DB Power Limited

CIN: U40109MP2006PLC019008

Business Office : Village – Badadarha, Post – Kanwali, Dist – Sakti, Chhattisgarh, PIN – 495695

Tel. : +91-7389912699

No. DBPL/ENV/369 Date: 16.05.2023

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

Subject: Six Monthly Compliance Report for the period of October 2022 – March 2023

Ref: Environment Clearance granted by MOEF vide letter no. J-13012/79/2008-IA. II (T) Dated 16/09/2010 to our 2X600 MW Thermal Power Plant located at village – Badadarha, Taluka- Dabhra, Dist –Sakti, Chhattisgarh, DB Power Limited.

Dear Sir,

We are pleased to enclose herewith six monthly Compliance Status Report for the conditions stipulated in subject EC granted to our Thermal power plant located at Village - Badadarha, Taluk - Dabhra, District-Sakti, Chhattisgarh. The report has following enclosures –

1. CSR & Expenses Report - Annexure IA & IB
2. FGD Progress Status Report – Annexure II
3. Fly Ash Utilization Report – Annexure III
4. Environment Monitoring Report-Annexure IV
5. Social Audit Report – Annexure V
6. Hydrogeological Report- Annexure VI

Thanking you,
Yours Faithfully

D.B. POWER LTD. * RAIGARH *

Authorized Signatory

Enclosures: as above

Copy to:

The Member Secretary, Chhattisgarh Environment Conservation Board,
Paryavas Bhavan, North Block Sector-19, Atal Nagar, Raipur (C.G.) 492002

Regional Officer, Chhattisgarh Environment Conservation Board
Vyapar Vihar, Near Pt. Dindayal Upadyay Garden, Dist: Bilaspur (C.G.)

Status of compliance of conditions of Environment Clearance granted by MOEF vide letter no. J-13012/79/2008-IA.II (T) dated 16.09.2010 to M/S DB Power limited, 2X600 MW Thermal Power Plant located at Baradarha, Sakti, Chhattisgarh

(Period : October2022 – March 2023)

A. Specific Conditions

S. No.	Stipulation	Compliance Status
i.	Vision document specifying prospective plan for the site shall be formulated and submitted to the Ministry within six months.	Complied.
ii.	Sulphur and ash contents in the coal to be used in the project shall not exceed 0.5% and 34% respectively at any given time. In case of variation of coal quality at any point of time, fresh reference shall be made to MoEF for suitable amendments to environmental clearance condition wherever necessary.	Company is procuring coal from Coal India subsidiaries namely SECL & MCL. We are committed to comply MOEF&CC notification vide S.O. 1561(E) dated 21.05.2020.
iii.	A bi-flue stack of 275 m height shall be provided with continuous online monitoring equipments for SOx, NOx and Particulate Matter. Exit velocity of flue gases shall not be less than 22 m/sec. Mercury emissions from stack may also monitored on periodic basis.	A 275 meter tall twin flue stack has been constructed for effective dispersion of fumes aimed at proper dilution. We have installed continuous online monitoring system each attached to stack for SOx, NOx and Particulate Matter. The exit velocity of flue gas > 22 m/s.
iv.	Source sustainability study of water requirement shall be carried out by an institute of repute. The study shall also specify the source of water for meeting the requirement during lean season. The Report shall be submitted to the Regional Office of the Ministry within six months.	Complied. Source sustainability study was carried out by ISM Dhanbad and same had been submitted along with compliance report vide our Letter No. DBPL/ENV/41 Dated 28.05.2018.
v.	Hydro-geological study of the area shall be reviewed annually and report submitted to the Ministry.	Hydro-geological study report attached in Annexure-VI
vi.	No ground water shall be extracted for use in operation of the power plant even in Lean season. COC of 5.0 shall be adopted.	Ground water is not extracted for industrial & domestic use. COC of 6.5 is maintained in water circulated through the cooling tower during operation. This is aimed at water conservation.
vii.	No water bodies including natural drainage system in the area shall be disturbed due to activities associated with the setting up /operation of the power plant. Minimum required environmental flow suggested by the competent Authority of the state govt. shall be maintained in the channel / Rivers (as applicable) even in lean season.	Being complied.
viii.	Local employable youth shall be trained in skills relevant to the project for eventual employment in the project itself. The action taken report and details thereof to this effect shall be submitted to the Regional Office of the Ministry and the State Govt. Dept. concerned from time to time.	The local youths are being trained in skills such as Plumbing, Masonry, Hand pump repair etc. by DB Power CSR team. CSR Report indicating such initiatives is attached as **Annexure I A.**
ix.	Additional soil for leveling of the proposed site shall be generated within the sites (to the extent possible) so that natural drainage system of the area is protected and improved.	Complied

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x.	Provision for installation of FGD shall be provided for future use. High Efficiency Electrostatic Precipitators (ESPs) shall be installed to ensure that particulate emission does not exceed 50 mg/Nm3. Adequate dust extraction system such as cyclones / bag filters and water spray system in dusty areas such as in coal handling and ash handling points, transfer areas and other vulnerable dusty areas shall be provided.	1. Flue Gas De-Sulphurisation (FGD) Plant project has been started with award of EPC work to meet the MOEF emission norms within the stipulated time: Contract awarded to Chinese EPC contractor M/s TUNA Corporation in Sep 2019. Project work is in progress. Find the attached FGD project status report as **Annexure-II** 2. High Efficiency (99.94%) Electro-static precipitator having 80 fields has been installed. This has kept particulate emission from stack < 50 mg/Nm3. 3. We have provided dust extraction system (DE) complete with filter bags, cage and hopper fitted to Crusher unit, transfer points (5, 6, 7 and 8) and bunkers. We have also provided dust suppression system (DS) at crusher house, TP-1,2,3 and 4 and also at MUH and ERH. The conveyors have been closed on all sides using color coated galvanized profile sheet (CCGP) to confine fugitive emissions. We have provided water cannons at strategic locations in coal handling. At ash silo loading point of ash, water fogging and spraying system is installed for fugitive emission of ash. Similar system is also installed at wagon tippler zone. Water sprinkling using tankers is done for dust suppression on road inside and outside premises. Ash transportation from generation point to silo and to ash pond is done using closed MS pipes. Above actions have immensely helped us contain fugitive emission and meet ambient air quality norms in the area.
xi.	Utilization of 100% Fly Ash generated shall be made from 4th year of operation of the plant. Status of implementation shall be reported to the Regional Office of the Ministry from time to time. Fly ash shall be collected in dry form and storage facility (silos) shall be provided. Unutilized fly ash shall be disposed off in the ash pond in the form of slurry form. Mercury and other heavy metals (As,Hg,Cr, Pb etc.) will be monitored in the bottom ash as also in the effluents emanating from the existing ash pond. No ash shall be disposed off in low lying area.	Fly ash generation & utilization report from April-2022 to March-2023 is attached as **Annexure III. Ash Utilization of 128.5% has been achieved during the FY23** Heavy metal monitoring is done periodically and analysis report is attached as **Annexure IV.**

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xii.	Ash pond shall be lined with HDPE / LDPE lining or any other suitable impermeable media such that no leaching takes place at any point of time. Adequate safety measures shall also be implemented to protect the ash dyke from getting breached. For disposal of Bottom Ash in abandoned mines (if proposed to be undertaken) it shall be ensured that the bottom and sides of the mined out areas are adequately lined with clay before Bottom Ash is tilled up. The project proponent shall inform the State Pollution Control Board well in advance before undertaking the activity.	Complied. LDPE liners used for lining of Ash pond.
xiii.	Green Belt consisting of 3 tiers of plantations of native species around plant and at least 100 m width shall be raised. Wherever 100 m width is not feasible a 50 m width shall be raised and adequate justification shall be submitted to the Ministry. Tree density shall not less than 2500 per ha with survival rate not less than 75 %.	The total plantation done in the area of 211 acre is 2,10170 (with 84% survival).
xiv.	Two nearest village shall be adopted and basic amenities like development of roads, drinking water supply, primary health center, primary school etc shall be developed in coordination with the District administration. For the tribal families (if any) affected directly or indirectly by the proposed project, specific schemes for upliftment of their sustainable livelihood shall be prepared with time bound implementation and in built monitoring program me. The status of implementation shall be submitted to the Regional Office of the Ministry from time to time.	We have adopted 2 villages Tundri and Badadarha located near the plant as required. Basic amenities like development of roads, drinking water supply, health camps, infrastructure and other support in schools, etc are being done. **Annexure I A.**
xv.	An action plan for R&R (as applicable) with package for the project affected persons be submitted and implemented as per prevalent R&R policy within three months from the date of issue of this letter.	Complied.
xvi.	An amount of Rs 26.0 Corers shall be earmarked as one time capital cost for CSR program. Subsequently a recurring expenditure of Rs 5.2 Corers per annum shall be earmarked as recurring expenditure for CSR activities. Details of the activities to be undertaken shall be submitted within one month along with road map for implementation.	Expenses incurred towards implementation of CSR program from April-2022 to March-2023 is attached as **Annexure 1B**.
xvii.	While identifying CSR programme the company shall conduct need based assessment for the nearby villages to study economic measures with action plan which can help in upliftment of poor Section of society. Income generating projects consistent with the traditional skills of the people besides development of fodder farm, fruit bearing orchards, vocational training etc. can form a part of such program. Company shall provide separate budget for community development activities and income generating program. This will be in addition to vocational training for individuals imparted to take up self-employment and jobs.	CSR activities have been undertaken by DB Power Ltd. CSR activity detail is attached as **Annexure I A.**

(viii.	It shall be ensured that in-built monitoring mechanism for the schemes identified is in place and annual social audit shall be got done from the nearest government institute of repute in the region. The project proponent shall also submit the status of implementation of the scheme from time to time.	Social Audit report for the year 2022-23 is under progress, report will be submitted in the next compliances. For the FY 2021-22 is attached in Annexure-V.

B. General Conditions

S. No.	Stipulation	Compliance Status
i.	The treated effluents conforming to the prescribed standards only shall be re-circulated and reused within the plant. There shall be no discharge outside the Plant boundary except during monsoon. Arrangements shall be made that effluents and storm water do not get mixed.	• Treated water of ETP is reused green belt irrigation besides in ash handling plant. • Ash Dyke decant water is treated and re-circulated to ash water sump for reuse. • The plant is designed for zero discharge. • Process and storm water is kept separate.
ii.	A sewage treatment plant shall be provided (as applicable) and the treated sewage shall be used for raising greenbelt / Plantation.	Sewage Treatment Plants (15 in number) have been installed and commissioned. The treated water from STPs is used for green belt nursing.
iii.	Rainwater harvesting should be adopted, Central Groundwater Authority / Board shall be consulted for finalization of appropriate rainwater harvesting technology within a period of three months from the date of issue of clearance and details shall be furnished to the Regional Office of the Ministry.	We have constructed 7 number of Rain water harvesting structures for the purpose. This is complete with a receiving pond, gravel/sand bed filter besides bore well. The collected water is subjected to ground water recharging.
iv.	Adequate safety measures shall be provided in the plant area to check / minimize spontaneous fires in coal yard, especially during summer season. Copy of these measures with full details along with plant layout shall be submitted to the Ministry as well as to the Regional Office of the Ministry.	Complied. We have provided a Fire Detection & Protection System (FDPS) including fire hydrants at all strategic points. The detail of same has already been submitted.
v.	Storage facilities for auxiliary liquid fuel such as LDO and HFO /LSHS shall be made in the plant area in consultation with Department of Explosives, Nagpur Sulphur content in the liquid fuel will not exceed 0. 5%, Disaster Management Plan shall be prepared to meet any eventuality in case of an accident taking place due to storage of oil.	A storage facility for LDO is in place after obtaining license from PESO. We also own onsite Disaster/emergency plan duly approved by Factory inspectorate for meeting emergencies.
vi.	Regular monitoring of ground water level shall be carried out by establishing a network of existing wells and constructing new piezometers. Monitoring around the ash pond area shall be carried out particularly for heavy metals (Hg, Cr,As, Pb) and records maintained and submitted to the Regional Office of this Ministry. The data so obtained should be compared with the baseline data so as to ensure that the ground water quality is not adversely affected due to the project.	The ground water monitoring is done at regular intervals and records are maintained.

vii.	Monitoring surface water quantity and quality shall also be regularly conducted and records maintained. The monitored data shall be submitted to the Ministry regularly. Further, monitoring points shall be located between the plant and drainage in the direction of flow of ground water and records maintained. Monitoring for heavy metals in ground water shall be undertaken.	The monitoring surface water around the plant is done at regular intervals and records maintained. **Annexure IV**
viii.	First Aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase.	Complied
ix.	Noise levels emanating from turbines shall be so controlled such that the noise in the work zone shall be limited to 75 dBA. For people working in the high noise areas, requisite personal protective equipment like earplugs / ear muffs etc. shall be provided, Workers engaged in noisy areas such as turbine area, air compressors etc shall be periodically examined to maintain audiometric record and for treatment for any hearing loss including shifting to non-noisy / less noisy areas.	The ambient noise monitoring is conducted regularly with noise within the prescribed limit and records maintained. See **Annexure IV** • Turbine is housed in a specially designed acoustic insulated box. • Compressors are kept in isolated closed chambers. • Boiler safety valves are fitted with silencers to contain noise. • In high noise areas PPE like Ear plugs / Ear Muffs are provided to keep impact minimum. • High noise area kept unmanned as far as practical. • The periodical audiometry test of all employees is done and recorded at OHC with remedial action in case of any hearing loss reported. Above arrangements have helped to keep noise level below 85 dB (A) as per Factory Act at plant equipment work zone and found impact negligible
x.	Regular monitoring of ground level concentration of SO2, NOX, PM2.5 & PM10 and Hg shall be carried out in the impact zone and records maintained. If at any stage these levels are found to exceed the prescribed limits, necessary control measures shall be provided immediately. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Periodic reports shall be submitted to the Regional Office of this Ministry. The data shall also be put on the website of the company.	Regular monitoring for ambient air quality is carried in the impact zone (both core and buffer). Values are well within norms. The monitoring report is enclosed as **Annexure IV.** We have installed 4 nos. online AAQMS for real time monitoring of ground level concentration and are integrated to the central server of CPCB. These are working fine.
xi.	Provision shall be made for the housing of construction labor (as applicable) within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the Project.	Complied.

xii.	The project proponent shall advertise in at least two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned within seven days from the date of this clearance letter, informs that the project has been accorded environmental clearance and copies of clearance letter are available with the State Pollution Control Board/Committee and may also be seen at Website of the Ministry of Environment and Forests.	Complied
xiii.	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parisad / Municipal Corporation, urban local Body and the Local NGO, if any, from whom suggestions/representations, if any, received while processing the proposal. The clearance letter shall also be put on the website of the Company by the proponent.	Complied
xiv.	An Environmental Cell shall be created at the project site itself and shall be headed by an officer of appropriate seniority and qualification. It shall be ensured that the head of the Cell shall directly report to the head of the organization.	Environmental Cell is in place and is suitably staffed. It is headed by a senior officer reporting directly to the head of the organization.
xv.	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically, It shall simultaneously be sent to the Regional Office of MOEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM (PM2.5 & PM10), SO2, NOX (ambient levels as well as stack emissions) shall be displayed at a convenient location near the main gate of the company in the public domain.	Complied.
xvi.	The environment statement for each financial year ending 31st March in From –V as is mandated to be submitted by the project proponent to the concerned State pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional Offices of the Ministry by e-mail.	Complied. Environment Statement submitted for FY 2021-22 vide letter dated 14.09.2022.

xvii.	The project proponent shall submit six monthly reports on the status of the implementation of the stipulated environmental safeguards to the Ministry of Environment and Forests, its Regional Office, Central Pollution Control Board and State Pollution Control Board. The project proponent shall upload the status of compliance of the environment of the environmental clearance conditions on their website and update the same periodically and simultaneously send the same bye-mail to the Regional Office, Ministry of. Environment and Forests.	Complied. The last six monthly compliance reports to EC conditions were submitted via email to IRO, MoEF&CC, Raipur, CG. through our Email dated 18.11.2022.
viii.	Regional Office of the Ministry of Environment & Forests will monitor the implementation of the stipulated conditions. A complete set of documents including Environmental Impact Assessment Report and Environment Management Plan along with the additional information submitted from time to time shall be forwarded to the Regional Office for their use during monitoring. Project proponent 'will upload the compliance status in their website and up-date the same from time to time at least six monthly basis. Criteria pollutants levels including NOX (Stack & ambient air) shall be displayed at the main gate of the power plant.	Being Complied as and when required.
xix.	Separate funds shall be allocated for implementation of environmental protection measures along with item-wise break-up, These cost shall be included as part of the project cost. The funds earmarked for the environment protection measures shall not be diverted for other purposes and year-wise expenditure should be reported to the Ministry.	The Expenditure incurred in environmental protection measures are – Capital Expenditure up to March 2018 = 1237.48 Crore Recurring Expenditure : Department / Expenses from April-22 to March-23 (in Crore) Environment – 0.87 Horticulture – 0.38 Fly ash utilization – 104.2 OHC – 0.11 Total – 105.60
xx.	The project authorities shall inform the Regional Office as well as the Ministry regarding the date of financial closure and final approval of the project by the concerned authorities and the dates of start of land development work and commissioning of plant.	Complied. Informed vide letter dated 06.06.2011.
xxi.	Full cooperation shall be extended to the Scientists / Officers from the Ministry / Regional Office of the Ministry at Bhopal / CPCB / SPCB who would be monitoring the compliance of environmental status.	Full cooperation will be extended to the Scientists / Officers from the Ministry / Regional Office of the Ministry at Bhopal / CPCB / SPCB as and when required.

