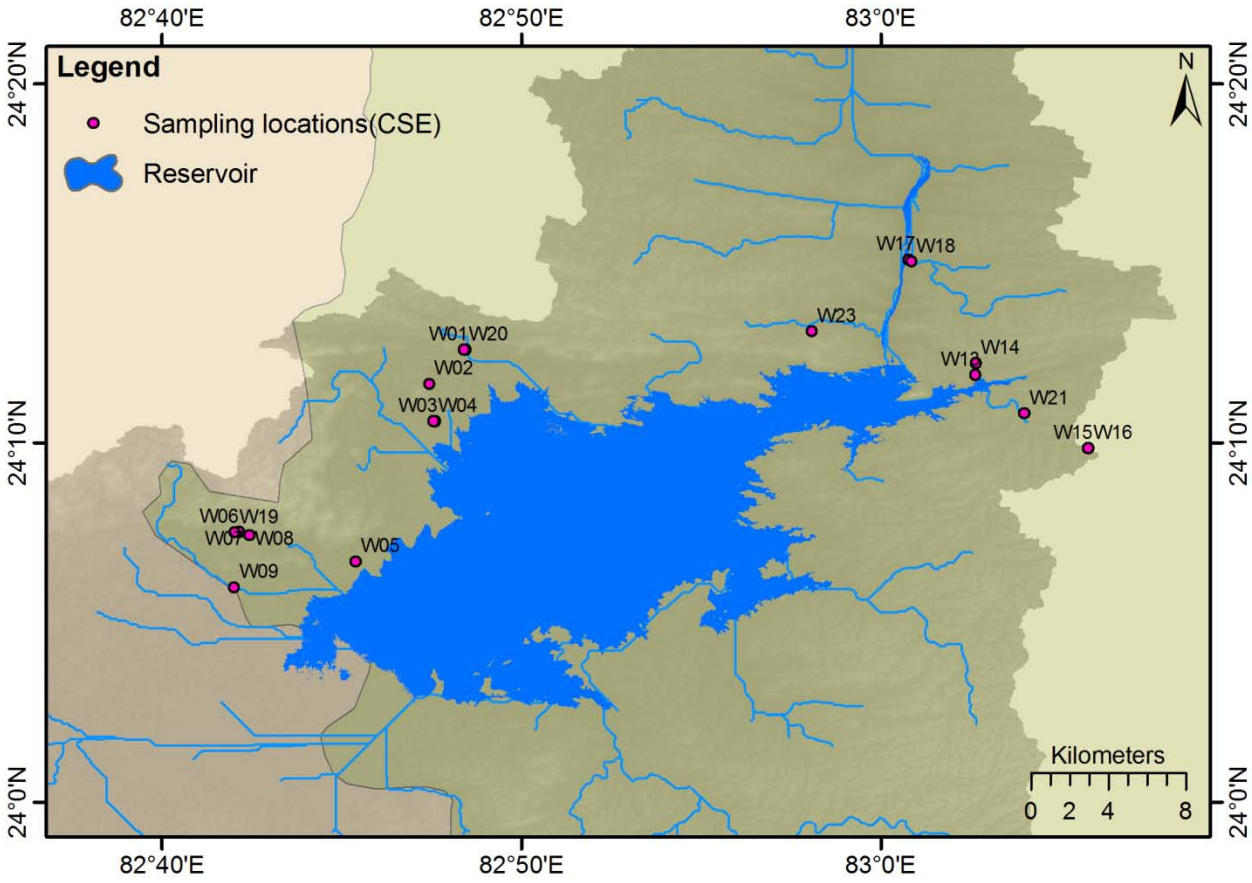
Annexure 2

Details of Water and Effluent Sample Collected from Singrauli

Sr. No.	Sample Code	Location	Date of Collection	Latitude	Longitude
1	W01	Hand pump at Dibulganj	28.05.2012	24.21008	82.807
2	W02	Well water from Kalika Singh"s House	28.05.2012	24.19406	82.7904
3	W03	Water Supplied by Renusagar PP (NTPC) to Garbandha village Area	28.05.2012	24.17688	82.79314
4	W04	Well Water Garbandha village	28.05.2012	24.17684	82.79237
5	W05	Water from ash pond of Shakti Nagar NTPC	28.05.2012	24.11169	82.75635
6	W06	Handpump in Prahlad's house at Chilika Daad	28.05.2012	24.12538	82.70212
7	W07	Handpump at Chilika Daad Near Kashmir Valley School	28.05.2012	24.12372	82.7071
8	W08	Water Supplied by NTPC to Chilika Daad	28.05.2012	24.12372	82.7071
9	W09	Water from Ballia Nallah	28.05.2012	24.09969	82.69992
10	W10	Water from Renuka River at Obra	29.05.2012	24.45124	82.96507
11	W11	Jharia Nallah at Obra near Shushil;s House	29.05.2012	24.45	82.96844
12	W12	Dongiya Nallah at Renukut (Pipri) Effluent of Aaditya Birla Chemicals(India) (ABCL)	29.05.2012	24.19908	83.37667
13	W13	Rihand Dam where Dongiya Nallah meet to Rihand Dam (Renukut pipri)	29.05.2012	24.19829	83.0439
14	W14	Water from tap supplied by UPID ,Near gate of VIP colony ,Renukut	29.05.2012	24.2037	83.04396
15	W15	Handpump in front of Rambhajans house at Kusmaha village –Filtered Water	30.05.2012	24.16428	83.09614
16	W16	Hand pump in front of Rambhajan's house at Kusmaha Village-Unfiltered water	30.05.2012	24.16428	83.09614
17	W17	Obra dam where Murdhawa Nallah (Ganda Nala/Thad Pathar) meets	30.05.2012	24.25173	83.01267
18	W18	Murdhawa Nallah (Ganda Nallah /Thad pathar)	30.05.2012	24.25082	83.01408
19	W19	Hand Pump at Chilika Daad	31.05.2012	24.12504	82.70011
20	W20	Handpump at Dibulganj in front of former Pradhan's house	31.05.2012	24.20993	82.80648
21	W21	Hand Pump in front og govt.school at Kirwani village,in front of Kailash's house	01.06.2012	24.18035	83.06649
22	W22	Hand Pump at Obra ,Malviya Nagar	01.06.2012	24.4495	82.96837
23	W23	Hand pump at bus stand Renukut near Ramlila Maidan	02.06.2012	24.21838	82.967996

Annexure 3

Sampling Locations for CSE Study



Annexure 4

Physico-chemical Characteristics of Samples Collected by CSE

Sr. No.	Sample Code	TDS (ppm)	Ca (ppm)	Mg (ppm)	T. Hardness (ppm)	Cl (ppm)	F (ppm)	Pb (ppm)	Cd (ppm)	Total Cr (ppm)	As (ppm)	Hg (ppm)
1	W01	807	184	17.08	530	100	0.6	ND	ND	ND	ND	0.026
2	W02	624	220	ND	410	70	0.2	BDL	ND	ND	BDL	0.008
3	W03	125	60	2.44	160	20	ND	ND	ND	ND	ND	ND
4	W04	852	224	ND	500	30	0.5	BDL	ND	ND	ND	ND
5	W05	683	220	ND	540	80	0.1	BDL	ND	ND	0.020	0.003
6	W06	754	208	19.52	600	130	ND	BDL	ND	ND	ND	BDL
7	W07	111	80	4.88	220	10	ND	ND	ND	ND	ND	ND
8	W08	64	64	3.9	56	10	0.3	ND	ND	ND	ND	ND
9	W09	389	80	29.28	320	50	1.8	ND	ND	ND	ND	ND
10	W10	335	48	43.92	300	20	2.1	BDL	ND	ND	0.008	ND
11	W11	501	136	51.24	550	60	0.3	ND	ND	ND	ND	ND
12	W12	1150	200	36.6	650	70	0.9	BDL	ND	ND	ND	ND
13	W13	299	100	12.2	200	20	0.4	BDL	ND	ND	ND	ND
14	W14	127	80	7.32	200	30	0.4	ND	ND	ND	ND	ND
15	W15	1130	224	21.96	650	100	0.9	ND	ND	ND	ND	ND
16	W16	92	60	26.84	230	8	0.1	BDL	ND	ND	ND	ND
17	W17	633	188	7.32	500	30	0.2	ND	ND	ND	0.019	0.01
18	W18	536	76	2.44	200	30	1.8	BDL	ND	ND	0.170	ND
19	W19	89	60	9.76	170	10	ND	BDL	ND	ND	0.002	ND
20	W20	103	76	17.08	220	10	0.1	BDL	ND	ND	ND	ND
21	W21	325	120	ND	250	10	0.2	0.047	BDL	ND	BDL	ND
22	W22	4370	562	41.48	1550	1530	4.5	BDL	ND	ND	BDL	0.127
23	W23	1200	64	4.88	180	100	1.9	BDL	ND	ND	0.17	ND

Annexure 5

क्षेत्रीय कार्यालय : उ0प्र0 प्रदूषण नियंत्रण बोर्ड, सोनभद्र

आ0सं0–276/2013 अश्वनी कुमार दुबे बनाम यूनियन ऑफ इण्डिया व अन्य तथा आ0संख्या– 20/2014 जगत नारायण विश्वकर्मा बनाम यूनियन ऑफ इण्डिया व अन्य के सम्बन्ध में मा0 राष्ट्रीय हरित न्यायाधिकरण, नई दिल्ली के आदेशों के अनुपालन में अतिप्रदूषणकारी क्षेत्र जनपद–सोनभद्र में चिन्हित ग्राम/मजरों में दिनांक 12.11.2014 तक स्थापित आर0ओ0 प्लाण्ट्स से एकत्र किये गये जल नमूने की विश्लेषण आख्याः–

क0 सं0	चिन्हित ग्राम	जल नमूना एकत्रण स्थल	दिनांक	Colour	PH	Conductivity	Chloride mg/L	Total Hardness	Ca++ mg/L	Mg++ mg/L	TDS	Fe	Fluoride mg/L	Mn	SO_4	Cd	Cu	MPN/ 100ML	Led mg/L	Mercury mg/L	Arsenic mg/L
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
	Indian Standard Specifications for Drinking water IS: 10500 Standards →			**05Hz**	**6.5 to 8.5**	**--**	**250**	**300**	**75**	**30**	**500**	**0.3**	**0.6 to 1.2**	**0.1**	**150**	**0.01**	**0.05**	**--**	**0.1**	**0.001**	**0.05**
1.	Sirsoti, NTPC Rihand Nagar	Near Community Centre	12.11.14	05Hz	6.99	41.1	7.48	NIL	NIL	NIL	27.1	0.27	0.29	**0.14**	11.0	0.38	0.22	NIL	0.004	**0.004**	0.001
2.	Sirsoti, NTPC Rihand Nagar	Sirsoti Market	12.11.14	05Hz	6.81	20.7	4.48	NIL	NIL	NIL	14.3	**0.37**	0.35	**0.31**	10.2	**0.08**	**0.10**	NIL	0.061	ND	0.002
3.	Sirsoti, NTPC Rihand Nagar	Near MGR Sirsoti	12.11.14	05Hz	6.55	44.3	9.48	NIL	NIL	NIL	30.3	0.33	0.32	**0.30**	5.0	0.050	0.19	NIL	0.029	ND	0.002
4.	Naktu Adhaura NTPC Rihand Nagar	आर0ओ0 प्लाण्ट स्थापित परन्तु विद्युत आपूर्ति के अभाव में कार्यरत नहीं।																			
5.	Chilkatad, NTPC Shakti-nagar	Chilkatad Panchayat Bhavan	12.11.14	05Hz	7.06	46.6	3.98	NIL	NIL	NIL	18.4	0.24	0.50	**0.60**	7.0	**0.017**	**0.25**	NIL	0.040	ND	0.001
6.	,,	Chilkatad, Dr. Ambedkar Bhavan	12.11.14	05Hz	7.36	31.1	4.98	NIL	NIL	NIL	22.3	0.29	0.23	**0.90**	6.5	**0.068**	**0.12**	NIL	0.026	**0.004**	0.002
7.	,,	Pareswar Raja, Shakti-nagar	12.11.14	05Hz	7.12	9.9	5.98	NIL	NIL	NIL	6.6	**0.42**	0.53	0.10	10.2	**0.060**	**0.17**	NIL	0.038	ND	ND
8.	,,	Badwa Bhatwari, near Sudama's House	12.11.14	05Hz	7.76	20.3	4.98	NIL	NIL	NIL	13.7	**0.61**	0.70	0.05	10.0	**0.046**	**0.20**	NIL	0.031	ND	0.001
9.	,,	Rani bari near Sulabh Complex	12.11.14	05Hz	7.99	18.3	3.98	NIL	NIL	NIL	12.3	0.30	0.46	**0.30**	11.0	**0.042**	**0.18**	NIL	0.043	ND	0.002
10.	,,	आर0ओ0 प्लाण्ट स्थापित परन्तु विद्युत आपूर्ति के अभाव में कार्यरत नहीं।																			
11.	U.P.R.V.U.N. Anpara	Auri Mod near Lalluji Tent House	12.11.14	05Hz	7.71	60.8	6.48	20.0	6.42	6.098	40.4	0.38	0.56	0.05	6.7	**0.051**	**0.20**	NIL	0.074	ND	0.001

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
12.	U.P.R.V.U.N. Anpara	Kashi Mod near Lovely poltry House	12.11.14	05Hz	6.95	71.2	8.49	16.0	5.61	0.49	47.8	0.35	0.44	0.19	6.0	**0.098**	**0.17**	NIL	0.035	ND	0.001
13.	,,	Hanuman Nagar, Anpara	12.11.14	05Hz	6.99	75.8	9.99	14.0	4.0	0.98	50.6	0.49	0.58	0.30	5.0	**0.011**	**0.19**	NIL	0.056	ND	0.001
14.	U.P.R.V.U.N. Obra	Khairatiya, Obra	12.11.14	05Hz	7.80	65.9	5.99	28.0	8.0	1.95	43.9	0.38	0.54	0.39	8.0	**0.058**	**0.14**	NIL	0.054	ND	0.002
15.	,,	Infront of Church, Obra	12.11.14	05Hz	7.01	63.1	5.99	26.0	8.0	1.46	42.4	0.31	0.33	0.31	7.6	**0.097**	**0.16**	NIL	0.082	ND	ND
16.	,,	Infront of Chalchitra, Obra	12.11.14	05Hz	7.11	61.0	8.48	16.0	4.80	0.98	44.4	0.33	0.43	**0.32**	4.0	**0.007**	**0.20**	NIL	0.072	ND	0.002
17.	,,	Infront of Convent School, Obra	12.11.14	05Hz	7.16	79.5	7.98	16.0	4.80	0.98	50.1	0.16	0.24	**0.31**	6.2	**0.035**	**0.17**	NIL	0.103	**0.012**	ND
18.	,,	Near Police Station. Obra	12.11.14	05Hz	7.50	39.9	6.98	6.0	1.60	0.49	26.6	0.32	0.22	**0.36**	7.2	**0.098**	**0.17**	NIL	0.078	ND	0.002
19.	,,	Near CISF Gate Obra	12.11.14	05Hz	7.10	60.8	5.48	16.0	5.61	0.49	41.2	**0.39**	0.39	0.37	8.0	**0.050**	**0.18**	NIL	0.078	**0.004**	nd
20.	,,	Sector No. 10, Near Railway Station, Obra	**आर0ओ0 प्लाण्ट स्थापित परन्तु स्टेबलाइजर खराब होने के कारण कार्यरत नहीं।**																		

नोटः– उपरोक्त विवरण में दी गयी प्रदूषक तत्वों की मात्रा केन्द्रीय प्रयोगशालाः उ0प्र0 प्रदूषण नियंत्रण बोर्ड, लखनऊ एवं क्षेत्रीय कार्यालयः वाराणसी से प्राप्त विश्लेषण आख्या के अनुसार है।

वैज्ञानिक सहायक **सहायक वैज्ञानिक अधिकारी** **क्षेत्रीय अधिकारी,**
उ0प्र0 प्रदूषण नियंत्रण बोर्ड,
सोनभद्र।

Annexure 6

क्षेत्रीय कार्यालय : उ0प्र0 प्रदूषण नियंत्रण बोर्ड, सोनभद्र

आउट लुक मैगजीन में छपे जनपद–सोनभद्र के 13 ग्रामों के भूगर्भ जल (हैण्ड पम्प) से एकत्र किये गये जल नमूनें की विश्लेषण आख्याः–

क्र0 सं0	चिन्हित ग्राम	जल नमूना एकत्रण स्थल	दिनांक	Colour	PH	Conductivity	Chloride mg/L	Total Hardness	Ca++ mg/L	Mg++ mg/L	TDS	Fe	Fluoride mg/L	Mn	SO_4	Cd	Cu	Led mg/L	Mercury mg/L	Arsenic mg/L
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Indian Standard Specifications for Drinking water IS: 10500 Standards →			**05Hz**	**6.5 to 8.5**	**--**	**250**	**300**	**75**	**30**	**500**	**0.3**	**0.6 to 1.2**	**0.1**	**150**	**0.01**	**0.05**	**0.1**	**0.001**	**0.05**
1.	अनपरा/ परासी, म्योरपुर	हैण्ड पम्प लक्ष्मी आवास, परासी	16.11.14	05Hz	7.16	753	82.96	344.0	112.22	15.62	436.0	0.58	0.80	**0.17**	128.0	**0.021**	**0.36**	0.064	**0.004**	0.001
2.	डिबुलगंज, म्योरपुर	पंचायत भवन के पास	16.11.14	05Hz	6.93	603.0	139.94	380.0	16.23	21.96	362.0	**2.03**	0.68	**0.21**	147.0	**0.046**	**0.36**	0.054	**0.004**	ND
3.	नई बस्ती, डाला, चोपन	रमेश सिंह गोमटी के सामने	16.11.14	05Hz	7.07	805.0	34.98	300.0	**96.16**	14.64	553.0	**1.20**	0.62	**0.20**	54.0	**0.085**	**0.34**	0.058	ND	0.002
4.	चिल्काडाड़, म्योरपुर, शक्तिनगर	चिल्काडाड़,	28.06.14	05Hz	7.80	--	--	180.0	90.0	**90.0**	--	--	0.25	**--**	--	**--**	**--**	--	**--**	--
5.	कुसुम्हा	कल्याण के घर के समीप	28.06.14	05Hz	6.92	913.0	47.48	278.0	84.96	16.10	569.0	0.20	**1.3**	<0.05	49.0	**0.024**	0.02	--	**--**	--
6.	खैराही, म्योरपुर	रामकेश के घर के समीप	28.06.14	10Hz	6.55	674.0	32.49	174.0	57.71	7.32	426.0	**1.53**	**1.5**	0.10	32.0	**0.026**	0.05	--	**--**	--
7.	बेलवादह, अनपरा	रामनरायन पनिका के घर के समीप	30.06.14	05Hz	7.82	324.0	10.99	146.0	49.70	5.37	216.0	**1.06**	**1.8**	0.11	24.0	BDL	BDL	--	**--**	--
8.	पिपरी, म्योरपुर	अर्जुन भारती के घर के समीप	30.06.14	05Hz	6.97	524.0	12.49	240.0	76.15	12.20	350.0	**1.20**	**1.3**	<0.05	34	BDL	0.05	--	**--**	--
9.	रोहनियाडामर, चोपन	मधुरी मोड़ रोहनियाडामर	16.11.14	05Hz	7.69	562.0	11.99	150.0	50.50	5.85	370.0	**0.56**	**1.20**	0.07	14.0	**0.082**	**0.39**	0.045	**0.008**	0.001
10.	बागेसोती, चोपन	कमलेश निवास	16.11.14	05Hz	6.67	296.0	8.48	160.0	52.10	7.32	194.0	**2.45**	0.75	0.10	24.0	**0.015**	**0.42**	0.052	**0.004**	ND
11.	गोबरदहा, चोपन	लालमनी के घर के समीप	16.11.14	05Hz	7.24	788.0	44.98	270.0	80.96	16.59	523.0	**5.06**	0.4	0.27	24.0	**0.089**	**0.35**	0.012	**ND**	0.003
12.	किरवानी, म्योरपुर	प्रा0 विद्यालय मनहरवा टोला	16.11.14	05Hz	7.01	486.0	11.49	290.0	**88.17**	17.08	224.0	**4.60**	0.86	0.70	50.0	0.007	**0.36**	0.033	**ND**	0.001
13.	मनबसा, दुद्धी	जय प्रकाश निवास के समीप	16.11.14	05Hz	7.34	701.0	10.49	200.0	61.72	11.22	463.0	**0.63**	0.54	0.13	55.0	**0.085**	**0.38**	0.050	**ND**	0.003

नोटः– उपरोक्त विवरण में दी गयी प्रदूषक तत्वों की मात्रा केन्द्रीय प्रयोगशालाः उ0प्र0 प्रदूषण नियंत्रण बोर्ड, लखनऊ एवं क्षेत्रीय कार्यालयः वाराणसी से प्राप्त विश्लेषण आख्या के अनुसार है।

वैज्ञानिक सहायक

सहायक वैज्ञानिक अधिकारी

क्षेत्रीय अधिकारी,
उ0प्र0 प्रदूषण नियंत्रण बोर्ड,
सोनभद्र।

क्षेत्रीय कार्यालय : उ0प्र0 प्रदूषण नियंत्रण बोर्ड, सोनभद्र

आ0सं0–276/2013 अश्वनी कुमार दुबे बनाम यूनियन ऑफ इण्डिया व अन्य तथा आ0संख्या– 20/2014 जगत नारायण विश्वकर्मा बनाम यूनियन ऑफ इण्डिया व अन्य के सम्बन्ध में मा0 राष्ट्रीय हरित न्यायाधिकरण, नई दिल्ली के आदेशों के अनुपालन में अतिप्रदूषणकारी क्षेत्र जनपद–सोनभद्र में चिन्हित 45 ग्रामों/मजरों से एकत्र किये गये जल नमूने की विश्लेषण आख्या के सम्बन्ध में।

क्र0 सं0	चिन्हित ग्राम	जल नमूना एकत्रण स्थल	जल स्रोत	दिनांक	Colour	PH	Conductivity	Chloride mg/L	Total Hardn-ess	Ca++ mg/L	Mg++ mg/L	TDS	Fe	Fluoride mg/L	Mn	SO_4	Cd	Cu
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	Indian Standard Specifications for Drinking water IS: 10500 Standards →				**05Hz**	**6.5 to 8.5**	**--**	**250**	**300**	**75**	**30**	**500**	**0.3**	**0.6 to 1.2**	**0.1**	**150**	**0.01**	**0.05**
1.	डाला टोला, सोनभद्र	मेन रोड टैम्पू स्टैण्ड, डाला	HP Mark 2nd	01.07.14	05Hz	7.54	589	19.99	**320**	**102.60**	15.62	390	**0.91**	BDL	**0.12**	29	0.01	0.01
2.	खाड़पाथर, रेनुकूट	सोनांचल शिक्षा निकेतन के समीप	HP Mark 2nd	28.06.14	05Hz	6.39	787	23.99	208	67.33	9.76	498	**0.84**	BDL	0.10	38	BDL	0.1
3.	बेलहत्थी, रेनुकूट	सहदेव हाऊस के पास	HP Mark 2nd	28.06.14	05Hz	6.65	829	25.99	232	72.14	12.69	422	0.09	0.12	0.05	32	**0.017**	**0.09**
4.	ठाड़पाथर, रेनुकूट	सुखनाथ के घर के समीप	HP Mark 2nd	29.06.14	05Hz	6.24	408	21.99	118	36.07	6.83	270	0.06	0.9	0.05	34	BDL	**0.06**
5.	रेनुकूट आंशिक	मेसर्स सिंह एजेन्सी टी0वी0एस0 के समीप	HP Mark 2nd	29.06.14	**20Hz**	6.11	793	69.97	252	**81.75**	11.71	**530**	0.30	0.33	**0.11**	32	BDL	0.32
6.	काशी मोड़, अनपरा	काशी मोड़ चौक के समीप	HP Mark 2nd	29.06.14	05Hz	6.50	1270	74.97	**308**	**92.18**	19.03	**805**	0.25	BDL	0.05	40	BDL	**0.40**
7.	गरबन्धा, रेनुसागर	श्रीमती तीर्थमनी देवी के घर के समीप	HP Mark 2nd	29.06.14	05Hz	6.67	1982	132.44	**544**	**159.51**	**35.62**	**1265**	**0.36**	0.10	0.05	36	BDL	**0.40**
8.	पड़तलिया, रेनुसागर	श्री प्यारे सिंह के घर के समीप	HP Mark 2nd	29.06.14	05Hz	6.94	1352	37.98	**440**	**144.28**	19.52	**854**	**1.31**	0.26	0.11	56	BDL	BDL
9.	पिपरी, अनपरा	श्री अर्जुन भारती के घर के पास	HP Mark 2nd	30.06.14	05Hz	6.97	524	12.49	240	**76.15**	12.20	350	**1.20**	**1.3**	<0.05	34	BDL	0.05
10.	बेलवादह, अनपरा	रामनरायन पनिका	HP Mark 2nd	30.06.14	05Hz	7.82	324	10.99	146	49.70	5.37	216	**1.06**	**1.8**	0.11	24	BDL	BDL

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
11.	रेहटा, अनपरा	श्री सुशीला निराला हाऊस	HP Mark 2^{nd}	30.06.14	05Hz	7.14	710	28.49	216	70.54	9.76	474	**1.33**	**1.4**	**0.65**	32	**0.012**	BDL
12.	बासी, अनपरा	श्री नन्दलाल के घर के समीप	HP Mark 2^{nd}	30.06.14	05Hz	7.20	1203	64.97	**340**	**104.20**	19.52	**799**	**0.99**	BDL	**0.65**	38	BDL	BDL
13.	कुसुम्हां, रेनुकूट	श्री कल्याण के घर के समीप	HP Mark 2^{nd}	28.06.14	05Hz	6.92	913	47.48	278	**84.96**	16.10	**569**	0.20	**1.3**	<0.05	49	**0.024**	0.02
14.	खैराही, रेनुकूट	श्री रामकेश के घर के समीप	HP Mark 2^{nd}	28.06.14	10Hz	6.55	674	32.49	174	57.71	7.32	426	**1.53**	**1.5**	0.10	32	**0.026**	0.05
15.	नकटू अधौरा, रिहन्दनगर	हैण्ड पम्प	HP Mark 2^{nd}	30.06.14	Absent	7.10	--	61	**312**	**228**	**84**	--	**3.52**	0.85	NT	16	--	NT
16.	सिरसोती, रिहन्दनगर	हैण्ड पम्प	HP Mark 2^{nd}	30.06.14	Absent	7.89	--	19	210	**116**	**94**	--	**0.89**	1.18	0.11	13	--	NT
17.	चिल्काटांड़, खड़िया	वाटर सप्लाई	Water Supply	28.06.14	Absent	**8.62**	--	12	122	48	**74**	--	**1.14**	NT	**0.15**	16	--	NT
18.	चिल्काटांड़, खड़िया	हैण्ड पम्प	HP Mark 2^{nd}	28.06.14	Absent	7.80	--	18	180	**90**	**90**	--	--	0.25	--	--	--	NT
19.	परसवार चौबे, शक्तिनगर	हैण्ड पम्प	HP Mark 2^{nd}	28.06.14	Absent	7.29	--	92	**412**	**292**	**120**	--	**3.67**	NT	**0.23**	14	--	NT
20.	परसवार राजा, शक्तिनगर	हैण्ड पम्प	HP Mark 2^{nd}	28.06.14	Absent	7.28	--	237	**396**	**308**	**88**	--	**2.39**	NT	**0.26**	14	--	NT
21.	परसवार बाबू शक्तिनगर	हैण्ड पम्प	HP Mark 2^{nd}	28.06.14	Absent	7.34	--	146	280	**124**	**156**	--	**1.32**	0.31	**0.35**	17	--	NT
22.	दुद्धीचुआं	हैण्ड पम्प	HP Mark 2^{nd}	28.06.14	Absent	7.85	--	47	94	42	**30**	--	--	1.17	--	--	--	NT
23.	दुद्धीचुआं	वाटर सप्लाई	Water Supply	28.06.14	Absent	8.20	--	13	98	40	**58**	--	**0.40**	NT	**0.42**	15	--	NT
24.	बड़वाभटवारी, शक्तिनगर	हैण्ड पम्प	HP Mark 2^{nd}	28.06.14	Absent	6.92	--	57	200	**100**	**100**	--	**3.85**	NT	**1.86**	16	--	NT
25.	चिल्काटांड़, शक्तिनगर	हैण्ड पम्प	HP Mark 2^{nd}	28.06.14	Absent	6.98	--	24	188	**96**	**92**	--	--	--	--	--	--	NT
26.	रानीबारी, शक्तिनगर	हैण्ड पम्प	HP Mark 2^{nd}	28.06.14	Absent	7.08	--	129	**418**	**278**	**140**	--	**1.62**	NT	**0.19**	18	--	NT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
27.	बरवारी, बीना	हैण्ड पम्प	HP Mark 2nd	29.06.14	Absent	7.35	--	27	196	62	**134**	--	--	NT	--	--	--	NT
28.	चन्दुआर, बीना	हैण्ड पम्प	HP Mark 2nd	29.06.14	Absent	7.31	--	32	296	**144**	**152**	--	**1.85**	NT	**1.18**	14	--	NT
29.	कोहरौल, बीना	हैण्ड पम्प	HP Mark 2nd	29.06.14	Absent	7.22	--	229	**516**	**268**	**248**	--	**3.36**	0.10	0.45	16	--	NT
30.	कोहरौलिया, बीना	हैण्ड पम्प	HP Mark 2nd	29.06.14	Absent	7.00	--	500	**1228**	**1000**	**228**	--	**0.59**	0.02	**0.27**	13	--	NT
31.	मिसिरा, बीना	हैण्ड पम्प	HP Mark 2nd	29.06.14	Absent	7.36	--	36	**380**	**220**	**160**	--	**0.76**	NT	**0.22**	17	--	NT
32.	भरवारी, बीना	हैण्ड पम्प	HP Mark 2nd	29.06.14	Absent	7.58	--	23	294	**148**	**146**	--	**3.69**	0.04	**0.34**	14	--	NT
33.	धरसड़ी, बीना	हैण्ड पम्प	HP Mark 2nd	29.06.14	Absent	7.52	--	30	**312**	**168**	**144**	--	**2.17**	NT	NT	12	--	NT
34.	रेनुकूट खाड़पाथर	खाड़पाथर गाँव में	न0पा0 टैंकर	28.06.14	05Hz	7.43	180	45.98	70	23.24	2.93	115	0.15	BDL	BDL	06	**0.083**	BDL
35.	खैराही, रेनुकूट (टैंकर)	श्री रामकेश के घर के समीप	न0पा0 टैंकर	28.06.14	05Hz	7.42	184	20.99	74	24.05	3.42	120	0.22	0.8	BDL	07	**0.016**	0.1
36.	ओबरा	ओबरा	HP Mark 2nd	01.07.14	Absent	7.20	--	**84**	**380**	240	140	--	**0.89**	**0.86**	**0.59**	12	--	NT
37.	डाला टोला वाटर सप्लाई	मे0 जे0पी0 सीमेन्ट फैक्ट्री का कैम्पस	WTP	01.07.14	05Hz	7.14	168	10.99	70	23.25	2.93	111	**0.67**	BDL	0.11	11	BDL	BDL
38.	ओबरा	रेनु रीवर ऑफटर मीटिंग झरिया नाला	--	01.07.14	Absent	8.17	--	36	218	**124**	**94**	--	--	--	--	--	--	NT
39.	परसवार चौबे, शक्तिनगर	वाटर सप्लाई	--	28.06.14	Absent	8.45	--	13	70	48	22	--	--	NT	--	--	--	NT