A glimpse of CSR activities from April 22 to March 2023

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CSR Activities

Constructed CC road (310 meter) in Patel Mohalla at village Badadarha & Constructed 300 meter CC road in Tundri and also Constructed 380 meter CC road at Rampur.

Drilling of bore well and installation of submersible pump at village Baispali.

Beautification in premises of Collector office has been done at Janjgir-Champa.

Procurement of an ambulance for better health service for villagers

CSR Activities

Constructed Shed in front of Radha Krishna Mandir Tundri, Boundary wall (Jyoti Kalash ,Temple) and Bathing steps near temple have been also completed at village Adbhar.

On the occasion of the marriage of girls of plant affected village (Badadarha & Tundri) 21 nos sewing machines and Rs.55,000/- financial help to villagers (16 villagers, Rs. 5000/each) for procurement of fridge have been given to them by DBPL management.

Organized Kanya Bhoj program and Provided Dari (02 Nos) and Chandni (01 Nos) to Kurupat dev samiti on the occasion of Ramnavmi Puja at Kurupat temple Tundri.

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CSR Activities

Tailoring Training Center- 20th Batches is being run with 8 candidates.

Weekly Health Camp- 28 Camp organized and 1647 people benefitted from this camp. Camp has been re-started from 1st Dec.22 (Due to Covid camp was postponed.)

Hand Pump (70 No's) & Submersible Pump (21 No's)- Repaired 51 hand pumps and 92 times motor pumps of plant affected villages.

Celebration of Independence & Republic Day and also distributed sweets to government schools (plant and railway corridor villages) on the occasion of Independence Day.

CSR Activities

- **Facilitated to youths (6 Girls from Tundri) to start online classes for preparation of PAT exam.**
- **Provided National Flags (2000 pcs) to villagers nearby plant and railway corridor villages for hosting with honor on the occasion of Amrit Mahotsav.**
- **Cleaning of Dari pond at Rampur.**
- **Repaired Kachcha Canal for irrigation at village Badadarha.**
- **Provided Fans to government higher secondary School at Sondka.**
- **Provided grocery items to villagers (14 People) nearby plant villages for performing Daskarm.**
- **Provided drinking water to villagers (16 People) nearby plant villages for social cause.**
- **Primary Health Center-** 2190 cases attended nearby plant villages.
- **Ambulance referral service-** 383 cases attended plant villages.
- **To control dust-** Cleaning of main road is being done by brroming and also Sprinkling is being done on main road from Tundri to Odekera via Kanwali, Approach road Badadarha, L&T road and ash dyke at DBPL.
- **Street Lights (72 Nos)-** Repaired 234 times street lights at Badadarha and Rampur respectively.
- **Biogas (35 Nos)-** Repaired 41 times biogas at Badadarha and Rampur respectively.

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CSR EXPENDITURE SORTED MONTH WISE FY 2022-23

Particulars	April '22	May'22	June'22	July'22	Aug'22	Sep'22	Oct'22	Nov'22	Dec'22	Jan '23	Feb'23	Mar'23	GRAND TOTAL
Health & Sanitation	16176	652324	1269374	79823	72913	582743	40388	589504	68467	682291	230847	1254683	5539532
Infrastructure	418246	2423575	415485	20807140	6314086	683034	10094391	5996852	10067904	95466	3300	25181855	82501335
Cultural & Social Events	116505	2572150	94085	522150	82525	290836	94250	83849	43975	327165	1275663	7178126	12681279
Rehabilitation and Compensation	1000000	931429	1848357	929072	932612	-1380594	272284	277631	270230	374825	-189562	29289	5295573
Women Empowerment & Skill	0	0	24022	6283	6500	6531	6500	6500	10150	9045	6500	11861	93892
Education &Skill Development	0	0	27000	13500	13500	13500	13500	21300	13500	13500	13500	27000	169800
Operating Expenses	24245	11373	24659	6753	54039	51138	153594	254560	32363	246031	6380	380922	1246055
MONTHLY TOTAL	**1575172**	**6590851**	**3702982**	**22364720**	**7476174**	**247187**	**10674907**	**7230196**	**10506589**	**1748324**	**1346628**	**34063736**	**107527467**

FGD: Progress status note [March-23]

Contract Award Status [Construction contracts]

- Award of Civil Construction Package has been completed; agencies **(M/s. Galaxy Infra)** are given the job viz. Package 1 for Electrical and Control Building and Package 2 for Complex building & common facilities **(M/s. Sarvamangala Infra Build)**.
- Both the agencies mobilized and work is progressing as per the schedule.
- Award of Mechanical Construction Package has been done and the agency **(M/s. Simar Infra)** mobilized in November 2021.
- Award of Electrical and C&I Erection work is M/s.VJR Electricals. (Mobilized on 10th Jan'23)
- **Team Deployment status:**
- M/s Tuna's Project in-charge and Commercial head reported at DBPL site and deployed their team for Construction and erection activities (Team Size – 13 Persons)
- M/s. Galaxy Infra and their team deployed at Site for Constructing the Electrical & Control building and Pump foundations # 1 & 2 and Pipe Rack foundations. (60-75)
- M/s. Simar Infra and their team deployed at Site for Absorber # 1 & 2 and other miscellaneous tanks. (180-200)
- M/s. Sarvamangala Infra Build and their team deployed at Site for Complex Building and Common Structure for Constriction work purpose. (130-150)
- M/s.VJR Electricals working both ECB & Complex Building Premises Electrical works. (50-60)

Design / Engineering approval status

- Out of 140 approval category drawings, 140 drawings are approved and released to proceed for furtherance.
- Out of 220 Information category drawings, 220 drawings are released to proceed for furtherance.

Equipment's supply status- OFF Shore

- All Offshore equipment's received. (35 out of 35)
- The below list of Offshore items are reached at DBPL Site for start up the erection activity,
  - Dampers
  - Seal Air Fan
  - Seal Air Heater
  - Spray Headers
  - Mist Eliminators
  - Vacuum Belt Filter
  - Top Chimney Absorber
  - Air compressor
  - Air Drier
  - Air Receiver
  - Hydro Cyclone
  - Re-circulation Pumps
  - Expansion Joints
  - Water Pump
  - Side & Top Agitators
  - Oxidation Blower
  - Slurry pumps
  - Slurry Spray Nozzles
  - Valves
  - Crane & Hoist and Etc.
  - Anti-corrosive (1st lot In-Transit from Kolkata port)

ON Shore Supply:

- Ordering completed 23 out of 23 numbers.
- Drawing & FQP submission 21 out of 23 numbers.
- Inspection and MDCC pending of communication system, Lighting and Lamps, HVAC sys & Exhaust Fan.
- Received of 18 items out of 23 numbers.
- OVDT & DCS & DC System & UPS & CEMS
- HT & LT Panel & Cable & control cable
- Elevator
- Fire protection system
- Steels
- Control cabinet
- Instruments
- Loader & Dozer

Construction status Civil Work

- Electrical control Building EL+15.5m floor 100% (148cum) casting completed & Head Room shuttering & reinforcement work to be done.
- Unit#2 Recirculation pipe support foundation excavation raft reinforcement & casting completed. (48cum)
- Unit#1 Excavation of Recirculation pump & Pipe support foundation 85% completed.
- Pipe Rack foundation 11 no's completed out of 16 nos.
- Brick work @ ECB +0.0 & 3.7& 7.5mtrs work completed & 100 % flooring completed @ECB 0 mtrs.
- Complex Building
    - Control Building EL+17m 160 cum casting completed.
    - Control Building EL+20m 40cum casting completed.
    - Limestone handling area EL +10m scaffolding & reinforcement work Under progress.
    - Super structure work from EL+13m to EL+20 mtrs 25 cum & Tie Beams -18 cum completed.
    - Brick work at complex building EL+3.5 m work under progress.
    - F3 Wall -60 cum casting completed.

Mechanical- Fabrication & Erection:

- Absorber I-120.4 mtrs (100%) erection completed-254 MT erected in last month.
- Unit#1 Booster Fan assembky-85% completed. Alignment & Grouting and Fan top house fixing works to be done.
- Unit#1 Booster Fan assembky-25% completed. (Diffuser only)
- Flue gas dust support erection progress of 50MT+15 MT respected units.
- Unit #2 Mist Eliminator support & Spray Header support 100% Erection completed-(54MT)
- Unit #2 conical portion 14 out of 17 no's completed & top chimney 10 out of 29 nos completed.

Electrical Work:

- OVDT -2nos Erection completed at Complex building.

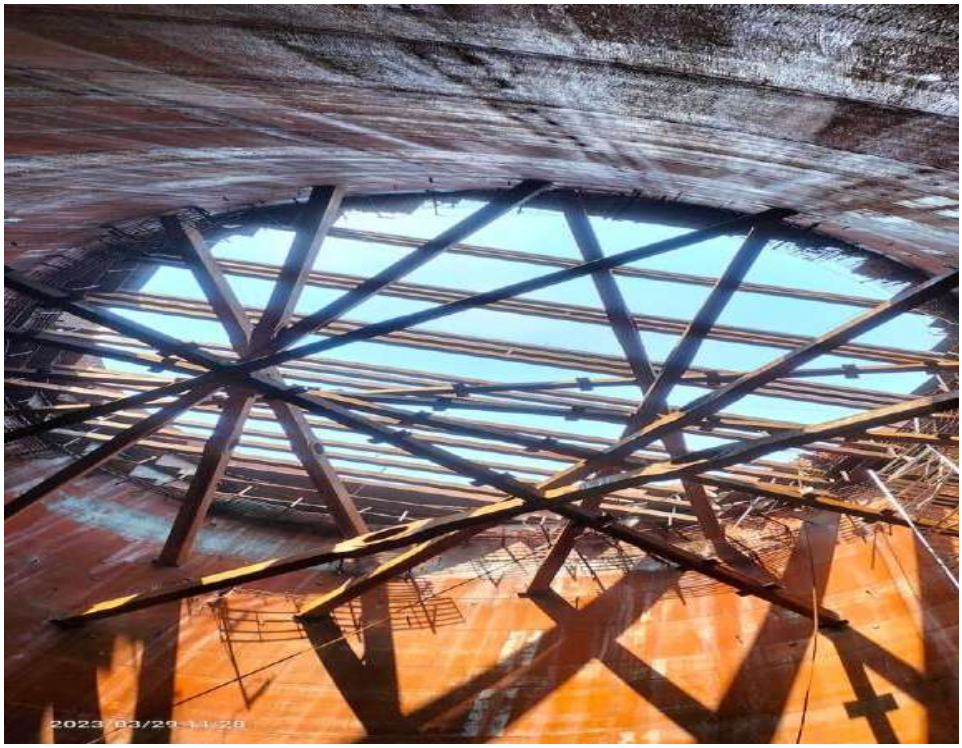
- Cable cellar at ECB +0m & 3.45 M @ complex building fabrication and erection work under progress. (65% completed)
- From DB main feeder to ECB HT cable-560m laying and dressing completed.
- Cable tray from DB main Feeder to Complex & ECB erection 100% Completed. UPS & Battery shifted to Electrical control building, Assembly/positioning to be done.

Key Milestone: -

SL. No	Milestone	Planned Date (R1)		Status	
		Unit #1	Unit #2	Unit #1	Unit #2
1	Submission of DBR, Layout, P&ID & Other Engg. Drwgs	~~31 Aug 22~~		In progress	
2	Installation of Absorber and all associated tanks, pumps, piping, accessories.	28-May-23	26-Jun-23	In progress	
3	Construction of Complex Building Covering all Facilities	25-May-23		In progress	
4	Foundation for Booster Fan, Duct Support, Process Tanks, Blowers	~~14-Jun-22~~	~~30-Jun-22~~	Completed	Completed
5	Recirculation Pump Foundations	26-Apr-23	11-Mar-23	Unit #1 Excavation U/P. & UNIT #2 Upto Raft level completed.	
6	Electrical Control Room in all Respect	30- Apr-23		In progress	
7	Water and Sewerage System, HVAC, Etc.	20-May-23		Not Started	
8	Limestone Slurry System Readiness	20-May-23		Not Started	
9	Gypsum Dewatering System Readiness	20-May-23		Not Started	
10	Electrical & C & I System Work	20-May-23		In progress	
11	Commissioning of Unit#1	31-May-23		Not Started	
12	Commissioning Unit #2	30-Jun-23		Not Started	

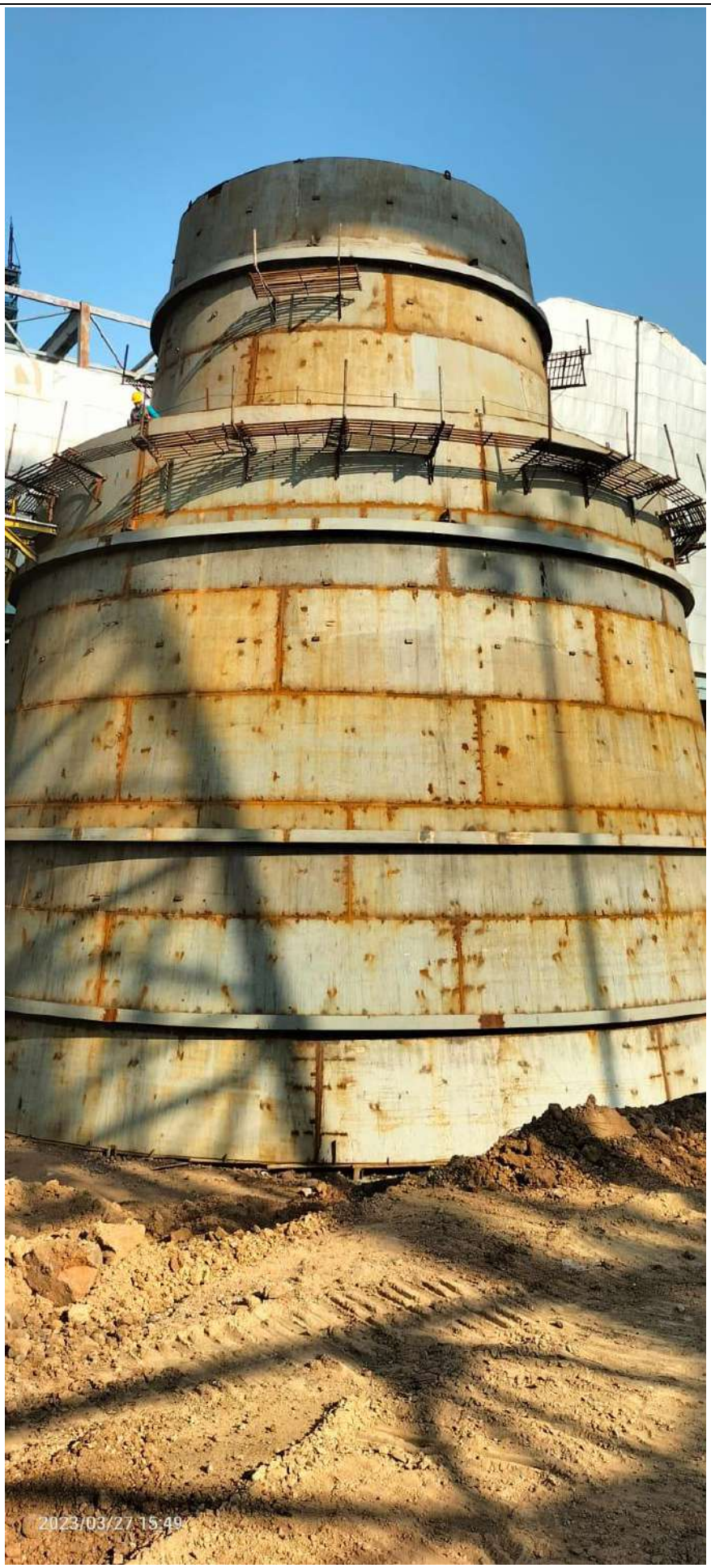
Site Photographs

Location	Photograph
Absorber-1	

Location	Photograph
Booster Fan-1	
Absorber –II Internal supports	

Location	Photograph
ECB –Electrical Control building	
Piping Work (Doubling) @ Fabrication Yard	

Location	Photograph
HT Cable Laying (Main Feeder to ECB)	
Cable Tray Structure erection	

Unit #2 Absorber (Cone Part 1&2)	

Location	Photograph
Complex Building limestone Handling area EL+10m slab	
ECB – Cable Gallery works	