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
41.	हाईटेक कार्बन, रेनुकूट WTP	मे0 हाईटेक कार्बन, रेनुकूट का कैम्पस	WTP	28.06.14	05Hz	7.73	136	28.99	54	14.44	1.95	87	0.26	BDL	0.05	07	BDL	0.03
42.	मुर्धवा, रेनुकूट	मे0 एस0आई0 हास्पिटल के समीप	Supply Water	05.07.14	05Hz	7.81	140	29.49	58	23.24	3.90	88	0.30	BDL	0.05	08	BDL	0.04
43.	परसवार राजा शक्तिनगर	परसवार राजा शक्तिनगर	Water Supply	28.06.14	Absent	8.44	--	11	68	46	22	--	--	NT	--	--	--	NT
44.	परसवार बाबू शक्तिनगर	परसवार बाबू शक्तिनगर	Water Supply	28.06.14	Absent	8.35	--	12	64	36	28	--	--	NT	--	--	--	NT
45.	WTP लैंको अनपरा	मे0 लैंको पावर प्लाण्ट का कैम्पस	WTP	30.06.14	05Hz	7.30	148	12.49	72	24.85	2.44	99	0.30	0.6	<0.05	20	BDL	BDL

नोटः– उपरोक्त विवरण में दी गयी प्रदूषक तत्वों की मात्रा क्षेत्रीय कार्यालयः वाराणसी एवं क्षेत्रीय कार्यालयः इलाहाबाद से प्राप्त विश्लेषण आख्या के अनुसार है।

वैज्ञानिक सहायक

सहायक वैज्ञानिक अधिकारी

क्षेत्रीय अधिकारी,
उ0प्र0 प्रदूषण नियंत्रण बोर्ड,
सोनभद्र।

Annexure 7

UTTAR PRADESH POLLUTION CONTROL BOARD
REGIONAL OFFICE, SONBHADRA

U.P. Pollution Control Board is also monitoring the Rihand Reservoir in Distt. Sonebhadra . The analysis report of the river quality is as follows:-

Sl. No.	Month	Sampling Points*	Analysed Parameters							
			pH	DO (mg/L)	BOD (mg/L)	COD (mg/L)	TDS (mg/L)	Sodium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)
1.	Jan., 14	U/S	8.04	7.4	2.3	20	192	9.2	50	42
		D/S	8.08	7.5	2.2	18	181	9.0	42	34
2.	Feb., 14	U/S	8.10	7.6	2.4	18	190	10.0	56	44
		D/S	8.05	7.7	2.2	17	176	9.7	48	42
3.	Mar, 14	U/S	8.00	7.5	2.2	16	132	10.2	53	43
		D/S	7.90	7.8	2.1	15	118	9.9	46	42
4.	Apr, 14	U/S	8.12	7.4	2.3	18	152	10.4	55	-
		D/S	7.18	7.6	2.0	20	136	9.8	49	-
5.	May, 14	U/S	8.26	7.8	2.4	20	144	9.6	42	46
		D/S	7.12	8.2	2.2	18	126	10.2	55	41
6.	June, 14	U/S	8.30	7.3	2.3	18	158	9.3	58	38
		D/S	8.12	7.5	2.0	16	146	8.8	48	50
7.	July, 14	U/S	8.25	7.0	2.2	16	166	7.5	52	28
		D/S	8.20	7.3	2.0	14	158	6.3	42	54
8.	Aug, 14	U/S	8.22	7.6	2.4	18	172	6.6	48	24
		D/S	8.24	7.8	2.2	20	164	6.9	36	50
9.	Sept, 14	U/S	8.26	7.4	2.3	16	155	7.2	40	38
		D/S	8.20	8.0	2.0	18	160	7.8	46	34
10.	Oct, 14	U/S	8.18	7.1	2.3	16.0	126.0	5.8	72.0	52.0
		D/S	8.26	7.4	2.1	18.0	138.0	5.3	64.0	48.0
11.	Nov, 14	U/S	5.15	7.6	8.5	18.00	109.0	6.4	68.0	44.0
		D/S	8.20	7.8	2.2	21.0	122.0	6.0	56.0	44.0

Annexure 8

UTTAR PRADESH POLLUTION CONTROL BOARD
REGIONAL OFFICE, SONBHADRA

ANALYSIS REPORT

BALIA NALA, SHAKTINAGAR, SONBHADRA

Sl. No.	Month	Analysed Parameters						
		pH	BOD (mg/L)	COD (mg/L)	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	F (mg/L)
	Month Standard	**6.5-8.5**	**30.0mg/L**	**250.0mg/L**	**100mg/L**	**500mg/L**	**600mg/L**	**1.0-2.0**
1.	Feb., 2013	7.88	15	92	86	332	418	1.01
2.	Mar., 2013	7.72	**135**	**336**	**210**	496	706	0.54
3.	Apr., 2013	7.76	**138**	**352**	**216**	502	718	0.59
4.	May, 2013	7.52	19	72	70	344	524	0.33
5.	June, 2013	7.40	**32**	128	96	362	458	-
6.	July, 2013	7.68	**33.4**	165	-	366	512	1.57
7.	Aug.,2013	7.34	**36.0**	128.0	58.0	122.0	180.0	0.48
8.	Sep.,2013	7.40	28.3	118.0	46.0	120.0	166.0	0.68
9.	Oct., 2013	7.40	26.5	120.0	32.0	132.0	164.0	0.56
10.	Dec. 2013	8.12	22.8	122.0	43.0	116.0	159.0	0.46
12.	Jan., 2014	7.42	31.8	112.0	36.0	98.0	134.0	0.54
13.	Apr., 2014	6.5	30.0	118.0	54.0	134.0	188.0	--
14.	May, 2014	7.0	**36.0**	126.0	48.0	128.0	176.0	--
15.	July, 2014	7.90	**38.0**	166.0	55.0	264.0	319.0	--
16.	Sep.,2014	7.63	**42.0**	134.0	60.0	321.0	381.0	--

ANALYSIS REPORT

MURDHAWA NALA, RENUKOOT, SONBHADRA

Sl. No.	Month	Analyzed Parameters						
		pH	BOD (mg/L)	COD (mg/L)	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	F (mg/L)
Month	**Standard**	**6.5-8.5**	**30.0mg/L**	**250.0mg/L**	**100mg/L**	**500mg/L**	**600mg/L**	**1.0-2.0**
1.	Jan.,2013	8.26	**38**	240	84	312	396	1.75
2.	Feb.,2013	**8.8**	30	110	78	296	374	1.72
3.	Mar.,2013	7.27	**33.6**	154.4	**118**	372	490	1.96
4.	Apr., 2013	**9.18**	**32**	144	62	292	354	1.13
5.	May,2013	6.85	25.6	76.12	**115**	220	335	3.30
6.	Jun.,2013	7.16	20.4	72.0	88	282	320	2.85
7.	July, 2013	7.38	11.5	55.2	34	290	324	-
8.	Aug.,2013	7.52	12.2	58.0	56.0	98.0	158.0	0.22
9.	Sep.,2013	7.60	13.6	52.0	50.0	92.0	142	0.28
10.	Oct., 2013	7.58	16.6	68.0	42.0	85.0	127.0	0.44
11.	Nov.,2013	7.50	14.2	58.0	48.0	92.0	140.0	0.72
12.	Dec. 2013	7.04	13.8	56.0	48.0	76.0	94.0	0.68
13.	Jan.,2014	7.56	12.8	54.0	46.0	86.0	132.0	0.70
14.	Apr., 2014	7.50	26.0	180.0	40.0	92.0	132.0	--
15.	May,2014	6.50	22.0	118.0	36.0	112.0	148.0	--
16.	Jun.,2014	**8.85**	**41.0**	238.0	76.0	507.0	583.0	--
17.	July, 2014	7.45	18.0	82.0	58.0	438.0	496.0	--
18.	Aug.,2014	7.53	19.0	114.0	70.0	514.0	584.0	--
19.	Sep.,2014	7.02	20.0	92.0	30.0	498.0	528.0	--
20.	Nov., 2014	7.18	22.0	114.0	78.0	356.0	434.0	--

ANALYSIS REPORT

DONGIYA NALA, RENUKOOT, SONBHADRA

Sl. No.	Month	Analyzed Parameters						
		pH	BOD (mg/L)	COD (mg/L)	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	F (mg/L)
Month	**Standard**	**6.5-8.5**	**30.0mg/L**	**250.0mg/L**	**100mg/L**	**500mg/L**	**600mg/L**	**1.0-2.0**
1.	Jan.,2013	8.21	5.2	26.4	54	298	352	0.91
2.	Feb.,2013	8.02	6.0	32	52	272	324	0.74
3.	Mar.,2013	8.24	14.1	104.8	43	290	333	0.44
4.	Apr., 2013	7.88	15	68	**283**	311	594	0.53
5.	May,2013	7.32	16.4	54.24	35	330	365	0.59
6.	Jun.,2013	7.68	5.6	32	32	280	312	0.16
7.	July, 2013	7.56	4.8	20	29	286	315	0.24
8.	Aug.,2013	7.61	8.3	42.00	52.00	92.0	144.00	0.32
9.	Sep.,2013	7.58	7.8	38.0	52.0	88.0	140.0	0.26
10.	Oct., 2013	7.82	12.3	62.0	40.0	76.0	116.0	0.24
11.	Nov.,2013	7.47	9.6	42.0	40.0	80.0	120.0	0.30
12.	Dec. 2013	**8.73**	10.6	62.0	46.0	72.0	118.0	0.34
13.	Jan.,2014	7.78	8.5	40	38	70	108	0.32
14.	Apr., 2014	8.0	12.0	72.0	48.0	108.0	156.0	--
15	May,2014	7.5	16.0	98.0	54.0	118.0	172.0	--
16.	July, 2014	7.78	14.0	76.0	62.0	206.0	322.0	--
17.	Aug.,2014	7.68	20.0	116.0	48.0	141.0	189.0	--
18.	Sept,2014	7.94	22.0	126.0	26.0	83.0	109.0	--
19.	Oct,2014	8.35	24.0	128.0	46.0	136.0	182.0	--

Annexure 9

Mercury & Fluoride in Groundwater Samples of Singrauli

Sr. No.	Sample Location	Mercury (mg/L)	Fluoride (mg/L)
1	Tube well (TW), CWS colony, Jayant, Singrauli	0.0003	-----
2	TW, Nigahi mode, Nigahi, Singrauli	Nil	-----
3	TW, Majan colony, Waidhan, Singrauli	0.0001	-----
4	TW, Nigam colony, Waidhan, Singrauli	Nil	-----
5	TW, Bilauni colony, Waidhan, Singrauli	0.0003	-----
6	TW, Ward no. 40, Waidhan, Singrauli	0.0001	-----
7	TW, Ward no. 39, Waidhan, Singrauli	Nil	-----
8	TW, Ward no. 31, Waidhan, Singrauli	0.0003	-----
9	TW, Chulha gate, Waidhan, Singrauli	Nil	-----
10	TW, Navjeevan vihar, Waidhan, Singrauli	Nil	-----
11	Handpump (HP), Pri. School, Dudhichua	Nil	BDL
12	HP, NCL Colony, Jhingurada	**0.002**	BDL
13	HP, Shiv mandir, Amlohri	Nil	BDL
14	HP, Sabjimandi, Jayant	Nil	BDL
15	HP, Sarasawahraja colony, Jayant	Nil	BDL
16	HP, Substation, Sector B, Dudhichua	**0.002**	BDL
17	HP, Vivekanand statue, Nigahi	Nil	BDL
18	HP, Sh. Tulsidas Pandey House, Telegawan	**0.002**	BDL
19	HP, Sh. Balmukund Mishra house, Jubadi	Nil	BDL
20	HP, Sh. Bhagwandas Harijan house, Judi	0.001	BDL
21	HP, Sh. Ramdayal Pal house, Chandrawal	Nil	BDL

BDL – Below detectable limit

Annexure 10

Drinking Water Quality Monitoring for Villages in the vicinity of Mahan Aluminium, Singrauli, Madhya Pradesh