Annexure-I

Ash Generation & Utilization Report
From April-22 to March-23

Sr.no	Month	Total Ash Generation (MT)	In making of Fly Ash based/ Bricks/ Blocks/ Tiles etc.	In manufacture of Portland Pozzolana Cement	In construction of Highways & Roads including Flyovers	Part replacement of cement in concrete	In Hydro Power Sector in RCC Dam Construction	In Ash dyke raising	In reclamation of low lying Area	In Mine filling	In Agriculture/ Waste land Devlopment	Others	Total Ash Utilization	Ash Utilization (%)
1	Apr-22	256092.75	2366.24	59451.54	0.00	0.00	0.00	0.00	85352.95	327382.96	0.00	0.00	474553.69	**185.31**
2	May-22	262686.65	1459.46	32472.83	0.00	0.00	0.00	0.00	94017.82	314187.36	0.00	0.00	442137.47	**168.31**
3	Jun-22	252120.71	2745.32	41493.95	0.00	0.00	0.00	0.00	94276.00	289918.26	0.00	0.00	428433.53	**169.93**
4	Jul-22	104010.36	1152.86	5581.10	0.00	0.00	0.00	0.00	1949.25	144126.81	0.00	0.00	152810.02	**146.92**
5	Aug-22	138680.09	1181.13	160.00	0.00	0.00	0.00	0.00	0.00	107764.49	0.00	0.00	109105.62	**78.67**
6	Sep-22	162629.62	1602.97	26.75	0.00	0.00	0.00	0.00	0.00	147619.19	0.00	0.00	149248.91	**91.77**
7	Oct-22	152654.30	2063.97	10634.13	0.00	0.00	0.00	0.00	0.00	104744.41	0.00	0.00	117442.51	**76.93**
8	Nov-22	179767.20	1658.23	18533.20	0.00	0.00	0.00	0.00	0.00	273740.00	0.00	0.00	293931.43	**163.51**
9	Dec-22	185606.10	734.00	14762.83	0.00	0.00	0.00	0.00	4905.82	254707.00	0.00	0.00	275109.65	**148.22**
10	Jan-23	227618.58	793.14	6931.07	0.00	0.00	0.00	0.00	12070.32	197265.70	0.00	0.00	217060.23	**95.36**
11	Feb-23	230756.83	917.74	5291.26	0.00	0.00	0.00	0.00	34950.21	160704.00	0.00	0.00	201863.21	**87.48**
12	Mar-23	217226.59	551.07	725.58	0.00	0.00	0.00	0.00	18229.42	164157.17	0.00	0.00	183663.24	**84.55**
Total		**2369850**	**17226**	**196064**	**0**	**0**	**0**	**0**	**345752**	**2486317**	**0**	**0**	**3045360**	**128.50**

Annexure-IV

Environment Monitoring Report

Netel (India) Limited

TEST REPORT

REF	: NIL/DBPL/AAQ/BZ/14-01		
Customer Name	: M/s. DB Power Limited		
Customer Address	: 2 X 600MW, Village - Badadhara, District: Janjgir–Champa (C.G.) 495695		
Sample Type	: **Ambient Air**	**Sampling done by**	: Netel India Limited
Date of Sampling	: 02.03.2023 - 30.03.2023	**Analysis Date**	: 03.03.2023 - 31.03.2023
Sample Received	: 03.03.2023 - 31.03.2023	**Date of Reporting**	: 01.04.2023
Sampling Location	: **BADADARHA VILLAGE**		

Test Method and NAAQM Standard for Ambient Air Quality Monitoring

Parameter	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	Hg
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ng/m³
Method Reference	IS 5182 (Part 23)	IS 5182 (Part 24)	IS 5182 (Part 02)	IS 5182 (Part 06)	IS 5182 (Part 10)	EPA Method IO-5
NAAQM Standard	100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³	---
Date of Sampling	**REPORT**					
02.03.2023	72.2	33.9	13.3	29.2	0.64	N.D.
07.03.2023	62.9	29.1	9.9	25.5	0.55	N.D.
09.03.2023	56.9	25.6	12.2	25.2	0.69	N.D.
14.03.2023	70.3	33.0	9.2	26.9	0.59	N.D.
16.03.2023	60.9	28.6	13.9	24.7	0.64	N.D.
21.03.2023	77.0	37.8	15.8	29.9	0.62	N.D.
23.03.2023	60.8	29.1	12.6	21.7	0.70	N.D.
28.03.2023	73.7	33.9	11.5	27.0	0.55	N.D.
30.03.2023	70.2	33.0	9.5	27.6	0.50	N.D.

Parameter	Ammonia	Ozone	Benzene	Benzo(a)pyrene	Ni	Pb	As
Method Reference	ISC Part-II (M-401)	IS 5182 (Part 09)	IS 5182 (Part 11)	IS 5182 (Part 12)	EPA Method IO-5		
NAAQM Standard	400	100	5	1	20	1	6
Date of Sampling	**REPORT**						
02.03.2023	27.6	15.2	N.D.	N.D.	N.D.	N.D.	N.D.
07.03.2023	31.7	15.5	N.D.	N.D.	N.D.	N.D.	N.D.
09.03.2023	22.5	14.1	N.D.	N.D.	N.D.	N.D.	N.D.
14.03.2023	25.5	17.6	N.D.	N.D.	N.D.	N.D.	N.D.
16.03.2023	26.8	18.0	N.D.	N.D.	N.D.	N.D.	N.D.
21.03.2023	18.4	14.2	N.D.	N.D.	N.D.	N.D.	N.D.
23.03.2023	18.3	15.2	N.D.	N.D.	N.D.	N.D.	N.D.
28.03.2023	31.2	15.0	N.D.	N.D.	N.D.	N.D.	N.D.
30.03.2023	23.3	17.8	N.D.	N.D.	N.D.	N.D.	N.D.

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

TEST REPORT

REF	: NIL/DBPL/AAQ/BZ/14-02		
Customer Name	: M/s. DB Power Limited		
Customer Address	: 2 X 600MW, Village - Badadhara, District: Janjgir–Champa (C.G.) 495695		
Sample Type	: **Ambient Air**	**Sampling done by**	: Netel India Limited
Date of Sampling	: 02.03.2023 - 30.03.2023	**Analysis Date**	: 03.03.2023 - 31.03.2023
Sample Received	: 03.03.2023 - 31.03.2023	**Date of Reporting**	: 01.04.2023
Sampling Location	: **BAISPALI VILLAGE**		

Test Method and NAAQM Standard for Ambient Air Quality Monitoring

Parameter	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	Hg
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ng/m³
Method Reference	IS 5182 (Part 23)	IS 5182 (Part 24)	IS 5182 (Part 02)	IS 5182 (Part 06)	IS 5182 (Part 10)	EPA Method IO-5
NAAQM Standard	100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³	---
Date of Sampling	REPORT					
02.03.2023	57.4	25.2	16.8	24.4	0.53	N.D.
07.03.2023	55.9	25.6	15.2	25.8	0.46	N.D.
09.03.2023	54.1	23.4	15.2	27.3	0.54	N.D.
14.03.2023	61.8	29.5	16.1	21.5	0.54	N.D.
16.03.2023	67.3	30.8	16.8	20.4	0.49	N.D.
21.03.2023	53.7	24.3	15.4	22.8	0.60	N.D.
23.03.2023	56.9	23.9	16.2	27.3	0.64	N.D.
28.03.2023	68.8	30.8	16.9	22.2	0.57	N.D.
30.03.2023	62.8	25.2	17.4	19.7	0.52	N.D.

Parameter	Ammonia	Ozone	Benzene	Benzo(a)pyrene	Ni	Pb	As
Method Reference	ISC Part-II (M-401)	IS 5182 (Part 09)	IS 5182 (Part 11)	IS 5182 (Part 12)	EPA Method IO-5		
NAAQM Standard	400	100	5	1	20	1	6
Date of Sampling	REPORT						
02.03.2023	26.8	11.8	N.D.	N.D.	N.D.	N.D.	N.D.
07.03.2023	24.3	13.6	N.D.	N.D.	N.D.	N.D.	N.D.
09.03.2023	26.5	12.3	N.D.	N.D.	N.D.	N.D.	N.D.
14.03.2023	28.2	12.5	N.D.	N.D.	N.D.	N.D.	N.D.
16.03.2023	21.0	11.8	N.D.	N.D.	N.D.	N.D.	N.D.
21.03.2023	26.6	14.8	N.D.	N.D.	N.D.	N.D.	N.D.
23.03.2023	26.7	13.1	N.D.	N.D.	N.D.	N.D.	N.D.
28.03.2023	24.5	12.5	N.D.	N.D.	N.D.	N.D.	N.D.
30.03.2023	26.7	13.3	N.D.	N.D.	N.D.	N.D.	N.D.

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

TEST REPORT

REF	: NIL/DBPL/AAQ/BZ/14-03		
Customer Name	: M/s. DB Power Limited		
Customer Address	: 2 X 600MW, Village - Badadhara, District: Janjgir–Champa (C.G.) 495695		
Sample Type	: **Ambient Air**	**Sampling done by**	: Netel India Limited
Date of Sampling	: 02.03.2023 - 30.03.2023	**Analysis Date**	: 03.03.2023 - 31.03.2023
Sample Received	: 03.03.2023 - 31.03.2023	**Date of Reporting**	: 01.04.2023
Sampling Location	: **TUNDRI VILLAGE**		

Test Method and NAAQM Standard for Ambient Air Quality Monitoring

Parameter	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	Hg
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ng/m³
Method Reference	IS 5182 (Part 23)	IS 5182 (Part 24)	IS 5182 (Part 02)	IS 5182 (Part 06)	IS 5182 (Part 10)	EPA Method IO-5
NAAQM Standard	100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³	---
Date of Sampling	REPORT					
02.03.2023	66.9	29.9	18.2	22.4	0.56	N.D.
07.03.2023	64.2	30.4	16.8	25.8	0.58	N.D.
09.03.2023	61.9	24.7	17.1	28.4	0.59	N.D.
14.03.2023	61.0	25.6	17.9	20.1	0.46	N.D.
16.03.2023	58.2	26.0	17.1	23.1	0.56	N.D.
21.03.2023	62.4	25.6	16.0	24.3	0.56	N.D.
23.03.2023	63.9	32.1	16.4	22.8	0.54	N.D.
28.03.2023	66.8	28.6	15.8	28.1	0.62	N.D.
30.03.2023	57.1	23.4	17.6	27.2	0.49	N.D.

Parameter	Ammonia	Ozone	Benzene	Benzo(a)pyrene	Ni	Pb	As
Method Reference	ISC Part-II (M-401)	IS 5182 (Part 09)	IS 5182 (Part 11)	IS 5182 (Part 12)	EPA Method IO-5		
NAAQM Standard	400	100	5	1	20	1	6
Date of Sampling	REPORT						
02.03.2023	22.8	12.1	N.D.	N.D.	N.D.	N.D.	N.D.
07.03.2023	21.7	12.0	N.D.	N.D.	N.D.	N.D.	N.D.
09.03.2023	24.5	12.4	N.D.	N.D.	N.D.	N.D.	N.D.
14.03.2023	21.1	13.9	N.D.	N.D.	N.D.	N.D.	N.D.
16.03.2023	24.5	11.8	N.D.	N.D.	N.D.	N.D.	N.D.
21.03.2023	26.3	13.6	N.D.	N.D.	N.D.	N.D.	N.D.
23.03.2023	24.0	12.4	N.D.	N.D.	N.D.	N.D.	N.D.
28.03.2023	24.7	13.3	N.D.	N.D.	N.D.	N.D.	N.D.
30.03.2023	26.2	11.9	N.D.	N.D.	N.D.	N.D.	N.D.

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Netel (India) Limited

TEST REPORT

REF	: NIL/DBPL/AAQ/BZ/14-04		
Customer Name	: M/s. DB Power Limited		
Customer Address	: 2 X 600MW, Village - Badadhara, District: Janjgir–Champa (C.G.) 495695		
Sample Type	: **Ambient Air**	**Sampling done by**	: Netel India Limited
Date of Sampling	: 02.03.2023 - 30.03.2023	**Analysis Date**	: 03.03.2023 - 31.03.2023
Sample Received	: 03.03.2023 - 31.03.2023	**Date of Reporting**	: 01.04.2023
Sampling Location	: **KANWALI VILLAGE**		

Test Method and NAAQM Standard for Ambient Air Quality Monitoring

Parameter	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	Hg
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ng/m³
Method Reference	IS 5182 (Part 23)	IS 5182 (Part 24)	IS 5182 (Part 02)	IS 5182 (Part 06)	IS 5182 (Part 10)	EPA Method IO-5
NAAQM Standard	100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³	---
Date of Sampling	**REPORT**					
02.03.2023	72.5	34.7	18.4	25.1	0.52	N.D.
07.03.2023	67.2	33.0	16.5	30.0	0.50	N.D.
09.03.2023	72.3	29.1	18.1	22.3	0.54	N.D.
14.03.2023	72.0	36.0	16.8	27.0	0.57	N.D.
16.03.2023	69.9	31.3	17.2	21.6	0.55	N.D.
21.03.2023	65.0	32.6	17.3	24.0	0.46	N.D.
23.03.2023	70.4	28.2	17.0	23.1	0.50	N.D.
28.03.2023	68.9	31.7	18.7	26.6	0.63	N.D.
30.03.2023	65.1	26.5	19.0	23.2	0.55	N.D.

Parameter	Ammonia	Ozone	Benzene	Benzo(a)pyrene	Ni	Pb	As
Method Reference	ISC Part-II (M-401)	IS 5182 (Part 09)	IS 5182 (Part 11)	IS 5182 (Part 12)	EPA Method IO-5		
NAAQM Standard	400	100	5	1	20	1	6
Date of Sampling	**REPORT**						
02.03.2023	20.4	12.8	N.D.	N.D.	N.D.	N.D.	N.D.
07.03.2023	21.0	12.7	N.D.	N.D.	N.D.	N.D.	N.D.
09.03.2023	23.5	12.9	N.D.	N.D.	N.D.	N.D.	N.D.
14.03.2023	22.3	12.5	N.D.	N.D.	N.D.	N.D.	N.D.
16.03.2023	23.5	13.0	N.D.	N.D.	N.D.	N.D.	N.D.
21.03.2023	22.4	13.0	N.D.	N.D.	N.D.	N.D.	N.D.
23.03.2023	22.2	13.6	N.D.	N.D.	N.D.	N.D.	N.D.
28.03.2023	24.7	12.1	N.D.	N.D.	N.D.	N.D.	N.D.
30.03.2023	20.2	13.6	N.D.	N.D.	N.D.	N.D.	N.D.

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

TEST REPORT

REF	: NIL/DBPL/AAQ/CZ/14-01		
Customer Name	: M/s. DB Power Limited		
Customer Address	: 2 X 600MW, Village - Badadhara, District: Janjgir–Champa (C.G.) 495695		
Sample Type	: **Ambient Air**	**Sampling done by**	: Netel India Limited
Date of Sampling	: 03.03.2023 - 31.03.2023	**Analysis Date**	: 04.03.2023 - 01.04.2023
Sample Received	: 04.03.2023 - 01.04.2023	**Date of Reporting**	: 03.04.2023
Sampling Location	: **AAQM STATION NO. I**		

Test Method and NAAQM Standard for Ambient Air Quality Monitoring

Parameter	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	Hg
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ng/m³
Method Reference	IS 5182 (Part 23)	IS 5182 (Part 24)	IS 5182 (Part 02)	IS 5182 (Part 06)	IS 5182 (Part 10)	EPA Method IO-5
NAAQM Standard	100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³	---
Date of Sampling	**REPORT**					
03.03.2023	70.0	28.6	17.1	23.7	0.57	N.D.
08.03.2023	77.9	35.2	9.1	25.7	0.65	N.D.
10.03.2023	58.7	29.5	12.3	23.7	0.64	N.D.
15.03.2023	68.1	28.6	10.1	29.4	0.51	N.D.
17.03.2023	67.8	26.9	12.4	22.0	0.55	N.D.
22.03.2023	66.1	30.4	9.8	23.2	0.62	N.D.
24.03.2023	76.2	33.4	12.5	27.4	0.50	N.D.
29.03.2023	76.3	34.3	10.3	24.2	0.65	N.D.
31.03.2023	53.3	24.3	14.9	26.6	0.53	N.D.

Parameter	Ammonia	Ozone	Benzene	Benzo(a)pyrene	Ni	Pb	As
Method Reference	ISC Part-II (M-401)	IS 5182 (Part 09)	IS 5182 (Part 11)	IS 5182 (Part 12)	EPA Method IO-5		
NAAQM Standard	400	100	5	1	20	1	6
Date of Sampling	**REPORT**						
03.03.2023	26.9	13.6	N.D.	N.D.	N.D.	N.D.	N.D.
08.03.2023	21.9	13.1	N.D.	N.D.	N.D.	N.D.	N.D.
10.03.2023	21.3	14.0	N.D.	N.D.	N.D.	N.D.	N.D.
15.03.2023	22.8	12.6	N.D.	N.D.	N.D.	N.D.	N.D.
17.03.2023	25.8	13.6	N.D.	N.D.	N.D.	N.D.	N.D.
22.03.2023	25.2	12.0	N.D.	N.D.	N.D.	N.D.	N.D.
24.03.2023	21.4	12.6	N.D.	N.D.	N.D.	N.D.	N.D.
29.03.2023	26.7	11.9	N.D.	N.D.	N.D.	N.D.	N.D.
31.03.2023	24.3	13.1	N.D.	N.D.	N.D.	N.D.	N.D.

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

TEST REPORT

REF	: NIL/DBPL/AAQ/CZ/14-02		
Customer Name	: M/s. DB Power Limited		
Customer Address	: 2 X 600MW, Village - Badadhara, District: Janjgir–Champa (C.G.) 495695		
Sample Type	: **Ambient Air**	**Sampling done by**	: Netel India Limited
Date of Sampling	: 03.03.2023 - 31.03.2023	**Analysis Date**	: 04.03.2023 - 01.04.2023
Sample Received	: 04.03.2023 - 01.04.2023	**Date of Reporting**	: 03.04.2023
Sampling Location	: **URJA AAQM STATION NO.- II**		

Test Method and NAAQM Standard for Ambient Air Quality Monitoring

Parameter	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	Hg
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ng/m³
Method Reference	IS 5182 (Part 23)	IS 5182 (Part 24)	IS 5182 (Part 02)	IS 5182 (Part 06)	IS 5182 (Part 10)	EPA Method IO-5
NAAQM Standard	100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³	---
Date of Sampling	**REPORT**					
03.03.2023	62.9	29.5	18.9	20.8	0.60	N.D.
08.03.2023	67.9	29.1	15.7	26.6	0.54	N.D.
10.03.2023	58.1	26.9	16.9	23.7	0.60	N.D.
15.03.2023	62.3	31.3	16.4	21.5	0.68	N.D.
17.03.2023	60.4	24.7	15.5	27.7	0.49	N.D.
22.03.2023	60.9	25.6	18.8	22.5	0.57	N.D.
24.03.2023	56.6	24.7	16.8	27.3	0.56	N.D.
29.03.2023	58.6	24.7	16.4	24.7	0.62	N.D.
31.03.2023	68.2	32.6	15.5	26.5	0.51	N.D.

Parameter	Ammonia	Ozone	Benzene	Benzo(a)pyrene	Ni	Pb	As
Method Reference	ISC Part-II (M-401)	IS 5182 (Part 09)	IS 5182 (Part 11)	IS 5182 (Part 12)	EPA Method IO-5		
NAAQM Standard	400	100	5	1	20	1	6
Date of Sampling	**REPORT**						
03.03.2023	21.2	14.6	N.D.	N.D.	N.D.	N.D.	N.D.
08.03.2023	21.2	14.5	N.D.	N.D.	N.D.	N.D.	N.D.
10.03.2023	23.4	14.2	N.D.	N.D.	N.D.	N.D.	N.D.
15.03.2023	23.3	14.2	N.D.	N.D.	N.D.	N.D.	N.D.
17.03.2023	21.2	12.0	N.D.	N.D.	N.D.	N.D.	N.D.
22.03.2023	21.0	12.0	N.D.	N.D.	N.D.	N.D.	N.D.
24.03.2023	25.8	12.2	N.D.	N.D.	N.D.	N.D.	N.D.
29.03.2023	22.8	15.0	N.D.	N.D.	N.D.	N.D.	N.D.
31.03.2023	27.5	14.8	N.D.	N.D.	N.D.	N.D.	N.D.

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

TEST REPORT

REF	: NIL/DBPL/AAQ/CZ/14-03		
Customer Name	: M/s. DB Power Limited		
Customer Address	: 2 X 600MW, Village - Badadhara, District: Janjgir–Champa (C.G.) 495695		
Sample Type	: **Ambient Air**	**Sampling done by**	: Netel India Limited
Date of Sampling	: 03.03.2023 - 31.03.2023	**Analysis Date**	: 04.03.2023 - 01.04.2023
Sample Received	: 04.03.2023 - 01.04.2023	**Date of Reporting**	: 03.04.2023
Sampling Location	: **RAW WATER AREA AAQM STATION NO. III**		

Test Method and NAAQM Standard for Ambient Air Quality Monitoring

Parameter	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	Hg
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ng/m³
Method Reference	IS 5182 (Part 23)	IS 5182 (Part 24)	IS 5182 (Part 02)	IS 5182 (Part 06)	IS 5182 (Part 10)	EPA Method IO-5
NAAQM Standard	100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³	---
Date of Sampling	**REPORT**					
03.03.2023	62.2	25.6	18.8	23.1	0.57	N.D.
08.03.2023	63.0	25.2	17.0	27.4	0.61	N.D.
10.03.2023	66.5	28.6	16.1	23.1	0.50	N.D.
15.03.2023	61.9	24.7	15.5	22.1	0.60	N.D.
17.03.2023	59.4	26.9	18.0	22.2	0.46	N.D.
22.03.2023	63.5	27.8	18.6	28.5	0.54	N.D.
24.03.2023	67.3	30.4	16.9	20.8	0.60	N.D.
29.03.2023	69.0	34.3	16.3	20.4	0.50	N.D.
31.03.2023	62.8	29.9	17.0	22.1	0.61	N.D.

Parameter	Ammonia	Ozone	Benzene	Benzo(a)pyrene	Ni	Pb	As
Method Reference	ISC Part-II (M-401)	IS 5182 (Part 09)	IS 5182 (Part 11)	IS 5182 (Part 12)	EPA Method IO-5		
NAAQM Standard	400	100	5	1	20	1	6
Date of Sampling	**REPORT**						
03.03.2023	21.3	14.7	N.D.	N.D.	N.D.	N.D.	N.D.
08.03.2023	26.1	13.8	N.D.	N.D.	N.D.	N.D.	N.D.
10.03.2023	23.5	14.7	N.D.	N.D.	N.D.	N.D.	N.D.
15.03.2023	24.6	12.0	N.D.	N.D.	N.D.	N.D.	N.D.
17.03.2023	26.8	12.3	N.D.	N.D.	N.D.	N.D.	N.D.
22.03.2023	25.0	13.4	N.D.	N.D.	N.D.	N.D.	N.D.
24.03.2023	26.0	13.5	N.D.	N.D.	N.D.	N.D.	N.D.
29.03.2023	24.6	12.2	N.D.	N.D.	N.D.	N.D.	N.D.
31.03.2023	26.7	13.6	N.D.	N.D.	N.D.	N.D.	N.D.

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

TEST REPORT

REF	: NIL/DBPL/AAQ/CZ/14-04		
Customer Name	: M/s. DB Power Limited		
Customer Address	: 2 X 600MW, Village - Badadhara, District: Janjgir–Champa (C.G.) 495695		
Sample Type	: **Ambient Air**	**Sampling done by**	: Netel India Limited
Date of Sampling	: 03.03.2023 - 31.03.2023	**Analysis Date**	: 04.03.2023 - 01.04.2023
Sample Received	: 04.03.2023 - 01.04.2023	**Date of Reporting**	: 03.04.2023
Sampling Location	: **AAQM STATION NO. IV**		

Test Method and NAAQM Standard for Ambient Air Quality Monitoring

Parameter	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	Hg
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ng/m³
Method Reference	IS 5182 (Part 23)	IS 5182 (Part 24)	IS 5182 (Part 02)	IS 5182 (Part 06)	IS 5182 (Part 10)	EPA Method IO-5
NAAQM Standard	100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³	---
Date of Sampling	**REPORT**					
03.03.2023	60.9	27.3	17.9	28.6	0.56	N.D.
08.03.2023	64.5	28.2	18.9	28.7	0.61	N.D.
10.03.2023	63.8	30.8	18.2	22.9	0.51	N.D.
15.03.2023	65.2	26.0	16.9	22.7	0.59	N.D.
17.03.2023	66.4	27.8	16.6	23.3	0.50	N.D.
22.03.2023	59.4	24.3	16.6	20.5	0.51	N.D.
24.03.2023	58.7	28.2	16.5	26.7	0.55	N.D.
29.03.2023	65.7	29.1	17.0	28.9	0.58	N.D.
31.03.2023	64.0	29.9	17.9	26.5	0.48	N.D.

Parameter	Ammonia	Ozone	Benzene	Benzo(a)pyrene	Ni	Pb	As
Method Reference	ISC Part-II (M-401)	IS 5182 (Part 09)	IS 5182 (Part 11)	IS 5182 (Part 12)	EPA Method IO-5		
NAAQM Standard	400	100	5	1	20	1	6
Date of Sampling	**REPORT**						
03.03.2023	24.6	13.0	N.D.	N.D.	N.D.	N.D.	N.D.
08.03.2023	23.8	12.2	N.D.	N.D.	N.D.	N.D.	N.D.
10.03.2023	23.5	13.0	N.D.	N.D.	N.D.	N.D.	N.D.
15.03.2023	20.8	12.9	N.D.	N.D.	N.D.	N.D.	N.D.
17.03.2023	20.5	11.5	N.D.	N.D.	N.D.	N.D.	N.D.
22.03.2023	23.4	12.5	N.D.	N.D.	N.D.	N.D.	N.D.
24.03.2023	21.3	11.0	N.D.	N.D.	N.D.	N.D.	N.D.
29.03.2023	20.5	12.6	N.D.	N.D.	N.D.	N.D.	N.D.
31.03.2023	23.7	13.0	N.D.	N.D.	N.D.	N.D.	N.D.

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

STACK MONITORING REPORT

Report No	: NIL/DBPL/stack/14-1/2023	**Date of Report**	: 19.03.2023
Company Name	: **M/s. DB Power Ltd.**	**Sample Description**	: Stack Monitoring
Address	: 2X600MW, Village - Badadhara, District – Janjgir–Champa , (C.G.) 495695		
Sample Collected by	: Netel (India) Limited	**Date of Sampling**	: 14.03.2023

Page : **1** of **1**

Sr. No.	STACK DETAILS	Unit - 1
	Load (MW)	**606**
1	Height of the Stack (m)	275
2	Dia of Stack (m)	7.3
3	Flue gas Temperature (°C)	131
4	Exit Velocity of flue gases (m/sec)	25.6
5	Flue gas flow rate (Nm^3/hr)	2788297
6	Pollution Control Equipment	ESP
7	Type of fuel	Coal

Pollutant Concentration (mg/Nm^3)

Sr. No.	Parameter(s)	Result	PCB Stipulated limits
1	Particulate Matter (PM)	43.7	50
2	Sulphur Dioxide (SO_2)	1142	200
3	Oxide of Nitrogen (NO_x)	308	450
4	Mercury (Hg)	BDL	0.03
5	Carbon Monoxide (CO)	<0.2	--
Test Method		**IS:11255 & USEPA**	

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

STACK MONITORING REPORT

Report No	: NIL/DBPL/stack/14-2/2023	**Date of Report**	: 19.03.2023
Company Name	: **M/s. DB Power Ltd.**	**Sample Description**	: Stack Monitoring
Address	: 2X600MW, Village - Badadhara, District – Janjgir–Champa , (C.G.) 495695		
Sample Collected by	: Netel (India) Limited	**Date of Sampling**	: 14.03.2023

Page : **1** of **1**

Sr. No.	STACK DETAILS	Unit - 2
	Load (MW)	**601**
1	Height of the Stack (m)	275
2	Dia of Stack (m)	7.3
3	Flue gas Temperature (°C)	139
4	Exit Velocity of flue gases (m/sec)	27.1
5	Flue gas flow rate (Nm^3/hr)	2894359
6	Pollution Control Equipment	ESP
7	Type of fuel	Coal

Pollutant Concentration (mg/Nm^3)

Sr. No.	Parameter(s)	Result	PCB Stipulated limits
1	Particulate Matter (PM)	46.0	50
2	Sulphur Dioxide (SO_2)	1150	200
3	Oxide of Nitrogen (NO_x)	318	450
4	Mercury (Hg)	BDL	0.03
5	Carbon Monoxide (CO)	<0.2	--
Test Method		**IS:11255 & USEPA**	

For **Netel (India) Limited**

D.Srinivasa Rao

NOISE REPORT

Customer Name	: M/s. DB Power Limited		
Customer Address	: 2 X 600MW, Village - Badadhara, District: Janjgir–Champa (C.G.) 495695		
Report No.	: NIL/DBPL/Noise/14-01/1/2023		
Sample Type	: **Noise Level Monitoring**	**Sampling done by**	: Netel India Limited
Instrument Make	: Lutron.	**Instrument Model**	: SL 4033SD
Date of Sampling	: 07.03.2023	**Date of Reporting**	: 01.04.2023

Workplace Noise Level

Sr. No.	Location	Unit	Noise Level	Limit
1	TG – I	dB(A)	79.0	**85 dB** (As per Factories Act 1948, maximum exposure for 8 hrs work shift.)
2	TG - II	dB(A)	79.9	
3	BFP-I	dB(A)	75.9	
4	BFP – II	dB(A)	74.6	
5	Compressor House	dB(A)	81.6	
6	TAC Building	dB(A)	73.3	
7	DM Plant	dB(A)	74.5	
8	MUH – CHP	dB(A)	74.0	
9	Crusher – CHP	dB(A)	80.5	
10	Near Silo	dB(A)	79.3	

Sr. No.	Location	Unit	Noise Level		Limit	
			Day Time	Night Time	Day	Night
Inside Plant						
1	AAQM Station No.-I	dB(A)	63.5	59.4	75	70
2	Urja AAQMS – II	dB(A)	65.7	60.7		
3	Raw Water AAQMS- III	dB(A)	64.7	61.1		
4	Near Coal Yard (AAQMS-IV)	dB(A)	68.2	64.4		
Outside Plant						
1	Tundri Village	dB(A)	49.0	44.0	55	45
2	Kanwali Village	dB(A)	52.0	44.0		
3	Badadhara Village	dB(A)	52.2	43.0		
4	Baispali Village	dB(A)	53.3	42.0		

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Netel (India) Limited

Name & Address of the Customer : **DB Power Limited** 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** STP Inlet Effluent	**Test Report No.** : NIL/22-23/EW/14-1 **Issue Date** : 25.03.2023	
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration**	**22.03.2023**
	Date of commencement of testing	**22.03.2023**
	Date of completion of testing	**25.03.2023**
	Sample condition at receipt	Found ok
	Sample tested as received	
Sampling Method: Sample collected by our representative on 21.03.2023		**Page 1 of 1**

Test Results

Sr. No.	Parameter	Unit	Result
1	pH	--	5.6
2	Total Suspended Solids	mg/L	158
3	Chemical Oxygen Demand (COD)	mg/L	174
4	Bio-chemical Oxygen Demand (3 days @ 27°C)	mg/L	62
5	Oil & Grease	mg/L	N.D.
6	Fecal Coliform	MPN/100ml	960

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Netel (India) Limited

Name & Address of the Customer : **DB Power Limited** 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** STP Outlet Effluent	**Test Report No.** : NIL/22-23/EW/14-2 **Issue Date** : 25.03.2023

Quantity	: 1 No. × 1 Litre	**Date of Registration**	**22.03.2023**
Test Method	: IS:3025 & APHA 23rd Edition	**Date of commencement of testing**	**22.03.2023**
Packing	: Plastic Bottle	**Date of completion of testing**	**25.03.2023**
Test Required	: As given below	**Sample condition at receipt**	Found ok
		Sample tested as received	

Sampling Method: Sample collected by our representative on 21.03.2023 **Page 1 of 1**

Test Results

Parameter Location↓	pH	Total Suspended Solids	Chemical Oxygen Demand (COD)	Bio-chemical Oxygen Demand (3 days @ 27°C)	Oil & Grease	Fecal Coliform
Unit	**--**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**MPN/100ml**
STP-1	6.85	17	62	21	N.D.	350
STP-2	7.31	19	68	19	N.D.	430
STP-3	6.73	20	64	18	N.D.	210
STP-4	7.51	18	65	16	N.D.	220
STP-5	8.11	19	63	17	N.D.	270
STP-6	7.39	18	62	16	N.D.	150
STP-7	6.81	14	67	20	N.D.	220
STP-8	7.55	17	66	17	N.D.	280
STP-9	8.19	19	73	18	N.D.	150
STP-10	7.00	20	70	21	N.D.	180
STP-11	6.91	14	73	16	N.D.	220
STP-12	7.53	14	68	17	N.D.	350
STP-13	7.21	19	69	22	N.D.	270
STP-14	6.51	20	69	18	N.D.	180
STP-15	7.89	16	70	18	N.D.	150
Limit	**5.5 – 9.0**	**100**	**250**	**30**	**10**	**<1000**