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FORMAT NO. ECO/QS/FORMAT/09 TEST REPORT NO:ECO LAB/205/DW/12/14
TEST REPORT ISSUE DATE:05.01.2015

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Distt.:Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 23.12.2014
Packaging of Sample : Plastic Can
Date of Analysis : 23.12.2014 to 31.12.2014
Source of Sample : Odgari Village Primary School,Hand Pump (ELW-1459)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.2	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	598.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	320.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	296.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	6.3	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	11.2	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	78.4	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	90.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.81	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.27	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.16	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

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FORMAT NO. ECO/QS/FORMAT/09 TEST REPORT NO:ECO LAB/205/DW/12/14
TEST REPORT ISSUE DATE:05.01.2015

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Distt.:Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 23.12.2014
Packaging of Sample : Plastic Can
Date of Analysis : 23.12.2014 to 31.12.2014
Source of Sample : Dharsara Village Nr. Primary School (ELW-1460)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.8	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	265.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	200.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	216.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.9	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	8.92	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	68.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	42.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.57	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.25	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.16	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

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FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/205/DW/12/14
TEST REPORT ISSUE DATE:05.01.2015

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Distt.:Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 23.12.2014
Packaging of Sample : Plastic Can
Date of Analysis : 23.12.2014 to 31.12.2014
Source of Sample : Barokhar Village Opp. Sarvodaya J. H. School, Hand Pump (ELW-1461)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.0	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	557.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	288.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	308.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.8	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	33.20	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	63.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	114.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.41	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.34	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.24	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

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FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/205/DW/12/14
TEST REPORT ISSUE DATE:05.01.2015

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Distt.:Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 23.12.2014
Packaging of Sample : Plastic Can
Date of Analysis : 23.12.2014 to 31.12.2014
Source of Sample : Barainiya Village, Near Temple (Hand Pump) (ELW-1462)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.1	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	489.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	292.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	252.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	6.0	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	34.50	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	51.5	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	84.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	1.0	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.45	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.23	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09 TEST REPORT NO:ECO LAB/184/DW/11/14TEST
REPORT ISSUE DATE:04.12.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 27.11.2014
Packaging of Sample : Plastic Can
Date of Analysis : 27.11.2014 to 05.12.2014
Source of Sample : Baghadih Village, High School, Hand Pump (ELW-1366)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS a per IS 10500:1991(Reaff:2012)	
					Desirable	Permissil
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.68	0.1-13.9	6.5-8.5	No Rela
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	425.0	10-10000	500 mg/l	2000 mg
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	240.0	1-500	200 mg/l	600 mg.
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	268.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.5	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	21.0	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	10.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	90.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Rela
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Rela
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Rela
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Rela
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.50	0.02-10	1.0 mg/l	1.5 mg/
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.25	0.02-100	5 mg/l	15 mg/
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	2.0	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/184/DW/11/14
TEST REPORT ISSUE DATE:04.12.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 27.11.2014
Packaging of Sample : Plastic Can
Date of Analysis : 27.11.2014 to 05.12.2014
Source of Sample : Bargawan Inter College Hand Pump(ELW-1364)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.8	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	1211.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	356.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	580.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.5	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	36.5	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	88.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	456.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.62	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.20	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.008	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

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FORMAT NO. ECO/QS/FORMAT/09 TEST REPORT NO:ECO LAB/184/DW/11/14TEST
REPORT ISSUE DATE:04.12.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD.
(Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886,
Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 27.11.2014
Packaging of Sample : Plastic Can
Date of Analysis : 27.11.2014 to 05.12.2014
Source of Sample : Odgari Village Primary School,Hand Pump(ELW-1365)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.98	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	665.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	316.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	364.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.6	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	10.5	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	82.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	88.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.92	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.24	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.18	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09 TEST REPORT NO:ECO LAB/184/DW/11/14TEST
REPORT ISSUE DATE:04.12.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 27.11.2014
Packaging of Sample : Plastic Can
Date of Analysis : 27.11.2014 to 05.12.2014
Source of Sample : Gidhar Village near Primary School, Hand Pump (ELW-1367)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.8	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	244.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	164.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	176.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.6	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	38.5	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	18.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	22.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.95	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.30	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.25	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

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FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/166/DW/10/14
TEST REPORT ISSUE DATE: 30.10.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 18.10.2014
Packaging of Sample : Plastic Can
Date of Analysis : 18.10.2014to 25.10.2014
Source of Sample : Gidhar Village near Primary School, Hand Pump (ELW-1246)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.8	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	239.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	104.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	148.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.5	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	41.3	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	20.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	22.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	1.0	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.36	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.29	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/166/DW/10/14
TEST REPORT ISSUE DATE:30.10.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 18.10.2014
Packaging of Sample : Plastic Can
Date of Analysis : 18.10.2014 to 25.10.2014
Source of Sample : Bargawan Inter College, Hand Pump (ELW-1245)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.9	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	1380.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	208	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	596	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.4	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	41.6	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	95.3	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	480.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.61	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.24	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	BDL	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/166/DW/10/14
TEST REPORT ISSUE DATE: 30.10.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 18.10.2014
Packaging of Sample : Plastic Can
Date of Analysis : 18.10.2014 to 25.10.2014
Source of Sample : Baghadih Village. Primary Health Centre, Hand Pump (ELW-1244)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.45	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	242.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	116.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	152.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	6.0	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	23.0	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	8.75	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	38.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.43	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.34	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	5.1	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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Manager (Q)

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/166/DW/10/14
TEST REPORT ISSUE DATE: 30.10.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 18.10.2014
Packaging of Sample : Plastic Can
Date of Analysis : 18.10.2014to 25.10.2014
Source of Sample : Odgari Village Primary School, Hand Pump (ELW-1243)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.0	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	625.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	240.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	348.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.5	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	12.0	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	94.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	72.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.94	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.24	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.27	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit.

Analyst

Lab Incharge

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/155/DW/09/14
TEST REPORT ISSUE DATE:10.10.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer	:	HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer	:	NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method	:	IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by	:	Mr. Ashok
Sample Quantity	:	2 Ltr.
Date of Sampling	:	27.09.2014
Packaging of Sample	:	Plastic Can
Date of Analysis	:	27.09.2014 to 05.10.2014
Source of Sample	:	Baraliniya Village, Near Temple (ELW-1159) (Hand Pump)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.3	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	615.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	172.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	236.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.8	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	37.66	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	55.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	108.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	1.0	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.48	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.29	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/155/DW/09/14
TEST REPORT ISSUE DATE:10.10.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 27.09.2014
Packaging of Sample : Plastic Can
Date of Analysis : 27.09.2014 to 05.10.2014
Source of Sample : Dharsara Village Nr. Primary School (ELW-1158)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.9	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	392.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	176.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	252.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.6	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	8.72	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	70.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	50.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.61	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.30	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.15	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/155/DW/09/14
TEST REPORT ISSUE DATE:10.10.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer	:	HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer	:	NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method	:	IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by	:	Mr. Ashok
Sample Quantity	:	2 Ltr.
Date of Sampling	:	27.09.2014
Packaging of Sample	:	Plastic Can
Date of Analysis	:	27.09.2014 to 05.10.2014
Source of Sample	:	Barokhar Village Sarvodaya J. H. School, Hand Pump (ELW-1157)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.8	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	730.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	168.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	460.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.5	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	38.19	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	61.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	174.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.48	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.32	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.25	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

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FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/155/DW/09/14
TEST REPORT ISSUE DATE:10.10.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 27.09.2014
Packaging of Sample : Plastic Can
Date of Analysis : 27.09.2014 to 05.10.2014
Source of Sample : Odgari Village Primary School, Hand Pump (ELW-1156)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.0	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	665.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	248.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	356.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.6	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	10.0	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	92.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	78.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.93	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.28	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.28	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/139/DW/08/14
TEST REPORT ISSUE DATE:20.09.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer	:	HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer	:	NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.
Sampling Method	:	IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by	:	Mr. Ashok
Sample Quantity	:	2 Ltr.
Date of Sampling	:	29.08.2014
Packaging of Sample	:	Plastic Can
Date of Analysis	:	29.08.2014 to 10.09.2014
Source of Sample	:	Bargawan Inter College, Hand Pump (ELW-1035)

No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.10	0.1-13.9	6.5-8.5	No Relax.
	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	1690.0	10-10000	500 mg/l	2000 mg/l
	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	180.0	1-500	200 mg/l	600 mg/l
	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	590.0	1-1000	200.0 mg/l	600.0
	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.6	0.1-10	-	-
	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	40.7	0.5-100	45.0 mg/l	100.0
	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	94.0	1.0-200	200.0 mg/l	400.0
	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	454.0	0.5-1000	250.0 mg/l	1000.0
	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.46	0.02-10	1.0 mg/l	1.5 mg/l
	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.21	0.02-100	5 mg/l	15 mg/l
	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	BDL	0.002-100	0.3 mg/l	1 mg/l
	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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Manager (Q)

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/139/DW/08/14
TEST REPORT ISSUE DATE:20.09.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.

Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 29.08.2014
Packaging of Sample : Plastic Can
Date of Analysis : 29.08.2014 to 10.09.2014
Source of Sample : Odgari Village Primary School, Hand Pump (ELW-1036)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.5	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	661.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	160.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	376.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.9	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	7.88	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	190.5	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	92.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	1.0	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.27	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.31	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

(Dr.O. P. Shukla)
Manager (Q)

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/139/DW/08/14
TEST REPORT ISSUE DATE:20.09.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.

Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 29.08.2014
Packaging of Sample : Plastic Can
Date of Analysis : 29.08.2014 to 10.09.2014
Source of Sample : Waghadih Village, Near Primary Health Center (ELW-1037) (Hand Pump)

No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.5	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	231.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	116.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	148.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	6.1	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	22.7	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	11.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	42.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.33	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.30	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	6.6	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

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FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/139/DW/08/14
TEST REPORT ISSUE DATE:20.09.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.

Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 29.08.2014
Packaging of Sample : Plastic Can
Date of Analysis : 29.08.2014 to 10.09.2014
Source of Sample : Gidhar Village Primary School, Hand Pump (ELW-1038)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissible
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	6.8	0.1-13.9	6.5-8.5	No Relax.
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	217.0	10-10000	500 mg/l	2000 mg/l
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	96.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	136.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.8	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	44.0	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	22.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	18.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Relax.
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Relax
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Relax.
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Relax
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.5	0.02-10	1.0 mg/l	1.5 mg/l
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/l
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.32	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.25	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/119/DW/07/14
TEST REPORT ISSUE DATE:07.08.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.

Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 28.07.2014
Packaging of Sample : Plastic Can
Date of Analysis : 28.07.2014 to 05.08.2014
Source of Sample : Bargawan Inter College, Hand Pump (EL-897)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissi
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.28	0.1-13.9	6.5-8.5	No Rela
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	1881.0	10-10000	500 mg/l	2000 m
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	184.0	1-500	200 mg/l	600 mg
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	556.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.5	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	21.03	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	80.75	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	45.20	0.5-1000	250.0 mg/l	1000.(
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Rela
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Rel
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Rela
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Rel
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.51	0.02-10	1.0 mg/l	1.5 mg
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.28	0.02-100	5 mg/l	15 mg/
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	BDL	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absen
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absen

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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TEST REPORT NO:ECO LAB/119/DW/07/14
TEST REPORT ISSUE DATE:07.08.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.

Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 28.07.2014
Packaging of Sample : Plastic Can
Date of Analysis : 28.07.2014 to 05.08.2014
Source of Sample : Barokhar Village, Near Sarvodaya School Hand Pump (EL-896)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissib
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.71	0.1-13.9	6.5-8.5	No Relax
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	932.0	10-10000	500 mg/l	2000 mg/
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	148.0	1-500	200 mg/l	600 mg/l
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	276.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.6	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	19.9	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	74.12	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	114.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Rela
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Rela
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Rela
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Rela
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.45	0.02-10	1.0 mg/l	1.5 mg/
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.37	0.02-100	5 mg/l	15 mg/
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.15	0.002-100	0.3 mg/l	1 mg/
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absen
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absen

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/119/DW/07/14
TEST REPORT ISSUE DATE:07.08.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.

Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 28.07.2014
Packaging of Sample : Plastic Can
Date of Analysis : 28.07.2014 to 05.08.2014
Source of Sample : Barainia Village Near Temple, Hand Pump (EL-895)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS as per IS 10500:1991(Reaff:2012)	
					Desirable	Permissib
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.75	0.1-13.9	6.5-8.5	No Relax
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	770.0	10-10000	500 mg/l	2000 mg.
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	156.0	1-500	200 mg/l	600 mg/
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	192.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.4	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	17.6	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	35.0	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	80.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Rela
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Rela
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Rela
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Rela
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	1.2	0.02-10	1.0 mg/l	1.5 mg/
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.31	0.02-100	5 mg/l	15 mg/
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.28	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absen
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absen

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

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An approved Laboratory from Ministry of Environment & Forests, Govt. of India, New Delhi

FORMAT NO. ECO/QS/FORMAT/09

TEST REPORT NO:ECO LAB/119/DW/07/14
TEST REPORT ISSUE DATE:07.08.2014

TEST REPORT OF DRINKING WATER*

Name of the Customer : HINDALCO INDUSTRIES LTD. (Unit Mahan Aluminium)
Address of the Customer : NH-75E, Bargawan – 486 886, Dist.: Singrauli, M.P.