For **Netel (India) Limited**

D.Srinivasa Rao

Netel (India) Limited

Name & Address of the Customer : **DB Power Limited** 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** Boiler Blow Down water (UNIT-II)	**Test Report No.** : NIL/22-23/EW/14-3 **Issue Date** : 25.03.2023	
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration**	**22.03.2023**
	Date of commencement of testing	**22.03.2023**
	Date of completion of testing	**25.03.2023**
	Sample condition at receipt	Found ok
	Sample tested as received	
Sampling Method: Sample collected by our representative on 21.03.2023		**Page 1 of 1**

Test Results

Sr. No.	Parameter	Unit	Result	Limit
1	Suspended Solids	--	6.5	100
2	Copper Total (as Cu)	mg/L	N.D.	1
3	Total Iron (as Fe)	mg/L	N.D.	1
4	Oil & Grease	mg/L	N.D.	20

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Netel (India) Limited

Name & Address of the Customer : **DB Power Limited** 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** Condenser cooling water (UNIT-II)	**Test Report No.** : NIL/22-23/EW/14-4 **Issue Date** : 25.03.2023	
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration**	**22.03.2023**
	Date of commencement of testing	**22.03.2023**
	Date of completion of testing	**25.03.2023**
	Sample condition at receipt	Found ok
	Sample tested as received	
Sampling Method: Sample collected by our representative on 21.03.2023		**Page 1 of 1**

Test Results

Sr. No.	Parameter	Unit	Result	Limit
1	pH	--	7.5	6.5 – 8.5
2	Temperature	°C	28.3	Note 1*
3	Free Available Chlorine	mg/L	0.2	0.5

Note : *1 - Not more than 5°C higher than the intake water temperature

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Mumbai 400 701

D.Srinivasa Rao

Name & Address of the Customer : **DB Power Limited** 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** Treated water of AWRS	**Test Report No.** : NIL/22-23/EW/14-5 **Issue Date** : 25.03.2023	
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration**	**22.03.2023**
	Date of commencement of testing	**22.03.2023**
	Date of completion of testing	**25.03.2023**
	Sample condition at receipt	Found ok
	Sample tested as received	
Sampling Method: Sample collected by our representative on 21.03.2023		**Page 1 of 1**

Test Results

Sr. No.	Parameter	Unit	Result	Limit
1	pH	--	7.19	5.5 – 9.0
2	Temperature	°C	27.1	Note 1*
3	Total Suspended Solid	mg/L	34	100
4	Chemical Oxygen Demand (COD)	mg/L	36	250
5	Biochemical Oxygen Demand (BOD 3 Days 27°C)	mg/L	17	30
6	Oil & Grease	mg/L	2.5	10
7	Phosphate (as PO_4)	mg/L	N.D.	5

Note : *1 - Not more than 5°C higher than the intake water temperature

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Netel (India) Limited

Name & Address of the Customer : **DB Power Limited** 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** ETP Inlet & Outlet Effluent	**Test Report No.** : NIL/22-23/EW/14-6 **Issue Date** : 25.03.2023	
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration**	**22.03.2023**
	Date of commencement of testing	**22.03.2023**
	Date of completion of testing	**25.03.2023**
	Sample condition at receipt	Found ok
	Sample tested as received	
Sampling Method: Sample collected by our representative on 21.03.2023		**Page 1 of 1**

Test Results

Sr. No.	Parameter	Unit	Inlet	Outlet	Limit (Outlet)
1	pH	--	8.38	7.82	5.5 – 9.0
2	Temperature	°C	28.1	27.6	Note 1*
3	Total Suspended Solid	mg/L	136	50	100
4	Chemical Oxygen Demand (COD)	mg/L	175	51	250
5	Biochemical Oxygen Demand (BOD 3 Days 27°C)	mg/L	51	20	30
6	Oil & Grease	mg/L	2	<1.0	10
7	Chloride	mg/L	49.9	36.1	--

Note : *1 - Not more than 5°C higher than the intake water temperature

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Netel (India) Limited

Name & Address of the Customer : **DB Power Limited** 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** Ash Pond Recovery water	**Test Report No.** : NIL/22-23/EW/14-7 **Issue Date** : 25.03.2023	
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration**	**22.03.2023**
	Date of commencement of testing	**22.03.2023**
	Date of completion of testing	**25.03.2023**
	Sample condition at receipt	Found ok
	Sample tested as received	
Sampling Method: Sample collected by our representative on 21.03.2023		**Page 1 of 1**

Test Results

Sr. No.	Parameter	Unit	Result	Limit (Outlet)
1	pH	--	7.23	5.5 – 9.0
2	Temperature	°C	29.0	--
3	Total Suspended Solid	mg/L	30	100
4	Chemical Oxygen Demand (COD)	mg/L	43	250
5	Biochemical Oxygen Demand (BOD 3 Days 27°C)	mg/L	12	30
6	Oil & Grease	mg/L	<1.0	10

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Netel (India) Limited

Name & Address of the Customer : **DB Power Limited** 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** Coal Settling Pond Water	**Test Report No.** : NIL/22-23/EW/14-8 **Issue Date** : 25.03.2023	
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration**	**22.03.2023**
	Date of commencement of testing	**22.03.2023**
	Date of completion of testing	**25.03.2023**
	Sample condition at receipt	Found ok
	Sample tested as received	
Sampling Method: Sample collected by our representative on 21.03.2023		**Page 1 of 1**

Test Results

Sr. No.	Parameter	Unit	Result	Limit
1	pH	--	7.28	5.5 – 9.0
2	Temperature	°C	30.7	--
3	Total Suspended Solid	mg/L	73	100
4	Chemical Oxygen Demand (COD)	mg/L	50	250
5	Biochemical Oxygen Demand (BOD 3 Days 27°C)	mg/L	15	30
6	Oil & Grease	mg/L	<1.0	10

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

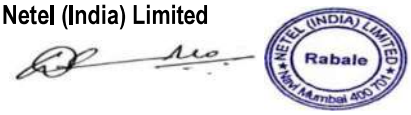
Netel (India) Limited

Name & Address of the Customer : **DB Power Limited** 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** Cooling Tower Blow-down	**Test Report No.** : NIL/22-23/EW/14-9 **Issue Date** : 25.03.2023	
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration**	**22.03.2023**
	Date of commencement of testing	**22.03.2023**
	Date of completion of testing	**25.03.2023**
	Sample condition at receipt	Found ok
	Sample tested as received	
Sampling Method: Sample collected by our representative on 21.03.2023		**Page 1 of 1**

Test Results

Sr. No.	Parameter	Unit	Result	Limit
1	pH	--	7.36	5.5 – 9.0
2	Temperature	°C	21.7	--
3	Total Suspended Solid	mg/L	28	100
4	Chemical Oxygen Demand (COD)	mg/L	28	250
5	Biochemical Oxygen Demand (BOD 3 Days 27°C)	mg/L	11	30
6	Oil & Grease	mg/L	<1.0	10

For **Netel (India) Limited**



D.Srinivasa Rao

Name & Address of the Customer : DB Power Limited 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695	**Test Report No.** : NIL/2023/DW-14/1 **Issue Date** : 01.04.2023 **Your Ref** : NIL
Sample Particulars: Drinking Water	
SAMPLE-1 : DRINKING WATER SERVICE BUILDING **SAMPLE-2** : DRINKING WATER WAGON TIPPER	**SAMPLE-3** : DRINKING WATER DM PLANT **SAMPLE-4** : DRINKING WATER ADITYA CANTEEN

Quantity	: 1 No. × 1 Litre	**Date of Registration**	**29.03.2023**
Test Method	: IS:3025 & APHA 23rd Edition	**Date of commencement of testing**	**29.03.2023**
Packing	: Plastic Bottle	**Date of completion of testing**	**01.04.2023**
Test Required	: As given below	**Sample condition at receipt**	Found ok
		Sample tested as received	

Sampling Method: Sample collected by our representative on 28.03.2023 **Page 1 of 3**

Test Results

Sr. No.	Parameter	Unit	Sample-1	Sample-2	Sample-3	Sample-4	Limit*
1	Colour	Hazen	<1	<1	<1	<1	**5 (max)**
2	Turbidity	NTU	<0.1	<0.1	<0.1	<0.1	**1.0 (max)**
3	pH	-	7.19	7.45	6.80	7.10	**6.5 To 8.5**
4	Residual Chlorine	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.2 (max)**
5	Total Dissolved Solids	mg/Lit	147	163	123	156	**500 (max)**
6	Alkalinity Total (As $CaCO_3$)	mg/Lit	47	44	50	91	**200 (max)**
7	Total Hardness (as $CaCO_3$)	mg/Lit	97	115	103	115	**200 (max)**
8	Calcium (as Ca)	mg/Lit	18.5	20.3	24.6	17.5	**75 (max)**
9	Magnesium (as Mg)	mg/Lit	5.6	6.7	6.8	6.2	**30 (max)**
10	Chloride (as Cl)	mg/Lit	24.5	30.2	19.0	24.3	**250 (max)**
11	Sulphate (as SO_4)	mg/Lit	13.4	16.3	10.2	11.6	**200 (max)**
12	Nitrate (NO_3)	mg/Lit	3.3	2.7	3.5	4.8	**45 (max)**
13	Boron (as B)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.5 (max)**
14	Iron (as Fe)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.3 (max)**
15	Fluoride (as F)	mg/Lit	0.07	0.06	0.04	0.08	**1.0 (max)**
16	Manganese (as Mn)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.1 (max)**
17	Lead (as Pb)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.01 (max)**
18	Zinc (as Zn)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**5.0 (max)**
19	Copper (as Cu)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.05 (max)**
20	Aluminium (as Al)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.03 (max)**
21	Mercury (as Hg)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.001 (max)**
22	Arsenic (as As)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.01 (max)**
23	Selenium (as Se)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.1 (max)**
24	Chromium (as Cr)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.001 (max)**
25	Sulphide (as S)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.01 (max)**
26	Cyanide (as CN)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.05 (max)**
27	Anionic Detergent (as MBAS)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.02 (max)**
28	Phenolic Compound (as C_5H_6OH)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.001 (max)**
29	Poly-nuclear Aromatic Hydrocarbon (PAH)	µg/Lit	N.D.	N.D.	N.D.	N.D.	**0.0001 (max)**
30	Mineral Oil	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.05 (max)**
31	Total Coliforms	MPN/100ml	Absent	Absent	Absent	Absent	**Absent**
32	EColi	MPN/100ml	Absent	Absent	Absent	Absent	**Absent**

Note : * Limits as per IS 10500:2012

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Name & Address of the Customer : DB Power Limited 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695	**Test Report No.** : NIL/2023/DW-14/2 **Issue Date** : 01.04.2023 **Your Ref** : NIL
Sample Particulars: Ground Water **SAMPLE-5** : **HAND PUMP WATER TUNDRI VILLAGE** **SAMPLE-6** : **HAND PUMP WATER BADADARHA VILLAGE**	**SAMPLE-7** : **GROUND WATER KANWLI VILLAGE** **SAMPLE-8** : **GROUND WATER BAISPALI VILLAGE**
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration** : **29.03.2023** **Date of commencement of testing** : **29.03.2023** **Date of completion of testing** : **01.04.2023** **Sample condition at receipt** : Found ok **Sample tested as received**
Sampling Method: Sample collected by our representative on 28.03.2023	**Page 2 of 3**

Test Results

Sr. No.	Parameter	Unit	Sample-5	Sample-6	Sample-7	Sample-8	Limit*
1	Colour	Hazen	<1	<1	<1	<1	**5 (max)**
2	Turbidity	NTU	<0.1	<0.1	<0.1	<0.1	**1.0 (max)**
3	pH	-	7.38	7.15	6.27	7.19	**6.5 To 8.5**
4	Residual Chlorine	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.2 (max)**
5	Total Dissolved Solids	mg/Lit	227	289	126	256	**500 (max)**
6	Alkalinity Total (As $CaCO_3$)	mg/Lit	104	96	47	159	**200 (max)**
7	Total Hardness (as $CaCO_3$)	mg/Lit	106	118	87	109	**200 (max)**
8	Calcium (as Ca)	mg/Lit	45.2	40.9	29.8	45.8	**75 (max)**
9	Magnesium (as Mg)	mg/Lit	12.4	10.1	7.1	21.9	**30 (max)**
10	Chloride (as Cl)	mg/Lit	25.3	32.7	18.0	54.1	**250 (max)**
11	Sulphate (as SO_4)	mg/Lit	17.5	17.3	10.9	15.2	**200 (max)**
12	Nitrate (NO_3)	mg/Lit	7.5	7.5	3.5	8.7	**45 (max)**
13	Boron (as B)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.5 (max)**
14	Iron (as Fe)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.3 (max)**
15	Fluoride (as F)	mg/Lit	0.17	0.15	0.07	0.29	**1.0 (max)**
16	Manganese (as Mn)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.1 (max)**
17	Lead (as Pb)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.01 (max)**
18	Zinc (as Zn)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**5.0 (max)**
19	Copper (as Cu)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.05 (max)**
20	Aluminium (as Al)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.03 (max)**
21	Mercury (as Hg)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.001 (max)**
22	Arsenic (as As)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.01 (max)**
23	Selenium (as Se)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.1 (max)**
24	Chromium (as Cr)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.001 (max)**
25	Sulphide (as S)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.01 (max)**
26	Cyanide (as CN)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.05 (max)**
27	Anionic Detergent (as MBAS)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.02 (max)**
28	Phenolic Compound (as C_5H_6OH)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.001 (max)**
29	Poly-nuclear Aromatic Hydrocarbon (PAH)	µg/Lit	N.D.	N.D.	N.D.	N.D.	**0.0001 (max)**
30	Mineral Oil	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.05 (max)**
31	Total Coliforms	MPN/100ml	Absent	Absent	Absent	Absent	**Absent**
32	EColi	MPN/100ml	Absent	Absent	Absent	Absent	**Absent**

Note : * Limits as per IS 10500:2012

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Name & Address of the Customer : DB Power Limited 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695	**Test Report No.** : NIL/2023/DW-14/3 **Issue Date** : 03.04.2023 **Your Ref** : NIL
Sample Particulars: Water **SAMPLE-9 : BORE WELL WATER TMANNA CRUSHER GUDELI** **SAMPLE-10 : BORE WELL WATER VINAYAK CRUSHER GUDELI**	
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration** 31.03.2023 **Date of commencement of testing** 31.03.2023 **Date of completion of testing** 03.04.2023 **Sample condition at receipt** Found ok **Sample tested as received**
Sampling Method: Sample collected by our representative on 30.03.2023	**Page 3 of 3**

Test Results

Sr. No.	Parameter	Unit	Sample-9	Sample-10	Limit*
1	Colour	Hazen	<1	<1	**5 (max)**
2	Turbidity	NTU	<0.1	<0.1	**1.0 (max)**
3	pH	-	7.17	7.22	**6.5 To 8.5**
4	Residual Chlorine	mg/Lit	N.D.	N.D.	**0.2 (max)**
5	Total Dissolved Solids	mg/Lit	368	384	**500 (max)**
6	Alkalinity Total (As $CaCO_3$)	mg/Lit	217	146	**200 (max)**
7	Total Hardness (as $CaCO_3$)	mg/Lit	137	144	**200 (max)**
8	Calcium (as Ca)	mg/Lit	46.1	53.0	**75 (max)**
9	Magnesium (as Mg)	mg/Lit	27.9	20.9	**30 (max)**
10	Chloride (as Cl)	mg/Lit	33.4	39.7	**250 (max)**
11	Sulphate (as SO_4)	mg/Lit	18.8	19.2	**200 (max)**
12	Nitrate (NO_3)	mg/Lit	10.6	10.3	**45 (max)**
13	Boron (as B)	mg/Lit	N.D.	N.D.	**0.5 (max)**
14	Iron (as Fe)	mg/Lit	N.D.	N.D.	**0.3 (max)**
15	Fluoride (as F)	mg/Lit	0.32	0.26	**1.0 (max)**
16	Manganese (as Mn)	mg/Lit	N.D.	N.D.	**0.1 (max)**
17	Lead (as Pb)	mg/Lit	N.D.	N.D.	**0.01 (max)**
18	Zinc (as Zn)	mg/Lit	N.D.	N.D.	**5.0 (max)**
19	Copper (as Cu)	mg/Lit	N.D.	N.D.	**0.05 (max)**
20	Aluminium (as Al)	mg/Lit	N.D.	N.D.	**0.03 (max)**
21	Mercury (as Hg)	mg/Lit	N.D.	N.D.	**0.001 (max)**
22	Arsenic (as As)	mg/Lit	N.D.	N.D.	**0.01 (max)**
23	Selenium (as Se)	mg/Lit	N.D.	N.D.	**0.1 (max)**
24	Chromium (as Cr)	mg/Lit	N.D.	N.D.	**0.001 (max)**
25	Sulphide (as S)	mg/Lit	N.D.	N.D.	**0.01 (max)**
26	Cyanide (as CN)	mg/Lit	N.D.	N.D.	**0.05 (max)**
27	Anionic Detergent (as MBAS)	mg/Lit	N.D.	N.D.	**0.02 (max)**
28	Phenolic Compound (as C_5H_6OH)	mg/Lit	N.D.	N.D.	**0.001 (max)**
29	Poly-nuclear Aromatic Hydrocarbon (PAH)	µg/Lit	N.D.	N.D.	**0.0001 (max)**
30	Mineral Oil	mg/Lit	N.D.	N.D.	**0.05 (max)**
31	Total Coliforms	MPN/100ml	Absent	Absent	**Absent**
32	EColi	MPN/100ml	Absent	Absent	**Absent**

Note : * Limits as per IS 10500:2012

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Name & Address of the Customer : : DB Power Limited 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695	**Test Report No.** : NIL/2023/DW-14/4 **Issue Date** : 03.04.2023 **Your Ref** : NIL
Sample Particulars: Surface Water **SAMPLE-1 : KURRA POND, GUDELI** **SAMPLE-2 : TONHI POND, GUDELI**	**SAMPLE-3 : MINE WATER, GUDELI** **SAMPLE-4 : BORE WELL WATER, SHYAM LAL GUDELI**
Quantity : 1 No. × 1 Litre **Test Method** : IS:3025 & APHA 23rd Edition **Packing** : Plastic Bottle **Test Required** : As given below	**Date of Registration** : **31.03.2023** **Date of commencement of testing** : **31.03.2023** **Date of completion of testing** : **03.04.2023** **Sample condition at receipt** : Found ok **Sample tested as received**
Sampling Method: Sample collected by our representative on 30.03.2023	**Page 1 of 1**

Test Results

Sr. No.	Parameter	Unit	Sample-1	Sample-2	Sample-3	Sample-4	Limit*
1	pH	-	7.2	7.1	7.4	7.7	**6.5 to 8.5**
2	Dissolved Oxygen	mg/L	6.5	6.8	7.6	7.2	**4.0(min)**
3	BOD (3 days at 27°C)	mg/L	2.1	2.4	1.9	2.2	**3.0(max)**
4	Total Coli forms	MPN/100ml	345	531	295	505	**5000(max)**
5	Colour	Hazen	<5	<5	<5	<5	**300(max)**
6	Fluoride as F	mg/L	0.10	0.10	0.09	0.10	**1.5(max)**
7	Cadmium as Cd	mg/L	<0.01	<0.01	<0.01	<0.01	**0.01(max)**
8	Chlorides as Cl	mg/L	60.8	52.7	75.7	48.3	**600(max)**
9	Chromium as	mg/L	<0.01	<0.01	<0.01	<0.01	**0.05(max)**
10	Cyanides as CN	mg/L	<0.02	<0.02	<0.02	<0.02	**0.05(max)**
11	TDS	mg/L	238.8	332.8	282.8	243.0	**1500(max)**
12	Selenium as Se	mg/L	<0.01	<0.01	<0.01	<0.01	**0.05(max)**
13	Sulphates as	mg/L	12	17	17.6	20.2	**400(max)**
14	Lead as Pb	mg/L	<0.01	<0.01	<0.01	<0.01	**0.1(max)**
15	Copper a Cu	mg/L	<0.01	<0.01	<0.01	<0.01	**1.5(max)**
16	Arsenic as As	mg/L	<0.01	<0.01	<0.01	<0.01	**0.2(max)**
17	Iron as Fe	mg/L	0.11	0.17	0.09	0.12	**50(max)**
18	Phenolic compounds	mg/L	<0.005	<0.005	<0.005	<0.005	**0.005(max)**
19	Zinc as Zn	mg/L	0.37	0.26	0.34	0.46	**15(max)**
20	Anionic	mg/L	<0.1	<0.1	<0.1	<0.1	**1.0(max)**
21	Oil & Grease	mg/L	<1.0	<1.0	<1.0	<1.0	**0.1(max)**
22	Nitrates as NO3	mg/L	6.1	6.8	6.5	4.3	**50(max)**
23	Selenium (as Se)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.1 (max)**
24	Chromium (as Cr)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.001 (max)**
25	Sulphide (as S)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.01 (max)**
26	Cyanide (as CN)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.05 (max)**
27	Anionic Detergent (as MBAS)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.02 (max)**
28	Phenolic Compound (as C_5H_6OH)	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.001 (max)**
29	Poly-nuclear Aromatic Hydrocarbon (PAH)	µg/Lit	N.D.	N.D.	N.D.	N.D.	**0.0001 (max)**
30	Mineral Oil	mg/Lit	N.D.	N.D.	N.D.	N.D.	**0.05 (max)**
31	Total Coliforms	MPN/100ml	Absent	Absent	Absent	Absent	**Absent**
32	EColi	MPN/100ml	Absent	Absent	Absent	Absent	**Absent**

Note : * Limits as per IS 10500:2012

For **Netel (India) Limited**

NETEL (INDIA) LIMITED Rabale Navi Mumbai 400 701

D.Srinivasa Rao

Netel (India) Limited

Name & Address of the Customer : DB Power Limited 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** Fly Ash	**Test Report No. : NIL** /2022/FA/03 **Issue Date : 28**-03-2023 **Your Ref : NIL**	
Qty: 1 Kg. **Test Method :**IS:1727 **Packing :** Sampling Bag **Test Required:** As given below	**Date of Registration**	17-03-2023
	Date of commencement of testing	17-03-2023
	Date of completion of testing	27-03-2023
	Sample condition at receipt	Found ok
	Sample tested as received	
Sampling Method: Sample collected by our Representative on 16-03-2023		

Sl.No.	Test Parameters	UOM	Results (% by mass)
1	Aluminiumas Al_2O_3	% by mass	28.35
2	Iron as Fe_2O_3	% by mass	6.32
3	Silica as SiO_2	% by mass	59.04
4	Calcium as CaO	% by mass	2.42
5	Magnesium as MgO	% by mass	1.96
6	Sulphur as SO_3	% by mass	0.97
7	Sodium as Na_2O	% by mass	0.42
8	Potassium as K_2O	% by mass	0.31

For **Netel (India) Limited**

D.Srinivasa Rao

NETEL (INDIA) LIMITED Rabale New Mumbai 400 701

Netel (India) Limited

Name & Address of the Customer : DB Power Limited 2X600MW, Village - Badadhara, District: Janjgir–Champa, (C.G.) 495695 **Sample Particulars:** Soil	**Test Report No. : NIL** /2022/Soil/02 **Issue Date:** **28**-03-2023 **Your Ref** **:** NIL	
Qty: ~1 Kg. **Test Method :**Soil analysis by T.C.Baruah **Packing :**Plastic Bag **Test Required:**As given below	**Date of Registration**	17-03-2023
	Date of commencement of testing	17-03-2023
	Date of completion of testing	27-03-2023
	Sample condition at receipt	Found ok
	Sample tested as received	

Sampling Method: Sample collected by our Representative on 16-03-2022

S. No.	Parameter	Unit	Result
1.	Particle size distribution		
	Sand	%	67.84
	Slit	%	24.48
	Clay	%	7.68
2.	Texture	-	Loamy
3.	pH	-	7.2
4.	Permeability	cm/sec	0.013
5.	Porosity	%	22.56
6.	Bulk density	g/cm3	1.18
7.	Electrical Conductivity	mS/cm	0.04
8.	Nitrite	mg/kg	0.02
9.	Nitrate	mg/kg	0.32
10.	Phosphate	mg/kg	<0.2
11.	Sodium (Na)	mg/kg	436.0
12.	Potassium (K)	mg/kg	732.0
13.	Iron (Fe)	mg/kg	524.5
14.	Lead (Pb)	mg/kg	16.3
15.	Manganese (Mn)	mg/kg	421.5
16.	Nickle (Ni)	mg/kg	25.3
17.	Barium (Ba)	mg/kg	<0.01
18.	Zinc (Zn)	mg/kg	25.1
19.	Copper (Cu)	mg/kg	23.6
20.	Cadmium (Cd)	mg/kg	0.82
21.	Chromium (Cr)	mg/kg	6.58
22.	Arsenic (As)	mg/kg	<0.001
23.	Mercury (Hg)	mg/kg	<0.001

For **Netel (India) Limited**

D.Srinivasa Rao

NETEL (INDIA) LIMITED Rabale New Mumbai 400 701

SOCIAL AUDIT REPORT

APRIL 2021 -MARCH 2022

Of

DB Power Limited

Village: Badadarha

Block & Tehsil: Dabhra

Distt: Janjgir-Champa

Chhattisgarh - 495695

Prepared By: Dr Vikram Singh

Associate Professor

Department of Social Work

Regional Campus Manipur

Indira Gandhi National Tribal University

(A Central University)

Amarkantak Madhya Pradesh-4848

Dr. Vikram Singh
Associate Professor
Department of Social Work
Regional Campus Manipur
Indira Gandhi National Tribal University
Amarkantak (M.P.)

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LIST OF TABLES

1.0. Introduction (DB Power Ltd):

DB Power Limited ("DBPL"), a special purpose vehicle (SPV), incorporated on October 12, 2006, is a subsidiary of Diligent Power Private Limited (DPPL), an associate company of the Dainik Bhaskar group, a diversified Indian conglomerate. DBPL has set up a coal-based Super Thermal Power Plant (TPP) of capacity 1200 MW (2 X 600 MW) at the village Badadarha District Janjgir -Champa in the state of Chhattisgarh. The major components of the project include Boiler, Turbine, and Generator. The other components include a coal handling system, a switch yard, and an ash handling system. It also includes wagon tipplers, railway siding, and transmission lines beside a water pipeline between the intake well at Mahanadi River, Chandrapur and the plant site. The plant is accessible by a major district road between Raigarh and Bilaspur. The site is also approachable from Kharsia via Kharsia Dabhra road. The nearest urban area is Raigarh, located at a distance of about 25 km towards the East of the plant. The nearest railway station is at Robertson, 15 km away while the nearest commercial airport is at a distance of 250 km away at Raipur.

2.0. Social Audit:

In the wake of rapid globalization and pressing ecological issues, the perception of corporations' role in the broader social paradigm is undergoing a sea change. In recent years, society and the state have put forward an expectation before public sector corporate to integrate the social responsibility aspects in their business persuasion. This scenario not only affects large-scale public-sector undertakings but also includes firms of small scale. The underlying assumption is that Corporate Social Responsibility (CSR) is one way through which companies can demonstrate their commitment to ally responsible. CSR as an integral aspect of a corporate has double edge effect in terms of creating goodwill for the company and acting as a social and economic intervention to bring about large-scale change in the life of people from different walks of a social audit is an independent evaluation of the performance of an organization as it relates to the attainment of its social goals. It is an instrument of social accountability of an organization.

In other words, a social audit may be defined as in-depth scrutiny and analysis of the working of any public utility vis-à-vis its social relevance. Social auditing is a process that enables an organization to assess and demonstrates its social, economic and environmental benefits. Social Audit gained significance after the 73rd amendment of the constitution relating to the Panchayati raj institutions. It demonstrates its social, economic and environmental benefits. Social Audit gained significance after the 73rd amendment of the constitution relating to the Panchayati raj institutions.

Social audit is based on the principle that democratic local governance should be carried out, as far as possible, with the consent and understanding of all concerned to demonstrate its social, economic and environmental benefits. Social Audit gained significance after the 73rd amendment of the constitution relating to the Panchayati raj institutions. It is thus a process and not an event. A social audit is a way of measuring, understanding, reporting and ultimately improving an organization's social and ethical performance. A social audit helps to narrow gaps between vision/goal and reality, between efficiency and effectiveness. It is a technique to understand, measure, verify, report on and improve the social performance of the organization.

Social auditing creates an impact on governance. It values the voice of stakeholders, including marginalized/poor groups whose voices are rarely heard. Social auditing is taken up to enhance local governance, particularly for strengthening accountability and transparency in local bodies. The key difference between a development and a social audit is that a social audit focuses on the neglected issue of social impacts, while a development audit has a broader focus including environmental and economic issues, such as the efficiency of a project or programme. The Social Audit has been carried out of CSR for FY:2020-2021. There are 08 villages where CSR activities have been carried out details are as follows;

Table 1 Number of Households in Affected Villages

S. No	Name of Village	Numbers of Household
1.	Badadarha	356
2.	Tundri	956

Table 02 Population of Villages beneficiaries under CSR Activities in Affected Villages

S.No.	Villages	Population
A.	Project-Affected Villages	
1.	Badadarha	1634
2.	Tundri	3810

3.0. Objectives of Social Audit:

1. Assessing the actual needs of village development and resources provided by DB power for village development.
2. Provide suggestions for Increasing the efficacy and effectiveness of village development programmes carried out by DB Power Ltd.
3. Analysis of work carried out keeping in view stakeholder interests and priorities, particularly of villagers.
4. To assess infrastructural development and its impact on the quality of lives (well-being) of the residents
5. Assessing the physical and financial gaps between needs and resources available for local development.
6. Creating awareness among beneficiaries and providers of local social and productive services.
7. Increasing efficacy and effectiveness of local development programmes.
8. Scrutiny of various policy decisions, keeping in view stakeholder interests and priorities, particularly of rural poor at the community level.
9. Estimation of the opportunity cost for stakeholders of not getting timely access to public services.

4.0. Methods Used for Social Audit:

Preliminary surveys of two category villages' i.e., Project Affected and Railway Corridor have been conducted from personal field observations, personal interviews, and obtaining information through schedules from various beneficiary groups.

A Series of meetings has been conducted with various SHGs Groups and Sewing Centre beneficiaries.

5.0. Sources of Data for Social Audit:

The sources of data to prepare the social audit were primary data collected by the auditor and secondary data provided by DB power Ltd such as Stock, meeting registers, and Quarterly and Monthly reports published by the CSR of DB Power.

6.0. Major Thrust Areas of CSR at DB Power Ltd:

Corporate social responsibility (CSR) refers to strategies corporations or firms conduct their business in a way that is ethical, society friendly and beneficial to the community in terms of development. The present-day CSR (also called corporate responsibility, corporate citizenship, responsible business and corporate social opportunity) is a concept whereby business organizations consider the interest of society by taking responsibility for the impact of their activities on communities and other stakeholders as well as their environment.

This obligation shows that the organizations must comply with legislation and voluntarily take initiatives to improve the well-being of the affected local community and society at large. CSR simply refers to strategies corporations or firms conduct their business in a way that is ethical and society friendly. The focus of the corporate social responsibility unit of DB Power Plant Janjgir-Champa is the holistic development and improvement in the quality of life of habitations and affected communities, particularly of the disadvantaged groups, in and around the neighbourhoods of power station project sites. DB power plant under its CSR

policy has implemented various projects in the financial year from 2020-21 based on the needs of the neighbouring affected villages and above-mentioned communities with the participation of the villagers, district, and local administrations. Based on the CSR guidelines issued by the department of public enterprises, the Government of India, DB Power Ltd must carry out CSR activities in affected villages every financial year. All activities undertaken by DB Power under CSR in the 8 Project Affected Villages will be covered in the Social Audit. The activities about various developmental fields are as follows:

A. Rural Infrastructure Programme

B. Education and Skill Development

C. Health, Hygiene & Sanitation

D. Women Empowerment

E. Social Welfare and Development Programme

7.0. The Profile of Dabhra Block

Dabhra is a Tehsil / Block (CD) in the Janjgir Champa District of Chhattisgarh. The total area of Dabhra is 437 km² including 419.48 km² rural area and 17.19 km² urban area. Dabhra has a population of 1,64,863 people. There are 43,160 houses in the sub-district. There are about 121 villages in the Dabhra block. 8 Villages are selected for CSR Activities and rural development.

8.0. Expenses of Budget Allocated in Financial Year 2021-2022 for CSR Activities

Financial Year	Rural Infrastructure Development	Health & Sanitation	Education & Skill Development	Women Empowerment	Rehabilitation & Compensation	Social & Cultural Programmes	Operating
2021-2022	13365403	7066449	241000	86419	24928052	2688761	359619

The above details are given about the expenditure done by the CSR Unit of DB Power Ltd in different thrust areas in affected villages in the financial year 2021-2022. After calculating the sub-heads, the total expenditure is Rs. 48,735,703/-. The expense details have been cross-checked through maintained records.

9.0. Detail description of Activities Carried Out in different thrust areas

9.1. Rural Infrastructure Program: Rural infrastructure is generally defined as the physical framework of facilities in rural areas through which, facilities and services are provided to the public. Rural infrastructure assumes great importance in India because of the country's predominant rural nature, and the crucial linkage of infrastructure to economic growth, poverty alleviation, and human development. Rural infrastructure covers a wide spectrum of services such as transportation, power generation, transmission and distribution, telecommunication, port handling facilities, water supply, sewage disposal, irrigation, medical, education and other primary services. Rural areas would have a high concentration of poverty given the existence of disguised unemployment in a big way in agriculture. Access to land and ownership of land is the key to income differences since land is the major productive asset in rural areas. Rural areas may be more usefully viewed as the concentration of poo resulting in little value for economic demand for infrastructural services.