Sampling Method : IS 3025 (Part – 1) 1987, Reaffirmed 2013.
Sample Collected by : Mr. Ashok
Sample Quantity : 2 Ltr.
Date of Sampling : 28.07.2014
Packaging of Sample : Plastic Can
Date of Analysis : 28.07.2014 to 05.08.2014
Source of Sample : Dharsara Village Near Primary School, Hand Pump (ELW-894)

Sl. No.	TESTS	PROTOCOL	RESULT	Detection Range	INDIAN STANDARDS a per IS 10500:1991(Reaff:2012)	
					Desirable	Permissil
1	pH	IS 3025 (Part 11) : 1983 Reaffirmed 2002	7.5	0.1-13.9	6.5-8.5	No Rela
2	Total Dissolved Solids as TDS (mg/l)	IS 3025 (Part 15) : 1984 Reaffirmed 2003	544.0	10-10000	500 mg/l	2000 mg
3	Alkalinity (mg/l)	IS 3025 (Part 23) : 1986 Reaffirmed 2003	164.0	1-500	200 mg/l	600 mg/
4	Total Hardness as $CaCO_3$ (mg/l)	IS 3025 (Part21) : 2009	160.0	1-1000	200.0 mg/l	600.0
5	Dissolved Oxygen (DO) (mg/l)	APHA 22nd EDN.:2012 (4500 C)	5.5	0.1-10	-	-
6	Nitrate Nitrogen as NO_3 (mg/l)	IS 3025 (Part34) : 1988 Reaffirmed 2003	1.74	0.5-100	45.0 mg/l	100.0
7	Sulfate as SO_4 (mg/l)	IS 3025 (Part 24) : 1986 Reaffirmed 2003 (Turbidity Method)	5.75	1.0-200	200.0 mg/l	400.0
8	Chloride as Cl (mg/l)	IS 3025 (Part 32) : 1988 Reaffirmed 2007 (Argentometric Method)	46.0	0.5-1000	250.0 mg/l	1000.0
9	Lead as Pb (mg/l)	IS 3025 (Part 47) : 1994 Reaffirmed 2003	BDL	0.009-1	0.01 mg/l	No Rela
10	Cadmium Cd (mg/l)	IS 3025 (Part 41) : 1992 Reaffirmed 2003	BDL	0.0019-2	0.003 mg/l	No Rela
11	Chromium as Cr+6 (mg/l)	IS 3025 (Part 52) : 2003 Reprint 2007	BDL	0.006-100	0.05 mg/l	No Rela
12	Total Chromium as Cr (mg/l)	APHA 22nd EDN.:2012, 3111 – A +B	BDL	0.004-10	0.05	No Rela
13	Fluorides as F (mg/l)	IS 3025 (Part 60) : 2008 (Ion Selective Electrode Method)	0.66	0.02-10	1.0 mg/l	1.5 mg/
14	Copper as Cu (mg/l)	IS 3025 (Part 42) : 1992 Reaffirmed 2003	BDL	0.04-5	0.05 mg/l	1.5 mg/
15	Zinc as Zn (mg/l)	IS 3025 (Part 49) : 1994 Reaffirmed 2003	0.34	0.02-100	5 mg/l	15 mg/l
16	Iron as Fe (mg/l)	IS 3025 (Part 53) : 2003 Reaffirmed 2009	0.72	0.002-100	0.3 mg/l	1 mg/l
17	Total coliform (MPN/100 ml)	APHA 22nd EDN.:2012, 9221 A+ B	BDL	1.8	Absent	Absent
18	E-Coli (Nos/100)	APHA 22nd EDN.:2012, 9221 A+ F	BDL	1.8	Absent	Absent

*The result are related only to item tested.
Note: Below Detection Limit

Analyst

Lab Incharge

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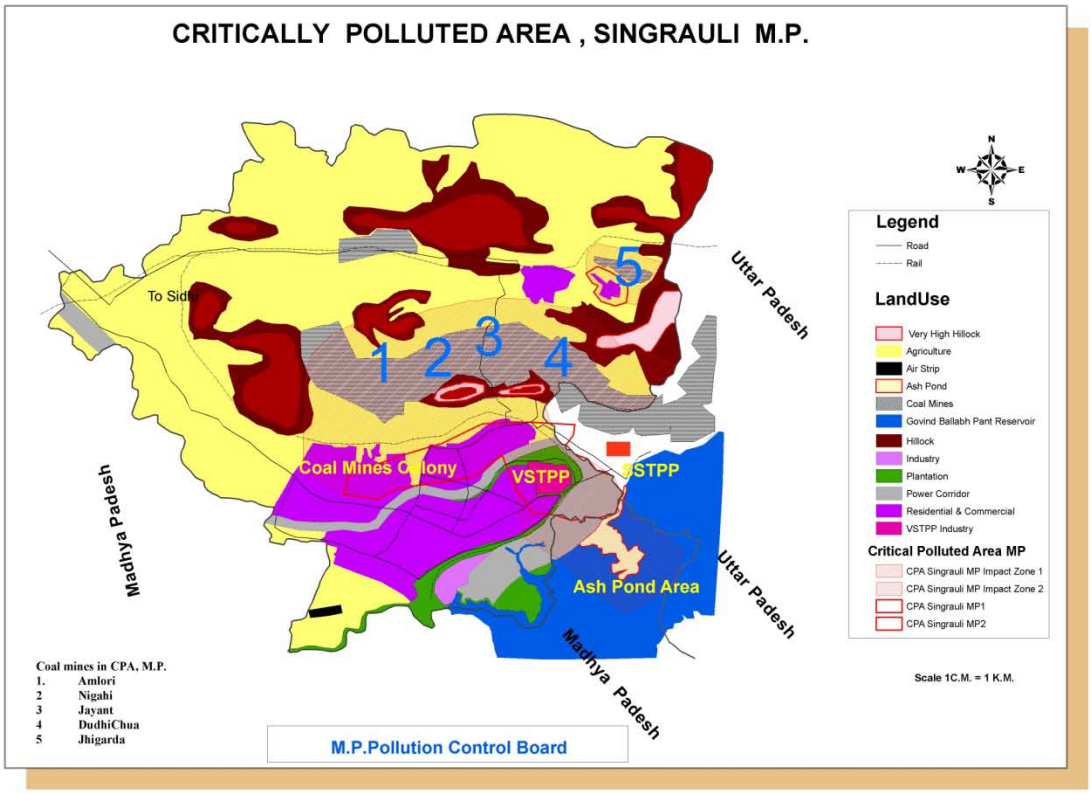
Annexure 11


CRITICALLY POLLUTED AREA , SINGRAULI M.P.
To Sidh
Uttar Padesh
Madhya Padesh
Coal Mines Colony
VSTPP
5STPP
Ash Pond Area
Uttar Padesh
Madhya Padesh
1
2
3
4
5
Legend
Road
Rail
LandUse
Very High Hillock
Agriculture
Air Strip
Ash Pond
Coal Mines
Govind Ballabh Pant Reservoir
Hillock
Industry
Plantation
Power Corridor
Residential & Commercial
VSTPP Industry
Critical Polluted Area MP
CPA Singrauli MP Impact Zone 1
CPA Singrauli MP Impact Zone 2
CPA Singrauli MP1
CPA Singrauli MP2
Scale 1C.M. = 1 K.M.
Coal mines in CPA, M.P.
1. Amlori
2 Nigahi
3 Jayant
4 DudhiChua
5 Jhigarda
M.P.Pollution Control Board

Annexure 12

Large Industries Located Within Critically Polluted Area Singrauli

Sr. No.	Industry Name	Address	Product Type
1	Vindhyanchal Super Thermal Power Project (NTPC) Stage-I 6X210 MW Stage-II 2X500 MW Stage-III 2X500 MW Stage-IV 2X500 MW	Vindhya Nagar, Singrauli	TPP
2	Almori Project –Northen Coalfield Ltd	Almori, Singrauli	Coal Mine
3	Nigahi Project –Northern Coalfield Ltd.	Nigahi, Singrauli	Coal Mine
4	Jayant Project Northern Coalfield Ltd.	Jayant, Singrauli	Coal Mine
5	Dudhichua Project Northern Coalfield Ltd	Dudhichua, Singrauli	Coal Mine
6	Jhingurda Project Northern Coalfield Ltd	Jhingurda, Singrauli	Coal Mine
7	IDL Explosive Ltd.	Jayant, Singrauli	SMS bulk Explosive
8	Indian Explosive Ltd.-Bulk Support Plant Jayant	Near nigahi colony, Singrauli	SMS bulk Explosive
9	Indian Oil Corporation –IBP Bulk Explosive Div	Jayant, Singrauli	SMS bulk Explosive
10	Indian Oil Corporation Ltd.Oil Depott Jayant	Jayant, Singrauli	Petroleum Oil Depot
11	M/s. Hindalco Industries Ltd.	Renukoot Sonebhadra	Metallurgy Al. Ingotts
12	M/s. Aditya Birla Chemical (India)	Renukoot Sonebhadra	Chemicals
13	M/s. NTPC	Shakti Nagar Sonebhadra	Thermal Power
14	M/s. NTPC	Rihand Nagar Sonebhadra	Thermal Power
15	M/s. Hindalco Industries (Power Division)	Renusagar Sonebhadra	Thermal Power
16	M/s. Anpara Thermal Power Station ,(A&B)	Anpara Sonebhadra	Thermal Power
17	M/s. Obra Thermal Power Station ,(A&B)	Sonebhadra	Thermal Power
18	M/s. Hitech Carbon	Renukoot Sonbhadra	Carbon Black
19	M/s. LANCO Anpara Power Ltd.	Anpara Sonebhadra	Thermal Power

Annexure 13

MINUTES OF THE MEETING OF THE SUB-COMMITTEE -2 FOR ASSESSMENT POTENTIAL IMPACT OF POLLUTION ON WATER RESOURCES CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL (NGT), NEW DELHI

In the Matter of OA No. 276 of 2013
Ashwani Kumar Dubey Vs Union Of India and Others

Hon'ble National Green Tribunal (NGT) vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013, Ashwani Kumar Dubey Vs Union of India constituted a Core Committee for monitoring of potential hazards of Industrial Development in Singrauli Area (both UP & MP). Besides, five sub-committees have also been constituted as follows:

Sub-committee – 1: Quantification of industrial impacts,
Sub-committee – 2: Potential impact of pollution on water resources
Sub-committee – 3: Potential impact of pollution on land resources
Sub-committee – 4: Potential impact of pollution on air quality
Sub-committee – 5: Potential impact of pollution on health with respect

The composition and terms of reference of Sub –committee - 2 are given below:

Terms of Reference:

- Water Quality Survey of the area
- Appropriate sampling methodology should be adopted to give representative picture of the entire area vis-à-vis location of industries.
- Inventory of sources (surface and groundwater sources) and their utilization status.
- Physical, chemical and micro-biological properties of surface and ground water sources with special reference to concentration of heavy metals including mercury, and other hazardous waste, if any.

Team:
Convener: Director, National Institute of Hydrology, Roorkee
Secretary: MS, UPPCB & MPPCB (both)
Members:

a. Representative of the Central Ground Water Authority having experience in Water Quality
b. Representative of the Ministry of Water Resources having experience in Water Quality
c. Representative of State Irrigation Department having experience in Water Quality
d. Representative of National Institute of Hydrology from Water Quality Laboratory

During the first meeting of the Core Committee held on 16th October, 2014 at New Delhi, it was decided that MS, UPPCB would be the Secretary for the Sub-committee-2.

The first meeting of sub-committee -2 for the assessment of potential impact of pollution on water resources was held on 24th December, 2014 at 3.00 PM in the chamber of Sri R. D. Singh, Director, National Institute of Hydrology, Roorkee and the Convener of the sub-committee - 2. The following members attended the meeting:

1. Sri R. D. Singh — Convener
   Director, NIH, Roorkee

2.	Sri Y. S. Yadav Member Secretary UPPCB, Lucknow	Secretary
3.	Dr. S. K. Srivastava Scientist D, CGWB, Lucknow	Representative of CGWA
4.	Sri Karunesh Kumar Drinking Water Expert State Water Resources Agency Lucknow	Representative of State Irrigation Department/State Water Resources Agency
5.	Dr. C. K. Jain Scientist G, NIH, Roorkee	Representative of NIH
6.	Sri Swami Nath CEO, UPPCB, Lucknow	Invitee
7.	Dr. M. K. Sharma Scientist D, NIH, Roorkee	Invitee
8.	Sri S. K. Mishra Environmental Engineer UPPCB, Lucknow	Invitee

The convener welcomed the members of the sub-committee – 2 and briefed the terms of reference of sub-committee – 2. Sri S. K. Mishra, UPPCB, Lucknow informed that there is problem of fluoride and mercury in the Singrauli area. M/s Hindalco Ltd. is using Bauxite as a raw material and using Alumina for scrubbing process. M/s Aditya Birla Chemical Ltd. (Formerly M/s Kannoriya Chemicals) was using mercury cell in manufacturing process of Caustic Soda, which has been stopped since 2011. After a lot of discussion, the convener apprised that there is water quality problem in the Singrauli area. The following decisions were taken in the meeting as per the Terms of Reference (TOR) of the Sub-committee-2:

TOR – 1: Water Quality Survey of the area

i) The following maps of the study area are to be prepared:

a) Map showing the locations of groundwater and surface water sampling sites for which water quality data is already available.

b) Map showing the locations of Industries, drains through which effluents from different industries are being discharged.

c) Map showing the locations of proposed groundwater and surface water sampling sites for which the samples are to be collected during the survey of the area **(Action: UPPCB, Lucknow).**

ii) Water quality data available with various agencies (CPCB/CGWB/UPPCB/MPPCB/SWRA) is to be collected for interim report **(Action: UPPCB, Lucknow).**

ii) The team will visit the Singrauli area in the third week of Januray, 2015 and will collect representative samples of groundwater/surface water/drains from the study area/problematic areas. **(Action: UPPCB, Lucknow in consultation with Convener, Sub-committee-2)**

TOR – 2: Appropriate sampling methodology should be adopted to give representative picture of the entire area vis-à-vis location of industries. (Action: UPPCB, Lucknow)

TOR – 3: Inventory of sources (surface and groundwater sources) and their utilization status.

Inventory of sources (surface and groundwater sources) and their utilization status will be prepared including map showing the locations of open wells, dug wells, rivers, Rihand reservoir and other water bodies.**(Action: State Water Resources Agency and CGWB)**

TOR – 4: Physical, chemical and micro-biological properties of surface and ground water sources with special reference to concentration of heavy metals including mercury, and other hazardous waste, if any.

i) All the analysis of collected samples (except Metal ions) will be carried out in the water quality laboratory of CGWB, Lucknow **(Action: CGWB, Lucknow)**

ii) Metal analysis of collected samples will be carried out by NIH, Roorkee

(Action: NIH, Roorkee)

Annexure 14

MINUTES OF THE MEETING OF THE SUB-COMMITTEE – 2 FOR ASSESSING POTENTIAL IMPACT OF POLLUTION ON WATER RESOURCES CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL (NGT), NEW DELHI

In the matter of OA No. 276 of 2013
Ashwani Kumar Dubey Vs Union of India and Others

The second meeting of the sub-committee – 2 for the assessment of pollution on water resources was held on January 29, 2015 at 11:00 Hr in the conference hall of M/s Hindalco Industries Limited, Renukoot. A list of participants attended the meeting is given in Annexure-I.The convener welcomed the members of the sub-committee-2 and briefed the terms of reference of sub-committee-2 and actions pending/required to achieve the TOR. Dr. S. K. Srivastava pointed out the absence of MoWR representative from the meeting. On this, UPPCB informed that they were not able to send invitation to MoWR and will invite their representative in future deliberations. The members discussed about the water quality problems in the region and the efforts initiated by government agencies as well industry to mitigate the problem. After discussions, the following decisions were taken in the meeting as per TOR of the sub-committee-2:

TOR 1 - Water quality survey of the area

1. Survey of India Map for Sonbhadra and Singrauli Region for preparation of geospatial maps should be provided. **(Action: UPPCB)**
2. The Latitude and Longitude of the existing as well as proposed sampling sites (Industries, drains, groundwater sources, and surface water sources etc) should be provided. **(Action: UPPCB & MPPCB)**
3. A line diagram illustrating the industries, their discharge and drains should be provided. **(Action: UPPCB)**
4. WQ data of surface water as well as groundwater of the Singrauli region (Madhya Pradesh) carried out by various agencies should be compiled. **(Action: MPPCB & UPPCB)**
5. The water quality data of Piezometers installed in the premises of the industries should be provided**. (Action : UPPCB&MPPCB)**
6. A structured programme should be planned for taking up a comprehensive water quality survey of the area during the next visit covering all the industries, nalas, rivers, hand pumps etc. In this regard a time table should be prepared for the collection of the samples. Accordingly, sampling sites should be clearly earmarked on the survey of India map on 1:50,000 scale and should be made available to each member of the team a prior to water quality survey of the area. **(Action: UPPCB&MPPCB)**

TOR 2 - Appropriate sampling methodology should be adopted to give representative picture of the entire area vis-à-vis location of the industries

1. A brief write up on the appropriate sampling methodology should be prepared **(Action: UPPCB)**

TOR 3 - Inventory of sources (surface and groundwater sources) and their utilization status

1. Inventory of ground water sources and their utilization status should be provided. **(Action: UPPCB & MPPCB to collect information from respective State Govt. Departments)**
2. Inventory of surface water sources and their utilization status should be provided. **(Action: SWARA, Lucknow)**.

TOR 4 - Physical, chemical and micro-biological properties of surface and groundwater sources with special reference to concentration of heavy metals including mercury and other hazardous waste, if any.

1. Due to bad weather conditions, visits and sampling would not be possible to all the villages and industries in critically polluted areas. Therefore, it was decided that the committee would visit some of the affected villages, one coal mining industry, and one power plant. It was also decided that the committee will revisit the area for comprehensive sampling in future covering entire critically polluted area. Tentatively, it was decided that either in the first week or second week of March 2015, second visit would be arranged. **(Action : UPPCB)**

2. Dr. S. K. Srivastava informed the inability of CGWB to analyze BOD, COD, and microbiological parameters in their laboratory due to non-availability of the necessary infrastructure. Considering the maximum time allowed between sample collection and analysis of microbiological parameters, it was decided that the samples should be analyzed either at CWC Varanasi or at IIT BHU. Dr S K Shrivastava informed that he had contacted CWC, Varanasi for analysis of bacteriological parameters. It was decided that CWC, Varanasi should be contacted for analysis of the samples for BOD, COD, TC & FC etc. These parameters will be analyzed for the samples to be collected during the next visit. **(Action : UPPCB)**

3. The physico-chemical parameters of the collected samples should be analysed. **(Action : CGWB)**
4. The heavy metal contents of the collected samples should be analysed. **(Action : NIH)**
5. All analysis results should be collected from CGWB & NIH and compiled at the earliest. **(Action : UPPCB)**

For sub-committee-2, representative of the Ministry of Water Resources having experience in Water Quality and representative of State Irrigation Departments having experience in Water

Quality are the members. However, so far, no such members are included in the committee. In this regard, nominations should be invited from Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD & GR), Government of India and State Irrigation departments of UP & MP before the next meeting. **(Action: UPPCB)**

An interim report should be prepared based on the base line data & information, made available/to be made available by UPPCB & MPPCB, and data collected from other secondary sources amalgamating the results of analysis of the samples collected during the visit. **(Action: UPPCB & NIH)**

Annexure 15

MINUTES OF THE MEETING OF THE SUB-COMMITTEE – 2 FOR ASSESSING POTENTIAL IMPACT OF POLLUTION ON WATER RESOURCES CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL (NGT), NEW DELHI

In the matter of OA No. 276 of 2013
Ashwani Kumar Dubey Vs Union of India and Others

The third meeting of the sub-committee – 2 for the assessment of pollution on water resources was held on April 27, 2015 at 11:00 Hr in the conference hall of M/s NTPC Shaktinagar, Sonbhadra. A list of participants attended the meeting is given in Annexure-I. The representative of convener welcomed the members of the sub-committee-2 and briefed the terms of reference of sub-committee-2 and actions pending/required to achieve the TOR. Dr. S. K. Srivastava and Shri Karunesh Kumar suggested that the committee should not visit the treatment plant of industries and mining areas, since this is not in the TOR. The members of committee agreed on the suggestion and accordingly the survey plan was revised. It was also decided that the committee will carry out survey and collect groundwater as well as reservoir samples across the boundary of reservoir. The committee was of the view that sampling of all the natural drains will be carried out in this survey. The members discussed about the water quality problems in the region and the efforts initiated by government agencies as well industry to mitigate the problem. After discussions, the following decisions were taken in the meeting as per TOR of the sub-committee-2:

TOR 1 - Water quality survey of the area

1. Survey of India Map for Sonbhadra and Singrauli Region for preparation of geospatial maps should be provided. **(Action: UPPCB) - Completed**
2. The Latitude and Longitude of the existing as well as proposed sampling sites (Industries, drains, groundwater sources, and surface water sources etc) should be provided. **(Action: UPPCB & MPPCB) - The Latitude and Longitude of sampling sites were recorded during the survey**
3. A line diagram illustrating the industries, their discharge and drains should be provided. **(Action: UPPCB) - Completed**
4. WQ data of surface water as well as groundwater of the Singrauli region (Madhya Pradesh) carried out by various agencies should be compiled. **(Action: MPPCB & UPPCB) - Completed**
5. The water quality data of Piezometers installed in the premises of the industries should be provided**. (Action : UPPCB&MPPCB) - Pending**

TOR 2 - Appropriate sampling methodology should be adopted to give representative picture of the entire area vis-à-vis location of the industries

1. A brief write up on the appropriate sampling methodology should be prepared **(Action: UPPCB) - Completed**

TOR 3 - ***Inventory of sources (surface and groundwater sources) and their utilization status***

1. Inventory of ground water sources and their utilization status should be provided. **(Action: UPPCB & MPPCB to collect information from respective State Govt. Departments) - Pending**
2. Inventory of surface water sources and their utilization status should be provided. **(Action: SWARA, Lucknow) - Completed**

TOR 4 - ***Physical, chemical and micro-biological properties of surface and groundwater sources with special reference to concentration of heavy metals including mercury and other hazardous waste, if any.***

1. The physico-chemical parameters of the collected samples should be analyzed. **(Action : CGWB)**
2. The heavy metal contents of the collected samples should be analyzed. **(Action : NIH)**
3. The bacteriological parameters of the collected samples will be analyzed. **(Action : CWC)**
4. All analysis results should be collected from CGWB, NIH & CWC and compiled at the earliest. **(Action : UPPCB)**

The final report should be prepared based on the base line data & information, made available/to be made available by UPPCB & MPPCB, and data collected from other secondary sources amalgamating the results of analysis of the samples collected during the visit. **(Action: UPPCB & NIH)**

Annexure 16

MINUTES OF THE MEETING OF THE SUB-COMMITTEE – 2 FOR ASSESSING POTENTIAL IMPACT OF POLLUTION ON WATER RESOURCES CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL (NGT), NEW DELHI

In the matter of OA No. 276 of 2013
Ashwani Kumar Dubey Vs Union of India and Others

The fourth meeting of the sub-committee – 2 for the assessment of pollution on water resources was held on June 04, 2015 at 10:00 Hr in the conference hall of M/s NTPC Vindhyanagar, Singrauli. A list of participants attended the meeting is given in Annexure-I. The representative of convener welcomed the members of the sub-committee-2 and briefed the terms of reference of sub-committee-2 as well as Hon'ble NGT vide its order dated April 29, 2015. RO Singrauli presented the survey plan and informed that Essar M.P. Power Ltd. is not operational since December 2014. Dr. Rajesh Singh informed that sampling of few locations w.r.t. to groundwater and Rihand Reservoir is required. It was decided to remove Essar M.P. Power Limited and include few locations for groundwater and Rihand Reservoir. Shri Karunesh Kumar opined that it was not in the purview of Committee to visit treatment and recycle plants as the same falls within the ToR of Sub-Committee-1. However other members differed. Accordingly, the survey plan was revised. After discussions, the following decisions were taken in the meeting as per TOR of the sub-committee-2:

1. The committee will visit the treatment and recycle plants of Moher & Moher Coal Block, Essar M.P. Power Ltd., Mahan Aluminium Power Division, since they are claiming for ZLD and collect samples from the natural drains, discharge from the industry if any, and drinking water samples from nearby habitation.
2. Letter from Essar M.P. Power Limited/MPPCB indicating non-operational status of Essar M.P. Power Limited.
3. The committee has already visited few NCL coal mines in previous surveys and hence, visit to NCL coal mines will not be done.
4. The committee will collect few samples from the Rihand Reservoir.
5. Analysis of physico-chemical parameters of the collected samples at **CGWB, Lucknow**
6. Analysis of heavy metal contents of the collected samples at **NIH, Roorkee.**
7. Analysis of bacteriological parameters of the collected samples at **CWC, Varanasi.**
8. All analysis results should be collected from CGWB, NIH & CWC and compiled at the earliest by **UPPCB, Lucknow.**

The final report should be prepared based on the base line data & information, made available/to be made available by UPPCB & MPPCB, and data collected from other secondary sources amalgamating the results of analysis of the samples collected during the field visits. **(Action: UPPCB & NIH)**

Annexure 17

SURVEY REPORT OF THE SUB-COMMITTEE – 2 FOR ASSESSING POTENTIAL IMPACT OF POLLUTION ON WATER RESOURCES CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL (NGT), NEW DELHI

In the matter of OA No. 276 of 2013
Ashwani Kumar Dubey Vs Union of India and Others

1. Introduction

Hon'ble National Green Tribunal (NGT) vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013, Ashwani Kumar Dubey Vs Union of India constituted a core committee for monitoring of potential hazards of Industrial Development in Singrauli Area (both UP & MP). Besides, 05 sub-committees have also been constituted-

Sub-committee 1:	Quantification of industrial impacts
Sub-committee 2:	Potential impact of pollution on water resources
Sub-committee 3:	Potential impact of pollution on land resources
Sub-committee 4:	Potential impact of pollution on air quality
Sub-committee 5:	Potential impact of pollution on health

The composition and terms of reference of Sub-committee 2 are given below:

Terms of Reference

- Water quality survey of the area
- Appropriate sampling methodology should be adopted to give representative picture of the entire area vis-à-vis location of the industries
- Inventory of sources (surface and groundwater sources) and their utilization status
- Physical, chemical and micro-biological properties of surface and groundwater sources with special reference to concentration of heavy metals including mercury and other hazardous waste, if any.

Team

Convener: Director, National Institute of Hydrology, Roorkee
Secretary: Uttar Pradesh pollution Control Board, Lucknow
Members:

a. Representative of the Central Ground Water Authority having experience in Water Quality
b. Representative of the Ministry of Water Resources having experience in Water Quality
c. Representative of State Irrigation Department having experience in Water Quality

d. Representative of the National Institute of Hydrology from Water Quality Laboratory

2. Field Visit

The sub-committee - 2 in its first meeting held on Dec. 24, 2014 decided that the members of the committee may visit Singrauli area in order to make preliminary assessment of pollution on water resources in the area. Accordingly, members of the sub-committee – 2 under the guidance of Er. R. D. Singh, Director, National Institute of Hydrology, Roorkee visited Singrauli area during Jan. 29 – 30, 2015. A list of the participants who participated in the field visit is given in end of the survey report.

The committee carried out inspection of the Singrauli area on January 29 & 30, 2015 and interacted with local residents while collecting samples from the affected areas. Due to bad weather conditions, it was not possible to visit all the industries and villages, therefore the committee decided to visit some of the villages and industries in affected area. The visit of the committee mainly focused as under-

On Jan. 29, 2015:

a. Meeting of sub-committee – 2 to bridge the gap in order to achieve the TOR specified by Hon'ble National Green Tribunal.
b. Visited industries / villages in Renukoot and carried out following activities-
   - Interacted with residents and collection of groundwater samples from village Govindpur, Kusmaha, and Khairahi
   - Inspected and collected samples from Murdhawa Nala

On Jan. 30, 2015:

a. Visited Singrauli industrial area and carried out following activities-

   - Inspectiom and collection of samples from Anpara A, B, & C Ash Dyke overflow to Rihand Reservoir.
   - Collection of samples from Rihand reservoir.
   - Inspection and collection of samples from ETP of Dudhichua & Jayant Coalmine Project.
   - Inspection of Jayant Coalmine and collection of samples from the mine sump.
   - Interaction with residents and collection of groundwater samples from Jayant Colony, Jaitpur, MPCC colony.
   - Inspection and collection of samples from Jayant Sewage Treatment Plant.
   - Collection of untreated and treated samples from Reverse Osmosis Plant

3. General Observations

Based on the field inspections during January 29 & 30, 2015 and interaction with locals/NGO and others, the general observations of the committee are as follows:

- Govindpur, Khairahi and Kushmaha villages lie under Myorpur Block of the Sonbhadra District. This is at north-eastern tip of the Rihand reservoir and the place is just opposite side to the Renukoot. In between, there is a valley of the reservoir. In this side of the valley, industrial units do not exist and hence, the chance of anthropogenic pollution of the water resources is very minimal. The nearest industry is Hindalco, which is in the opposite side of the valley. The sign of fluorosis was observed in the residents of village Govindpur, Kusmaha, and Khairahi. Moreover, the some of the IM-II hand pumps were equipped with fluoride removal units indicating contamination of groundwater with fluoride. Samples were collected from the hand pumps of these villages for estimation of fluoride and other drinking water parameters. More samples are needed to be collected Rihand reservoir adjacent to the said area (24.193188^{o}, 83.048349^{o}); to ascertain if this water is polluting the ground water of the area around.

- Murdhawa nala carries effluents of Hindalco Industries Ltd., SKI (Hitech) Carbon, and nearby habitation. At the time of visit, the flow in the drain was very low. However, mud and sludge along the flow lines suggested a higher discharge in the nala in the recent past. Continuous monitoring for a day or two is required to get real picture of quality and quantity of flow through the drain.

- The sludge drying beds of Dudhichua and Jayant Coalmine Projects were under designed and the capacity of same should be enhanced. Moreover, sludge was found disposed off along the road. Proper disposal of sludge should be practiced; otherwise the sludge removed in the treatment plant will be carried away along with the surface run-off. Improper disposal may also lead to contamination of groundwater due to leaching of contaminants.

- The operators of the treatment plants lack basic knowledge about the equipments and their operation. Proper training should be provided to the operators for enhancing the efficiency of the treatment plants.