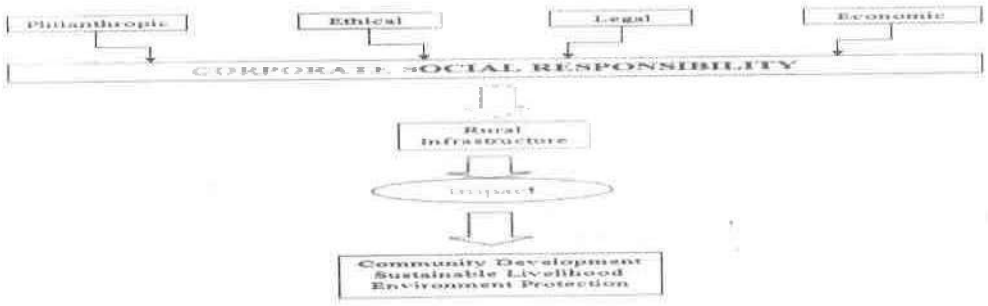

Figure: 01 Conceptual Framework of DB Power Ltd CSR Unit in Rural Infrastructure

This section covered the details of CSR intervention in rural infrastructure, public relations, and activities based on preserving the environment like pollution prevention programs, and awareness programs in the community. It also analyzed how CSR activities have provided significant employment to the local community people and production of crops and enhancement in services Infrastructure assets such as rural roads, tracks, bridges, irrigation schemes, water supplies, schools, health Centre and markets are needed in rural areas for the local population to fulfil their basic needs and live a social and economic productive life.

9.1.1. Overview of Badadarha: According to Census 2011 information the location code or village code of Badadarha village is 437104. Badadarha village is in Dabhra Tehsil of Janjgir Champa district in Chhattisgarh, India. It is situated 30km away from sub-district headquarters Dabhra and 85km away from district headquarter Janjgir. As per the 2009 status, Badadarha is the gram panchayat of Badadarha village. The total geographical area of the village is 458.82 hectares. Badadarha has a total population of 1,634 people. There are about 436 houses in Badadarha village. Kharsia is the nearest town to Badadarha which is approximately 15km away. In Badadarha village population of children with age 0-6 is 218 which makes up 13.34 % of the total population of the village. The average Sex Ratio of Badadarha village is 907 which is lower than the Chhattisgarh state average of 991. The child Sex Ratio for Badadarha as per census is 1057, higher than Chhattisgarh's average of 969. Badadarha village has a higher literacy rate compared to Chhattisgarh. In 2011, the literacy rate of Badadarha village was 75.07 % compared to 70.28 % in Chhattisgarh. In Badadarha Male literacy stands at 86.28 % while the female literacy rate was 62.41 %. Schedule Tribe (ST) constitutes 16.89 % while Schedule Caste (SC) was 11.44 % of the total population in Badadarha village. In Badadarha village out of the total population, 1076 were engaged in work activities. 47.12 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 52.88 % were involved in Marginal activity providing a livelihood for less than 6 months. Of 1076 workers engaged

in Main Work, 85 were cultivators (owner or co-owner) while 206 were Agricultural labourers.[1]

Badadarha is a medium size village located in Dabhra Tehsil of Janjgir Champa district, Chhattisgarh with a total of 436 families residing. The Badadarha village has a population of 1634 of which 857 are males while 777 are females as per Population Census 2011. In Badadarha village population of children with age 0-6 is 218 which makes up 13.34 % of the total population of the village. The average Sex Ratio of Badadarha village is 907 which is lower than the Chhattisgarh state average of 991. The child Sex Ratio for Badadarha as per census is 1057, higher than Chhattisgarh's average of 969. Badadarha village has a higher literacy rate compared to Chhattisgarh. In 2011, the literacy rate of Badadarha village was 75.07 % compared to 70.28 % in Chhattisgarh. In Badadarha Male literacy stands at 86.28 % while the female literacy rate was 62.41 %. As per the constitution of India and the Panchayati Raj Act, Badadarha village is administrated by the Sarpanch (Head of Village) who is elected representative of the village. Our website doesn't have information about schools and hospitals in Badadarha village. Schedule Tribe (ST) constitutes 16.89 % while Schedule Caste (SC) was 11.44 % of the total population in Badadarha village. In Badadarha village out of the total population, 1076 were engaged in work activities. 47.12 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 52.88 % were involved in Marginal activity providing a livelihood for less than 6 months. Of 1076 workers engaged in Main Work, 85 were cultivators (owner or co-owner) while 206 were Agricultural labourers.

Table: 03 Population Profile of Badadarha (in Percentage)

Particulars	Total	Male	Female
Total No. of Houses	436	-	-
Population	1,634	857	777
Child (0-6)	218	106	112
Schedule Caste	187	96	91
Schedule Tribe	276	137	139
Literacy	75.07 %	86.28 %	62.41 %
Total Workers	1,076	594	482
Main Worker	507	-	-
Marginal Worker	569	160	409

Table 04: Badadarha Village Profile

Particulars	Total	Male	Female
Total No. of Houses	436	-	-
Population	1,634	857	777
Child (0-6)	218	106	112
Schedule Caste	187	96	91
Schedule Tribe	276	137	139
Literacy	75.07 %	86.28 %	62.41 %
Total Workers	1,076	594	482
Main Worker	507	-	-
Marginal Worker	569	169	400
Source: Census 2011			

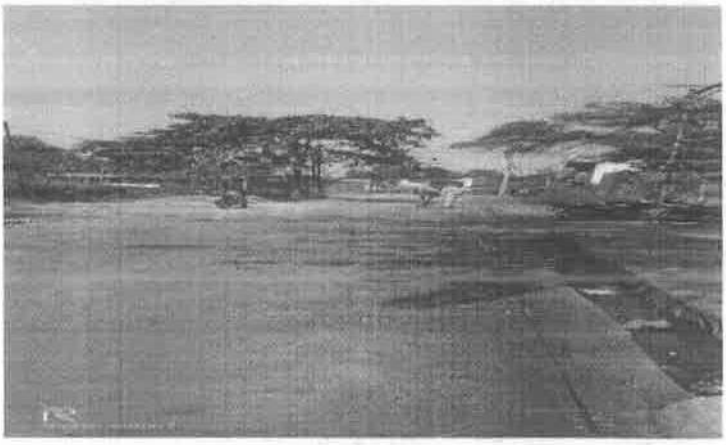

Photo 1: Construction of 300-meter CC road in village Badadarha

Photo 2: Cleaning of Kachcha Canal at Badadarha

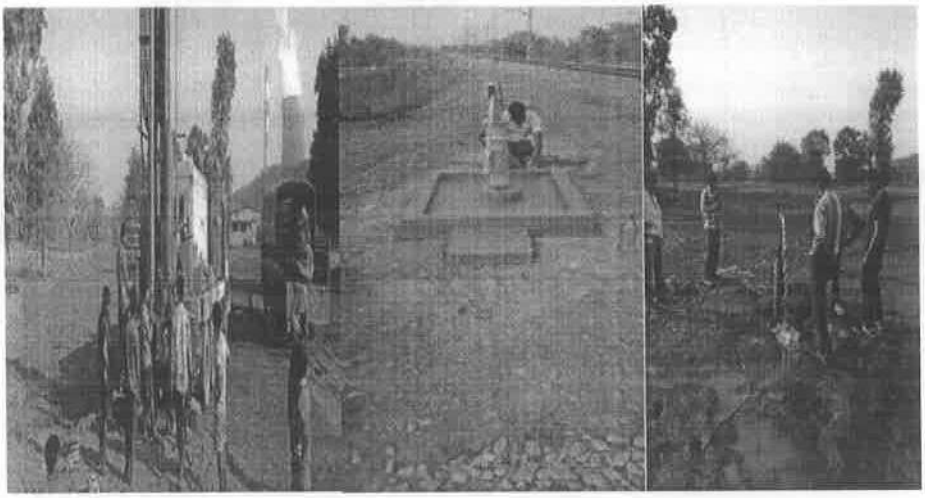

Photo 3: Drilling of bore well & Installation of Submersible pump & Hand pump at Labour colony, Badadarha

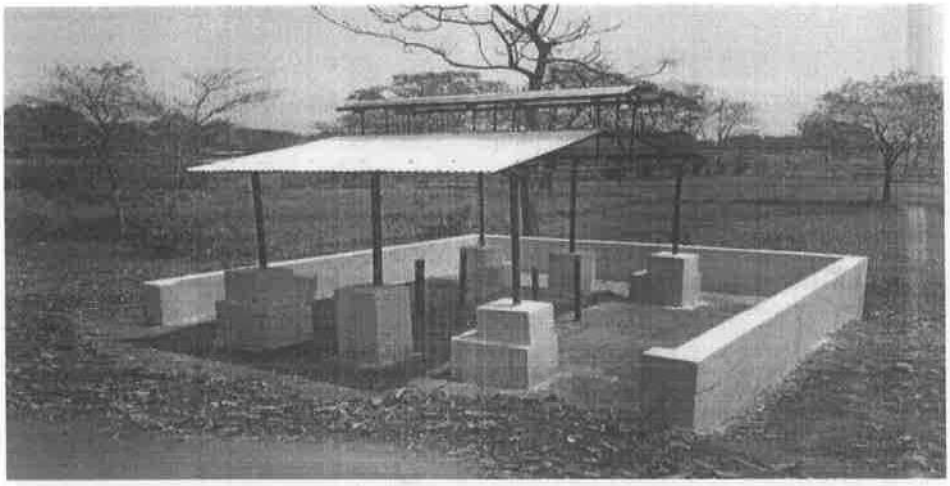

Photo 4: Constructed Cremation shed (2 nos.) Ghanatarai & Kalmidipa at Tundri

In village Tundari with the assistance of DB Power Pvt. Ltd. constructed the Cremation shed place by murram near the main road. Such initiatives are expected to improve the durability of the area of Cremation place within the Tundri village (**See Photo 4**). The construction of steps nearby to the ponds of the three mentioned villages with Bricks and Cement has enhanced the accessibility of villagers to use the water resources for different purposes. Moreover, it also reduced the accidental cases of slipping and drowning in the villages as discussed with the respondents. This initiative of DB Power also helped villagers to develop these ponds for fish farming which emerged as an alternative source of livelihood among them (**See Photo 5**).

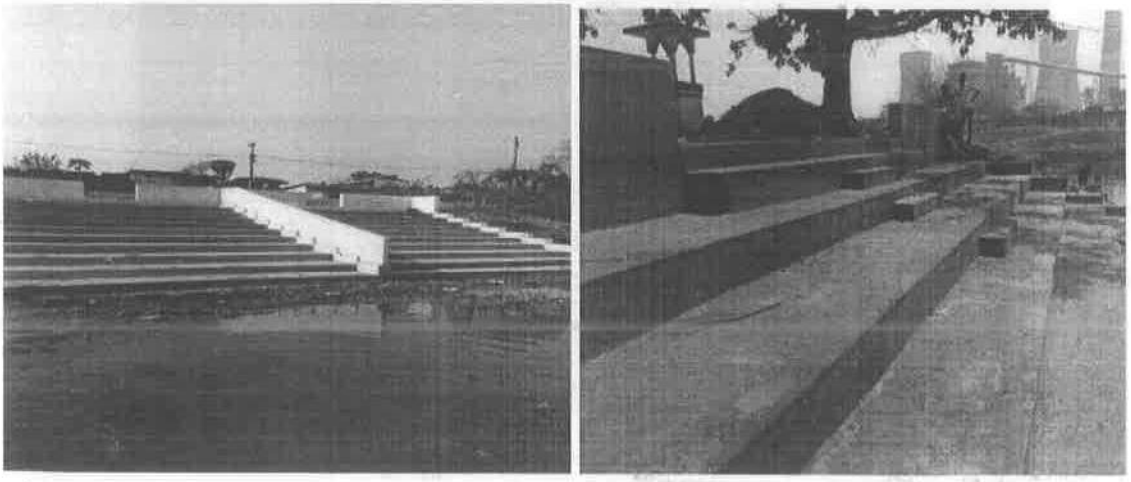

Photo 5: Construction of Stairs near Dadu pond, Patadi Nala, Darri Pond and Nimohi pond at Badadarha, Rampur & Baispali

Photo 6: Fencing has done at the outer periphery of Government Hospital Tundri village

Installing fences around Government Hospital at tundari village with barbed wire fencing done by DB Power to keep government property safe from intruders and thieves. It is one of the most used methods to install security measures in places like this. The use of steel-reinforced barbed wires creates a perimeter boundary to increase the level of security. However, installing barbed wire fencing is an initiative to protect Government property from burglars, stray animals, and intruders **(See Photo 7)**.

Photo 7: Culvert formation near Bandhwa Pond at Tundri

Culverts function primarily as hydraulic conduits, conveying water from one side of a roadway or similar traffic embankment to the other; therefore, culverts serve the dual purposes of functioning as hydraulic structures as well as acting as traffic load-

bearing structures. Culvert is defined as a tunnel structure constructed under roadways or railways to provide cross drainage or to take electrical or other cables from one side to another. It is enclosed by soil or ground. The design of the culvert is based on hydraulic, water surface elevation, roadway height and other conditions. The Culvert at Bandhwa pond, Tundari helps the pond-water conduits, conveying water from one side of a roadway situated in the village, especially in the rainy season

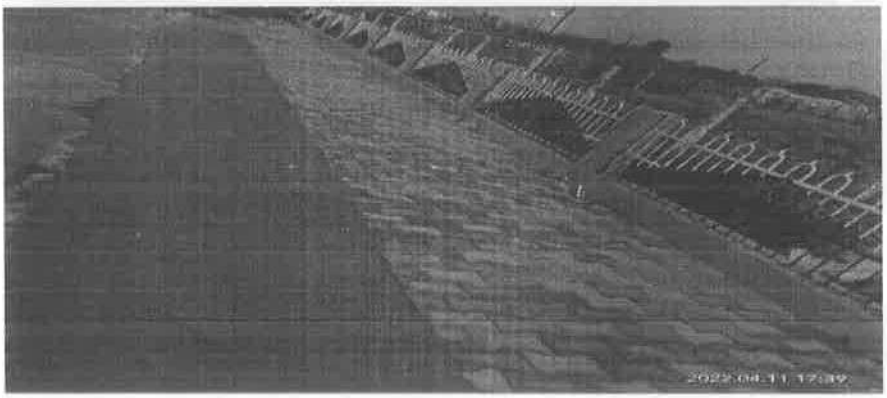

Photo 8: Renovation work on the premises of the Collector office at Janjgir-Champa.

Renovation (also called remodelling) is the process of improving a broken, damaged, or outdated structure. Renovations are typically either commercial or residential. Additionally, renovation can refer to making something new, or bringing something back to life and can apply in social contexts. The purpose behind this renovation was to create a bridge for the smooth functioning of the Administration, hence the road of the collector office connected to villages with metal roads for better reach for primary and secondary stakeholders **(See Photo: 8)**.

Photo 9: Construction of shed near the farm pond at Adbhar.

"Farm ponds recognized as a drought-proofing measure have received a great push from the central government recently. Most of the farm ponds are instead being used as storage tanks for pumped-out groundwater exposing this underground resource to losses through evaporation, etc. In the process, they are accelerating the rate of groundwater exploitation multifold. The utility of such ponds for the farmers is quite apparent. *"Farm ponds are of great help. Now we can save at least half the crop with protective irrigation in summer and drought situations. And since protective irrigation is assured, the quality of the fruits.* Equally important as these tangible benefits of the farm ponds is the psychological relief of farmers seeing the stored water"[ii]. However, the focus is to develop a shed by DB Power near the farm pond because it harvests rainwater and ensures groundwater recharge.

9.1.2. Impact on Community People:

The construction of CC road has been constructed by DB Power Ltd under CSR which is to improve transportation within the village (**See Photograph 1: CC Road in Badadarha Village).** "Interest in concrete roads exists for many reasons, especially in developing countries. Concrete roads offer several advantages to other solutions from both technical and economic points of view."[iii] A good load distribution, which eliminates the need for thick and expensive bases; A great resistance to deformation

and wear at any temperature; and an insensitivity to stagnant oil, clay, or faecal matter. The estimated service life of more than 30 yrs. Now Villagers are connected to urban pockets. In the rural set-up, Canal is the main source of irrigation in crop fields. Cleaning of Kachcha Canal has been done for irrigation purposes at Badadarha by DB Power Pvt. Ltd. Canals can be an effective source of irrigation in areas of low-level relief, deep fertile soils, perennial sources of water and extensive command area.[iv] In India, 22 million hectares by irrigated canals and about two third of cultivation in India are still dependent on the monsoon. [v]**(See Photograph 2).** Groundwater is an important source of irrigation in large tracks of India. This source has been considered infinite and used indiscriminately without any disregard to recharge prospects[vi]. In India, about 45% of the rural poor do not have access to safe Drinking water. The drinking water crisis in Indian Cities has reached explosive proportions. In rural areas, inadequate drinking water supplies are forced to use any water that is available even if it is highly contaminated. Consequently, it is this section of the population that is most often hit by waterborne epidemics of Jaundice, Cholera, or gastroenteritis.[vii] "In the rural area being an agrarian, farmers are dependent mainly on groundwater for irrigation. With increasing population, lesser land holdings and urbanisation, deeper borewells are dug for groundwater abstraction. Borewells & tube wells are remarkably similar. Both are vertically drilled wells, bored into an underground aquifer in the earth's surface, to extract water for various purposes."[viii] Drilling of Bore well & Installation of Hand pump near Labour Colony through the assistance of DB Power Pvt. Ltd which can help the villagers to safe and drinking water (Photo 4 Drilling of bore well & Installation of Submersible pump & Hand pump at Labour colony, Badadarha).