- The quality of water flowing in the drains through which the wastewater from industries is discharged in the reservoir is monitored by UPPCB on monthly basis. Continuous measurement of the critical parameters should be practiced. In this regard on line water quality monitoring system need to be installed to monitor some crucial water quality parameters regularly.

- The coal overburden in the mining area was naked and requires eco-restoration to safeguard the water resources of the area.

- Anpara Ash Dyke overflow is discharged in the reservoir which is contaminating it. It was informed by UPPCB that the industry is in the process of installing recirculation system. This system should be installed as soon as possible to avoid the contamination of fresh water.

- All the Ash Dykes in this area are in the vicinity of the reservoir. They are constructed in such way that the wall is shared by Reservoir and Ash Dyke. This should be avoided. Moreover, the upcoming industries in the area should construct Ash Dykes at least 5 Km away from the reservoir preferably at a higher elevation than the location of the power plant/industry. This will reduce the pumping cost of overflow from the ash dyke as well as easy monitoring by the monitoring agencies.

- While interacting with local residents during the field visit, the committee came to know that the drinking water is being supplied in some of the localities through RO plants .Some of the residents were complaining about gastrointestinal problems. Normally the conductivity of treated water from RO plants installed for providing drinking water to residents of affected villages may be very low to the tune of 20 to 80 µS/cm. It means the TDS of the water may range from 10 to 40 mg/L which is considered to be unstable water leading to gastrointestinal problems. It is recommended to install calcite filters in the RO treated water to make it fit for drinking. However, water samples are collected from a RO plant to analyse for various water quality parameters.

List of the participants visited Singrauli area during January 29-30, 2015

Sr. No.	Name & Designation	Organization	Mobile No.
1	Er. R. D. Singh, Director	National Institute of Hydrology, Roorkee	9411111973
2	Dr. S. K. Srivastava, Scientist D	Central Ground Water Board, Lucknow	9411383119
3	Dr. Rajesh Singh, Scientist B	National Institute of Hydrology, Roorkee	9267483749
4	Shri Karunesh Kumar, EE	State Water Resources Agency (SWaRA), Lucknow	9451903901
5	Shri Swami Nath Ram, CEO	U. P. Pollution Control Board, Lucknow	9415336599
6	Shri S. K. Mishra, EE	U. P. Pollution Control Board, Lucknow	9415157947
7	Shri Kalika Singh, RO	U. P. Pollution Control Board, Sonbhadra	9415872354
8	Shri S. P. Jha, EE	M. P. Pollution Control Board, Singrauli	9425330324
9	Dr. A. K. Shrivastava, RO	M. P. Pollution Control Board, Singrauli	9425173153
10	Dr. Anant Dubey, ASO	U. P. Pollution Control Board, Lucknow	9450752729
11	Shri Ram Aadhar Singh Kushwaha, AE	RCO, Pipri, Sonbhadra	9450718958
12	Shri Sarvesh Kumar Shukla, LA	U. P. Pollution Control Board, Lucknow	7839563727
13	Shri B. B. Mishra, SA	U. P. Pollution Control Board, Sonbhadra	9450162327
14	Shri Ranjeet Kumar, MA	U. P. Pollution Control Board, Sonbhadra	9454137493
15	Shri Vishal Maurya, LA	U. P. Pollution Control Board, Sonbhadra	9765726543

Annexure 18

Survey of Study Area during Jan. 29-30, 2015

Handpump Nr. Sukhdevram house, Govindpur

Handpump Nr. Rambhajan house, Govindpur

Handpump Nr. Shivprasad house, Khairahi

Handpump Nr. Jayant Bus Stand

Baliya Nala

Jayant ETP

Jayant STP

Murdhawa Nala

Lanco Ash Dyke

Rihand Reservoir

Annexure 19

SURVEY REPORT OF THE SUB-COMMITTEE – 2 FOR ASSESSING POTENTIAL IMPACT OF POLLUTION ON WATER RESOURCES CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL (NGT), NEW DELHI

In the matter of OA No. 276 of 2013
Ashwani Kumar Dubey Vs Union of India and Others

1. Introduction

Hon'ble National Green Tribunal (NGT) vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013, Ashwani Kumar Dubey Vs Union of India constituted a core committee for monitoring of potential hazards of Industrial Development in Singrauli Area (both UP & MP). Besides, 05 sub-committees have also been constituted-

Sub-committee 1:	Quantification of industrial impacts
Sub-committee 2:	Potential impact of pollution on water resources
Sub-committee 3:	Potential impact of pollution on land resources
Sub-committee 4:	Potential impact of pollution on air quality
Sub-committee 5:	Potential impact of pollution on health

The composition and terms of reference of Sub-committee 2 are given below:

Terms of Reference

- Water quality survey of the area
- Appropriate sampling methodology should be adopted to give representative picture of the entire area vis-à-vis location of the industries
- Inventory of sources (surface and groundwater sources) and their utilization status
- Physical, chemical and micro-biological properties of surface and groundwater sources with special reference to concentration of heavy metals including mercury and other hazardous waste, if any.

Team

Convener: Director, National Institute of Hydrology, Roorkee
Secretary: Uttar Pradesh pollution Control Board, Lucknow
Members:

a. Representative of the Central Ground Water Authority having experience in Water Quality
b. Representative of the Ministry of Water Resources having experience in Water Quality
c. Representative of State Irrigation Department having experience in Water Quality

d. Representative of the National Institute of Hydrology from Water Quality Laboratory

2. Field Visit

The sub-committee - 2 in its second meeting held on January 29, 2015 decided that the members of the committee may visit Singrauli area for comprehensive survey and sampling to assess pollution on water resources in the area. Accordingly, members of the sub-committee – 2 visited Singrauli area during April 27-30, 2015. A list of the participants who participated in the field visit is given in Annexure I.

The committee carried out inspection of the Singrauli area on April 27-29, 2015 and interacted with local residents as well as Shri Jagat Narayan Viswakarma while collecting samples from the affected areas. 48 samples (23 groundwater + 11 natural drains + 03 Lakes & Ponds + 02 River + 02 RO plant + 07 Rihand reservoir) were collected from the affected area. The visit of the committee mainly focused as under-

On April 27, 2015:

- Meeting of sub-committee – 2 to bridge the gap in order to achieve the TOR specified by Hon'ble National Green Tribunal. The minutes of meeting is given in Annexure II.
- Interaction with residents and collection of groundwater samples from village Parsavar-raja, Chilika Dand, Naktu, Khairi, Khatkhariya, Harrhawa, and Tuba Khann.
- One sample from RO plant at Parsavar-raja village was collected.
- Samples from Rihand reservoir, Rihand River, and Chilka lake were collected.
- Inspection and collection of samples from Baliya nala, Surya nala, and Sasan UMPP drain.

On April 28, 2015:

- Inspection and collection of samples from NTPC Shaktinagar and Vindhyanagar Ash Dykes overflow to Rihand Reservoir.
- Interaction with residents and collection of groundwater samples from village Mayorpore, Chilka Dand, Gahilgarh, Bhairva, and Dibulganj.
- Collection of samples from Rihand reservoir.
- Inspection and collection of samples from RO plant at Dibulganj village.
- Inspection and collection of samples from Surya nala and Janturia nala.

On April 29, 2015:

- Inspection and collection of samples from Anpara A, B, & C Thermal Power Plant Ash Dyke overflow to Rihand Reservoir.
- Interaction with residents and collection of groundwater samples from village Parasi, Govindpur, Kusmaha, Khairahi, and Kirwani.

- Collection of samples from Rihand reservoir and ponds in Kusmaha and Govindpur village.
- Inspection and collection of samples from Murdhawa nala and Dongiya nala.

The latitude, longitude and other details of the sampling sites are given in Annexure-III.

3. General Observations

Based on the field inspections during April 27-29, 2015 and interaction with locals/NGO and others, the general observations of the committee are as follows:

- Signs of fluorosis were observed in the residents of village Govindpur, Kusmaha, and Khairahi under Myorpur Block of the Sonbhadra District. Some of the IM-II hand pumps were equipped with fluoride removal units (FRU), but during field survey it was found that the FRU's were bypassed by villagers. On interaction with villagers it was found that the FRU units were not serviced since long and the flow through the FRU has reduced significantly forcing the villagers to bypass the FRU. Samples were collected from the hand pumps of these villages for estimation of fluoride and other drinking water parameters. One sample from FRU outlet which was in service was also collected. Moreover, sample from Rihand reservoir adjacent to the said area was collected.

- Villagers of other areas indicated that groundwater in their villages is not having any problem except at few locations the water turns red. Moreover, villagers in Haarrhawa village near Sasan UMPP informed that quality of dug well as well as hand pump water has been deteriorated after the commissioning of Sasan UMPP.

- The quality of water flowing in the drains through which the wastewater from industries is discharged in the reservoir is monitored by UPPCB on monthly basis. Continuous measurement of the critical parameters should be practiced. In this regard on line water quality monitoring system need to be installed to monitor some crucial water quality parameters regularly.

- The coal overburden in the mining area was naked and requires eco-restoration to safeguard the water resources of the area.

- Anpara Ash Dyke overflow is discharged in the reservoir which is contaminating it. Construction of ash water recirculation system was in process.

- Discharge from Shaktinagar (NTPC) Ash Dyke into reservoir was observed due to breakage of pipe closure. This should be repaired immediately.

- Overflow from Vindhyanagar (NTPC) Ash Dyke ash water recirculation system was observed. Overflow was probable due to operator negligence and operators should be trained to avoid this type of situation.

List of the participants visited Singrauli area during April 27-29, 2015

Sr. No.	Name & Designation	Organization	Mobile No.
1	Dr. S. K. Srivastava, Scientist D	Central Ground Water Board, Lucknow	9411383119
2	Dr. Rajesh Singh, Scientist B	National Institute of Hydrology, Roorkee	9267483749
3	Shri Karunesh Kumar, EE	State Water Resources Agency (SWaRA), Lucknow	9451903901
4	Shri Rajkumar, Research Officer	Central Water Commission, Varanasi	9450709821
5	Shri Swami Nath Ram, CEO	U. P. Pollution Control Board, Lucknow	9415336599
6	Shri S. K. Mishra, EE	U. P. Pollution Control Board, Lucknow	9415157947
7	Shri Kalika Singh, RO	U. P. Pollution Control Board, Sonbhadra	9415872354
8	Shri S. P. Jha, EE	M. P. Pollution Control Board, Singrauli	9425330324
9	Shri Pradeep Kumar Vishwakarma, ASO	U. P. Pollution Control Board, Sonbhadra	9410415563
10	Shri Ram Govind Singh, AE	Rihand Civil Khand, Pipari, Sonbhadra	9415833497
11	Shri A. K. Saxena, ARO	Central Water Commission, Varanasi	9454701125
12	Shri Ranjeet Kumar, MA	U. P. Pollution Control Board, Sonbhadra	9454137493
13	Shri Vishal Maurya, LA	U. P. Pollution Control Board, Sonbhadra	9765726543

Annexure 20

Survey of Study Area during April 27-29, 2015

RO Outlet, Parsavar-raja village (GW-25)

Borewell, Cilkadand village (GW-23)

Handpump, Parsavar-raja village (GW-24)

Chilka Lake (SW-22)

Baliya Nala (SW-4)

Rihand Reservoir (SW-14)

Handpump, Sirsoti (GW-22)

Handpump, Forest Office, Naktu (GW-21)

Handpump, Khairi (GW-20)

Rihand Reservoir (SW-13)

Handpump, Khatkhariya (GW-19)

Rihand River (SW-20)

Channel under Rihand River Bridge (SW-19)

Handpump, Harrhawa (GW-18)

Dugwell, Harrhawa (GW-17)

Handpump, Chilkadand (GW-15)

NTPC Shaktinagar Ash Dyke Overflow (SW-9)

Handpump, NTPC Vinghyanagar ARS (GW-14)

NTPC Vindhyanagar Ash Dyke Overflow (SW-8)

Surya Drain (SW-6)

Rihand Reservoir (GW-15)

Handpump, Gahilgarh (GW-9)

Rihand Reservoir (Sw-16)

Dugwell, Bhairawa (GW-13)

Handpump, Bhairawa (GW-12)

Janturia Nala (SW-7)

Rihand Reservoir (SW-17)

Handpump, Kakri (GW-7)

RO Dibulganj (GW-10 & 11)

Murdhawa Nala (SW-2)

Dongiya Nala (Sw-3)

Renu River (SW-21)

Anpara Ash Dyke Overflow (SW-11)

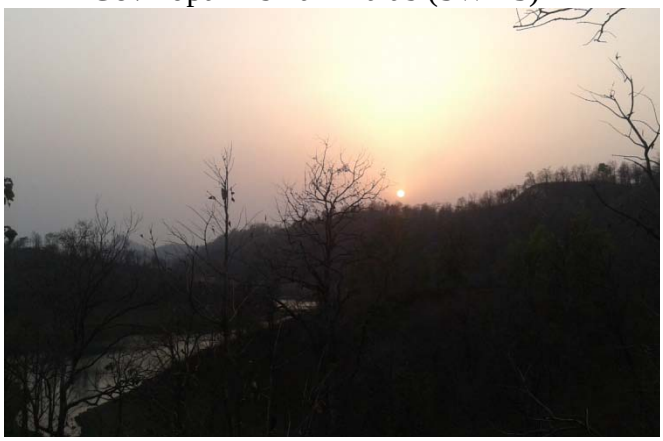
Rihand Reservoir (SW-12)

Handpump, Govindpur (GW-2)

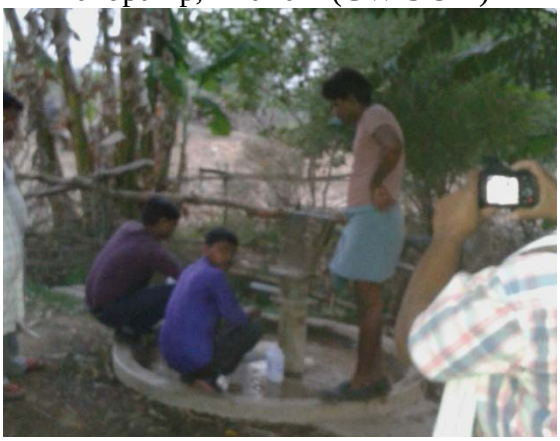
Kusmaha Pond (SW-1)

Govindpur Ashram Talab (SW-23)

Handpump, Khairahi (GW-3 & 4)



Rihand Reservoir (Sw-18)



Handpump, Kirwani (GW-1)

Annexure 21

SURVEY REPORT OF THE SUB-COMMITTEE – 2 FOR ASSESSING POTENTIAL IMPACT OF POLLUTION ON WATER RESOURCES CONSTITUTED BY THE HON'BLE NATIONAL GREEN TRIBUNAL (NGT), NEW DELHI

In the matter of OA No. 276 of 2013
Ashwani Kumar Dubey Vs Union of India and Others

1. Introduction

Hon'ble National Green Tribunal (NGT) vide its order dated August 25, 2014 in the matter of OA No. 276 of 2013, Ashwani Kumar Dubey Vs Union of India constituted a core committee for monitoring of potential hazards of Industrial Development in Singrauli Area (both UP & MP). Besides, 05 sub-committees have also been constituted-

Sub-committee 1: Quantification of industrial impacts
Sub-committee 2: Potential impact of pollution on water resources
Sub-committee 3: Potential impact of pollution on land resources
Sub-committee 4: Potential impact of pollution on air quality
Sub-committee 5: Potential impact of pollution on health

The composition and terms of reference of Sub-committee 2 are given below:

Terms of Reference

- Water quality survey of the area
- Appropriate sampling methodology should be adopted to give representative picture of the entire area vis-à-vis location of the industries
- Inventory of sources (surface and groundwater sources) and their utilization status
- Physical, chemical and micro-biological properties of surface and groundwater sources with special reference to concentration of heavy metals including mercury and other hazardous waste, if any.

Team

Convener: Director, National Institute of Hydrology, Roorkee
Secretary: Uttar Pradesh pollution Control Board, Lucknow
Members:

a. Representative of the Central Ground Water Authority having experience in Water Quality
b. Representative of the Ministry of Water Resources having experience in Water Quality
c. Representative of State Irrigation Department having experience in Water Quality

d. Representative of the National Institute of Hydrology from Water Quality Laboratory

2. Field Visit

Hon'ble NGT vide its order dated April 29, 2015 directed the Committees to visit Sasan Ultra Mega Power Project, Moher & Moher Coal Block, Essar M.P. Power Ltd., Mahan Aluminium Power Division, and all the mines of NCL whichever of them falls in the critically polluted area and are necessary in the opinion of the committee. In this regard, the members of the sub-committee – 2 visited Singrauli area during July 04-05, 2015. A list of the participants who participated in the field visit is given in the end of survey report.

The committee inspected the industries indicated by Hon'ble NGT and nearby habitation on July 04-05, 2015 and also interacted with local residents. 16 samples (10 groundwater + 01 natural drain + 02 Effluent + 02 River + 01 Rihand reservoir) were collected from the affected area. The visit of the committee mainly focused as under-

On July 04, 2015:

- Meeting of sub-committee – 2 to finalize the survey plan as per directives of Hon'ble National Green Tribunal dated April 29, 2015. The minutes of meeting is given in Annexure II.
- Interaction with residents and collection of groundwater samples from villages located in the vicinity of Moher & Moher Coal Block & Mahan Aluminium Power Division.
- Sample was collected from Kachan River.
- Inspection of water usage, treatment and recycling of wastewater in the Moher & Moher Coal Block & Mahan Aluminum Power Division. Samples were also collected from Coal settling pit and sedimentation pond in Moher & Moher Coal Block.

On July 05, 2015:

- Inspection and collection of sample from water supply scheme in Navjeevan Vihar, Vindhyanagar, singrauli. Interaction with the residents in the area.
- Inspection of water usage, treatment and recycling of wastewater in the Sasan Ultra Mega Power Project.
- Interaction with residents and collection of groundwater samples from villages in the vicinity of Sasan Ultra Mega Power Project.
- Collection of samples from Rihand reservoir, Mayar River, and Kavya Nala.

3. General Observations

Based on the field inspections during July 04-05, 2015 and interaction with locals and others, the general observations of the committee are as follows:

- The residents in the vicinity of these industries have no complains related to water quality. The residents brought to notice regarding few hand pumps in the area and the numbers should be increased.

- At the time of visit, no overflow was observed from the Moher & Moher Coal Settling Pit but overflow in the recent past might have occurred as was evident. It was informed by the plant officials that occasional overflow occurs and they are in a process of fixing the problem. The committee suggested installing a sludge thickener, to avoid this type of incidents and a step towards ZLD and more efficient usage of water.

- For Mahan Aluminum Power Division & Sasan Ultra Mega Power Project, the committee suggested to construct a dedicated drain for surface run off and should not be linked with the effluent drains.

- Moher & Moher Coal Block, Mahan Aluminium Power Division, and Sasan Ultra Mega Power Project have installed schemes for water treatment & recycling. The committee though could not ascertain the adequacy of the same, provided few suggestions for improvement in the schemes.

- The coal overburden in the mining area was naked and requires eco-restoration to safeguard the water resources of the area and avoid causalities in the monsoon. Moreover, the slopes should be reduced and safety measures should be practiced.

List of the participants visited Singrauli area during July 04-05, 2015

Sr. No.	Name & Designation	Organization	Mobile No.
1	Dr. Rajesh Singh, Scientist C	National Institute of Hydrology, Roorkee	9267483749
2	Shri Karunesh Kumar, EE	State Water Resources Agency (SWaRA), Lucknow	9451903901
3	Shri Rajkumar, Research Officer	Central Water Commission, Varanasi	9450709821
4	Shri Swami Nath Ram, CEO	U. P. Pollution Control Board, Lucknow	9415336599
5	Shri S. K. Mishra, EE	U. P. Pollution Control Board, Lucknow	9415157947
6	Shri R. B. S. Yadav, EE	U.P. Irrgation, Sonbhadra	9412409968
7	Shri Kalika Singh, RO	U. P. Pollution Control Board, Sonbhadra	9415872354
8	Dr. Arun Kumar Shrivastava, RO	M. P. Pollution Control Board, Singrauli	9425173153
9	Shri S. P. Jha, AEE	M. P. Pollution Control Board, Singrauli	9425330324
10	Shri Pradeep K. Vishwakarma, ASO	U. P. Pollution Control Board, Sonbhadra	9410415563
11	Shri A. K. Saxena, ARO	Central Water Commission, Varanasi	9454701125
12	Shri Ranjeet Kumar, MA	U. P. Pollution Control Board, Sonbhadra	9454137493
13	Shri B. B. Mishra, SA	U. P. Pollution Control Board, Sonbhadra	9450162327

Annexure 21

Survey of Study Area during July 04-05, 2015

Kachan River

Handpump, Naugarh-Amlori

Handpump, Harraiya

Handpump, Amlori Basti

Moher & Moher Coal Settling Pit

Abandoned Dugwell, Moher & Moher

Moher & Moher Sedimentation Tank

Handpump, Bargawa

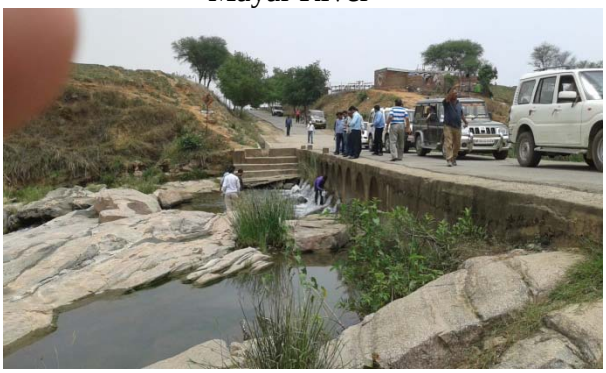
Oddgadi

Borewell, Navjeevan Vihar

Handpump, Thana, Waidhan Block Colony

Mayar River

Sasan UMPP ETP



Kavya Nala

Handpump, Jarha

Rihand Reservoir

Mahan Aluminium

Moher & Moher Coal Mine

Annexure 23

General Standards for Discharge of Environmental Pollutants Part-A: Effluents

Sr. No.	Parameter	Standards			
		Inland Surface Water	Public Sewer	Land for Irrigation	Marine/ Coastal Areas
1	Colour and odour	See 6 of Annexure-1	-----	See 6 of Annexure-1	See 6 of Annexure-1
2	Suspended solids, mg/L, max,	100	600	200	a. For process wastewater- 100 b. For cooling water effluent- 10 % above total suspended matter in influent
3	Particulate size of suspended solids	shall pass 850 micron IS Sieve	-----	-----	a. Floatable solids max. 3mm. b. Settle able solids, max. 856 microns
4	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5	Temperature	Shall not exceed 5ºC above the receiving water temperature	-----	-----	Shall not exceed 5ºC above the receiving water temperature
6	Oil & grease, mg/L, max.	10	20	10	20
7	Total residual chlorine, mg/L, max.	1.0	-----	-----	1.0
8	Ammonical nitrogen (as N), mg/L, max.	50	50	-----	50
9	Total kjeldahl nitrogen (as NH3), mg/L, max.	100	-----	-----	100
10	Free ammonia (as NH3), mg/L, max.	5.0	-----	-----	5.0
11	Biochemical oxygen demand (3 days at 27 ºC), mg/L, max.	30	350	100	100
12	Chemical oxygen demand, mg/L, max.	250	-----	-----	250
13	Arsenic (as As), mg/L, max.	0.2	0.2	0.2	0.2
14	Mercury (as Hg), mg/L, max.	0.01	0.01	-----	0.01
15	Lead (as Pb), mg/L, max.	0.1	0.1	-----	2.0
16	Cadmium (as Cd), mg/L, max.	2.0	1.0	-----	2.0
17	Hexavalent chromium (as Cr^{+6}), mg/L, max.	0.1	2.0	-----	1.0
18	Total chromium (as Cr), mg/L, max.	2.0	2.0	-----	2.0
19	Copper (as Cu), mg/L, max.	3.0	3.0	-----	3.0
20	Zinc (as Zn), mg/L, max.	5.0	15.0	-----	15

21	Selenium (as Se), mg/L, max.	0.05	0.05	-----	0.05
22	Nickel (as Ni), mg/L, max.	3.0	3.0	-----	5.0
23	Cynaide (as CN), mg/L, max.	0.2	2.0	0.2	0.2
24	Fluoride (as F), mg/L, max.	2.0	15	-----	15
25	Dissolved phosphate (as P), mg/L, max.	5.0	-----	-----	-----
26	Sulfide (as S), mg/L, max.	2.0	-----	-----	5.0
27	Phenolic compounds (as C_6H_5OH), mg/L, max.	1.0	5.0	-----	5.0
28	Radioactive materials				
	Alpha emitter, micro curie/ml	10^{-7}	10^{-7}	10^{-8}	10^{-7}
	Beta emitter, micro curie/ml	10^{-6}	10^{-6}	10^{-7}	10^{-6}
29	Bio-assay test	90 % survival of fish after 96 hrs in 100 % effluent	90 % survival of fish after 96 hrs in 100 % effluent	90 % survival of fish after 96 hrs in 100 % effluent	90 % survival of fish after 96 hrs in 100 % effluent
30	Manganese (as Mn), mg/L, max.	2	2	-----	2
31	Iron (as Fe), mg/L, max	3	3	-----	3
32	Vanadium (as V), mg/L, max	0.2	0.2	-----	0.2
33	Nitrate nitrogen, mg/L, max	10	-----	-----	20

Note:

1. "6 of Annexure 1" states "All efforts should be made to remove colour and unpleasant odour as far as practicable." These standards shall be applicable for industries, operations or processes other than those industries, operations or processes for which standards have been specified in Schedule of the Environment Protection Rules, 1989.

Annexure 24

Drinking Water Specification (IS 10500: 2012)

Sr. No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in Absence of Alternate Source
Organoleptic & Physical Parameters			
1	Colour, Hazen units, max.	5	15
2	Odour	Agreeable	Agreeable
3	pH value	6.5 – 8.5	6.5 - 8.5
4	Taste	Agreeable	Agreeable
5	Turbidity, NTU, max.	1	5
6	Total dissolved solids, mg/L, max.	500	2000
General Parameters Concerning Substances Undesirable in Excessive Amounts			
1	Aluminum (as Al), mg/L, max.	0.03	0.2
2	Ammonia (as total ammonia –N), mg/L, max.	0.5	No relaxation
3	Anionic detergents (as MBAS), mg/L, max.	0.2	1.0
4	Barium (as Ba), mg/L, max.	0.7	No relaxation
5	Boron (as B), mg/L, max.	0.5	1.0
6	Calcium (as Ca), mg/L, max.	75	200
7	Chloramine (as Cl_2), mg/L, max.	4.0	No relaxation
8	Chloride (as Cl), mg/L, max.	250	1000
9	Copper (as Cu), mg/L, max.	0.05	1.5
10	Fluoride (as F), mg/L, max.	1.0	1.5
11	Free residual chlorine, mg/L, min.	0.2	1
12	Iron (as Fe), mg/L, max.	0.3	No relaxation
13	Magnesium (as Mg), mg/L, max.	30	100
14	Manganese (as Mn), mg/L, max.	0.1	0.3
15	Mineral oil, mg/L, max.	0.5	No relaxation
16	Nitrate (as NO_3), mg/L, max.	45	No relaxation
17	Phenolic compounds (as C_6H_5OH), mg/L, max.	0.001	0.002
18	Selenium (as Se), mg/L, max.	0.01	No relaxation
19	Silver (as Ag), mg/L, max.	0.1	No relaxation
20	Sulfate (as SO_4), mg/L, max.	200	400
21	Sulfide (as H_2S), mg/L, max.	0.05	No relaxation
22	Total alkalinity as $CaCO_3$, mg/L, max.	200	600

23	Total hardness as $CaCO_3$, mg/L, max.	200	600
24	Zinc (as Zn), mg/L, max.	5	15
Parameters Concerning Toxic Substances			
1	Cadmium (as Cd), mg/L, max.	0.003	No relaxation
2	Cyanide (as CN), mg/L, max.	0.05	No relaxation
3	Lead (as Pb), mg/L, max.	0.01	No relaxation
4	Mercury (as Hg), mg/L, max.	0.001	No relaxation
5	Molybdenum (as Mo), mg/L, max.	0.07	No relaxation
6	Nickel (as Ni), mg/L, max.	0.02	No relaxation
7	Polychlorinated biphenyles, mg/L, max.	0.0005	No relaxation
8	Polynuclear aromatic hydrocarbons, mg/L, max.	0.0001	No relaxation
9	Total arsenic (as As), mg/L, max.	0.01	0.05
10	Total chromium (as Cr), mg/L, max.	0.05	No relaxation
11	Trihalomethanes		
	Bromoform, mg/L, max.	0.1	No relaxation
	Bibromochloromethane, mg/L, max.	0.1	No relaxation
	Bromodichloromethane, mg/L, max.	0.06	No relaxation
	Chloroform, mg/L, max.	0.2	No relaxation
Parameters Concerning Radioactive Substances			
1	Radioactive materials		
	Alpha emitter, Bq/L, max.	0.1	No relaxation
	Beta emitter, Bq/L, max.	0.1	No relaxation