9.2. Education and Skill Development:

This section covered the details intervention of CSR in Education and Skill Development. Education features very highly in both the UN Millennium Development Goals and the Sustainable Development Goals. Whilst progress is being made, there are still huge gaps in terms of educational outcomes in developed vs. developing countries. India's organized sector has only 34 million people which forms

a small stratum of the total population. This statement itself says a lot about the Indian literacy rate and the education system.[ix] The system of education in rural areas has been undergoing many changes and transformations. In the present existence, there have been developments and progressions taking place in the system of education in rural areas. The role of education in assisting social and economic progress is well accepted. Access to education is critical to access emerging opportunities that supplement economic growth. Taking into consideration this accepted fact, there has been the main thrust on education, since the country achieved its independence. But as far as guaranteeing quality education in rural India is concerned, it has been one of the major challenges for the government.[x] Every village is not provided with a school which means that students must go to other villages to get an education. Owing to this parent usually do not send their daughters to school, leading to a failure in achieving rural education in India. Poverty is another setback; Government schools are not as good and private schools are expensive. The dropout -rate of the secondary level is extremely high in Villages.[xi] In English, the term "Education" has been derived from two Latin words Educare (Educere) and **Educatum.** "Educare" means to train or mould. It again means to bring up or to lead out or to draw out, propulsion from inward to outward. The term "Educatum" denotes the act of teaching. It throws light on the principles and practices of teaching. The term Educare or Educere mainly indicates the development of the latent faculties of the child. But the child does not know these possibilities. It is the educator or the teacher who can know these and take appropriate methods to develop those powers. In Hindi, the term "Shiksha" has come from the Sanskrit word "Shash." "Shash" means to discipline, control, order, direct, to rule etc. Education in the traditional sense means controlling or disciplining the behaviour of an individual. In Sanskrit "Shiksha" is a particular branch of the Sutra literature, which has six branches: Shiksha, Chhanda, Byakarana, Nirukta, Jyotisha and Kalpa. The Sutra literature was designed to learn the Vedas. Siksha denotes the rules of pronunciation. In India, skill development occurs through two broad institutional structures – formal and non-informal. The formal structure includes higher technical education in colleges, vocational education in post-secondary schools, technical skills in specialized institutions and apprenticeship training. As part

of the Government's social development agenda, there are several schemes which provide basic employable skill development. India is an Agrarian Society; here more than 70 per cent population lives in rural areas. They depend on agriculture and associated sectors of agriculture for their livelihood. The ability of the individuals in any society is necessity to vest them for social alteration, economic growth, contribution in development process. Therefore, a Nation seeking towards development requires institutions, entrepreneurship, and skill development, to initiate, engross and achieve the course of change and the changing societal structure and livelihood profiles. In 40's after independence India was a developing nation because of the burden of imperialism. It is understood that restraints and possibilities towards the development of the rural area are embedded in the agrarian society. In the 20th century Industrial Revolution fetched fundamental alterations in agrarian societal structures that were entrenched in the agriculture sector. 'The Industrial Revolution took away this responsibility from women's, brought about a rural-urban dichotomy, particularly in agrarian societies and created a demand for some other educational agent outside homes. The educational agent, the school, was assigned two basic goals: (1) development of human resources (particularly men) with skills for the manufacturing sector; (2) undertaking partial responsibility of the home, namely value addition and moral education (India, 2006). It gave rise to separation in all sectors, and the bulk of deficient Rural Youth in productive and technical skills. Hence, youth living in rural areas must struggle to get earnings or voluntarily/forcibly migrated to urban areas in search of jobs. The migration arrangement varies with the region, prospects, and socio-economic status of the families. The poorest families, particularly the landless and marginal holders have poor-quality land inclined to migrate. Such migrations severely affected the quality of life, because of poor health, lack of education, skill development and social pressures leading to the erosion of moral values. 'In the '50s, almost national governments in Asia formulated 'community development programmes to achieve self-reliance and development through local institutions and participation of the rural communities for their development (CIRDP, 1987). The core elements of community development were (i) People's participation in local community development projects, (ii) democratic

decentralization, (iii) transfer of technology, and (iv) self-help efforts. 'The rural development pursued in the 1950s and 1960s was largely centred around 'growth first' models. Despite robust growth in the 1960s, economic benefits did not 'trickle down and most of the population was languishing in abject poverty, rising unemployment and increased inequalities' (India, 2006)

9.2.1. Different Work carried out under Education and Skill Development section are:

9.2.2. Training Centre for Skill Development among Rural women at Tundri Village

Destitute women as well as women who were affected by bigamy were sent back to their parents for additional dowry or lack of children, aged deserted by children, not married due to disability or due to poor financial position of their parents and women deceived in the name of love will be covered under this project. They were unable to raise their children properly due to financial problems and were forced to send them for work at a tender age as child labour. The CSR unit has conducted a survey and identified such women in Tundri village. They are almost invariably dependent on others – typically male members of their family because they are unable to secure an independent means of livelihood for themselves. In many instances, being separated or divorced or even abandoned women do not get recognition as a separate household and become reliant on their father or brother. The livelihoods have been affected badly. There are important implications here for the empowerment of women, especially in difficult family relationships as access to a separate income would provide them with a viable source of livelihood, giving women the opportunity to live with dignity and independence. This is possible if their skills are developed and provided work in a production center for sustainable livelihoods. The centre is designed to provide financial stability as well as employment/working opportunities to destitute women and adolescent girls who are the vulnerable group of social neglect and exploitation. After the training, with in a period of six months, forward and backward linkages will be provided for the establishment of Training-cum-Production centre & self-employment units of their own for all the women. They will also be provided with marketing assistance. They will be provided all the necessary

assistance for the economic empowerment. DB power CSR unit will facilitate for the establishment of the production center. The said centre will be managed and run by themselves through a managing committee. The trained women will work at the center and earn wages. All necessary facilitation will be done by DB Power Ltd. Raw material supply will be ensured. Marketing assistance will be provided by DB power ltd.

Photo10: Training-cum-Production Centre for Skill Development

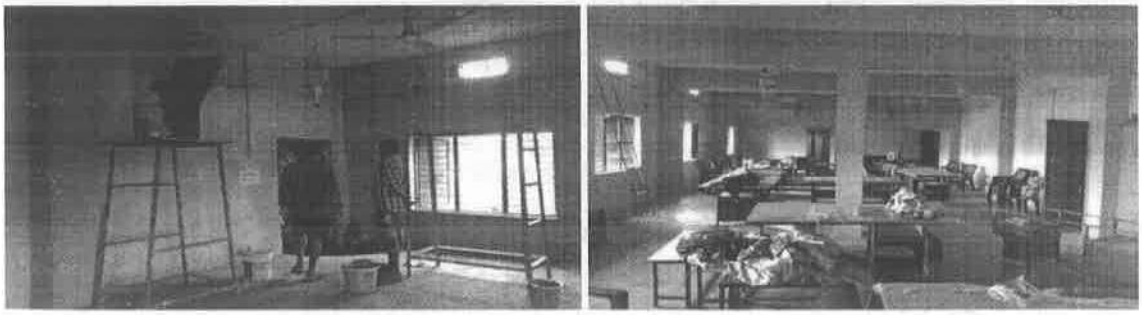

Photo11: Painting work has been done in the common classroom, Government Higher Secondary School, Tundri.

9.2.3. Set-up of smart class govt. Higher Secondary School Tundri to inaugurate by Mr. Ramkumar Kumar Yadav (Local MLA, Chandrapur) to impart Training on basic knowledge of computers among students at govt. Higher Secondary School, Sondka

DB Power Ltd. provides free computer training to underprivileged students. They are trained by experts in the field who also provide them

with practical training for hands-on experience. Expert trainers and volunteers make sure the students receive the best knowledge of computers. DB Power CSR unit manages and runs computer learning training from time to time to help these deprived students realize their dream of learning computers and securing a bright career. Hence initiative to set up a smart-classroom has been done.

Photo 12: Set-up of Smart Classroom & Inauguration

9.3. Health, Hygiene & Sanitation

Sanitation, hygiene, and cleanliness are the symbols of a cultured society. Sanitation is critical for health and sustainable socio-economic development. Sanitation plays a vital role in human health. "Sanitation is more important than independence," this quotation said by Mahatma Gandhi in 1923 reveals the importance of sanitation in a civilized society. India is a country whose majority of the population lives in a rural area where the rural population has high tendency to use vicinities area for defecation. The challenge for the healthcare sector, the government, medical profession, health care provider, as well as for healthcare business manager, is to continually explore ways to ensure that the welfares of individual patients remain the utmost primacy and promote health care equity via corporate socially responsible activities. The main issue of health care sector and sanitation is lack of resources and awareness related to the rights and availability of services. There is an essential need to truly embrace corporate social responsibility (CSR) and ethical principles that would promote equal distribution of healthcare resources.

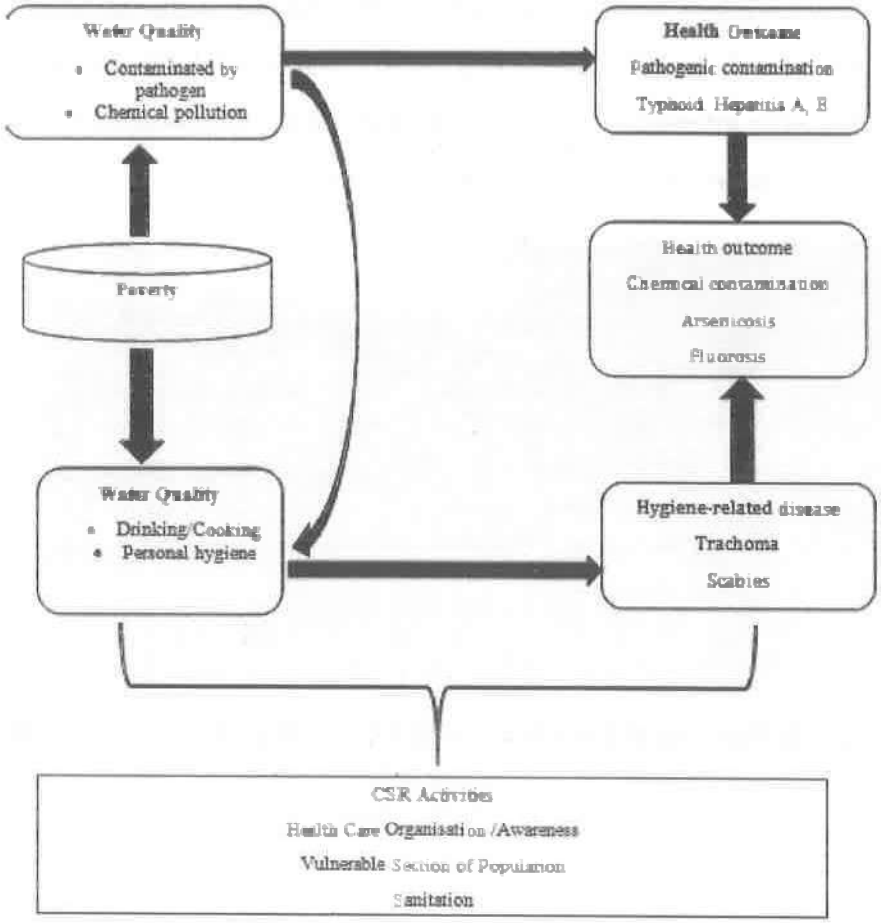

Figure: 02 Conceptual frameworks depicting the Role of CSR in Health and Sanitation

This section covered the details of CSR intervention in Health & Sanitation. It also discusses how Health is increasingly becoming a focal point of Corporate Social Responsibility (CSR), largely due to the recognition that a healthy workforce and community are fundamental to the longevity of a business and the success of an economy. The following work has been carried out under Health and Sanitation.

9.3.1. Community Health Centre at Tundri-Badadarha

Community Health Centre is functioning in the temporary shed as shown in the above photo because the connectivity of CHC with the road is not completed; hence the construction of the Road is in Progress. This CHC constitute of 06 staff, (03 Male & 01 female Attendants, 01 BAMS & 01 MBBS Doctor. The time is 9:30 am to 5:00 pm. In this CHC after diagnosis Doctor provides medicines to the patients

and in case of emergency patients has referred to Raigarh with the help of the Ambulance Service of the CSR unit. The facility and availability of ambulance service are 24X7. The attendants also maintain Patient Registration and Medicine, Stock Register. A total number of 1142 cases attended.

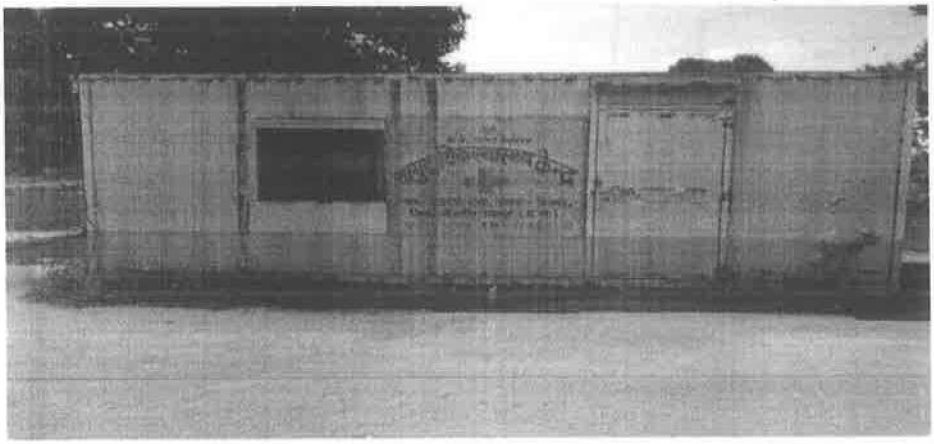

Photo 13: Health Services at Community Health Centre of DB Power Ltd.

Photo 14: Cases attended in CHC

Photo15: 24X7 Ambulance Service referral Service attended 162 cases

The facility and availability of ambulance service are 24X7. The attendants also maintain Patient Registration and Medicine, Stock Register. **Good Health** is the greatest blessing in life. Life is a weary burden to a person of broken health. In rural places in backward States like Chhattisgarh, health is considered the major issues and economically backward populations are unable to access better health services, other than the availability of health centres is the major problem. Despite significant growth in the healthcare units many villages in backwards States like Chhattisgarh India continue to face serious challenges of unavailability of Institutional Health Care. Hence DB Power has made significant efforts towards Institutional Health Care.

9.3.2. Sprinkling of Water:

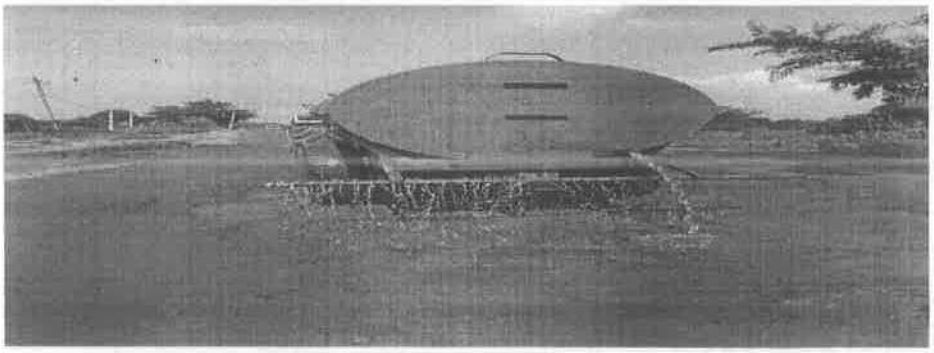

Photo 16: Sprinkling of water on main road Tundri to Kanwali, Saraipali to Odekera & Tundri to Bypass Road Badadarha and ash dyke to L&T gate.

In the wake of severe air pollution emergence in the Power Plant Area, DB Power Pvt. Ltd. will use 'dust suppressants and water sprinkling to control road dust. As per the officials, the plain water sprinkling controls dust for only 15 to 30 minutes but the additional dust suppressants last for five to six hours. Among various dust control measures, the use of dust suppressants in water can be more effective than plain water sprinkling as it shows more efficiency in reducing particulate matter emissions.

Also, it requires the water requirement for sprinkling as hygroscopic liquid compounds with bid additives help to reduce dust for five to six hours as compared to plain water which lasts for 15 to 30 minutes," said a DB Power official. DB Power is trying its best by taking various steps within its jurisdiction to control air dust such as a regular sprinkling of water on roads, footpaths and in the constructions. The water sparkling using dust suppressants will be carried out at an appropriate time before the AQI attains its peak around 9.00 am 6.00 am.

9.3.3. Financial Aid

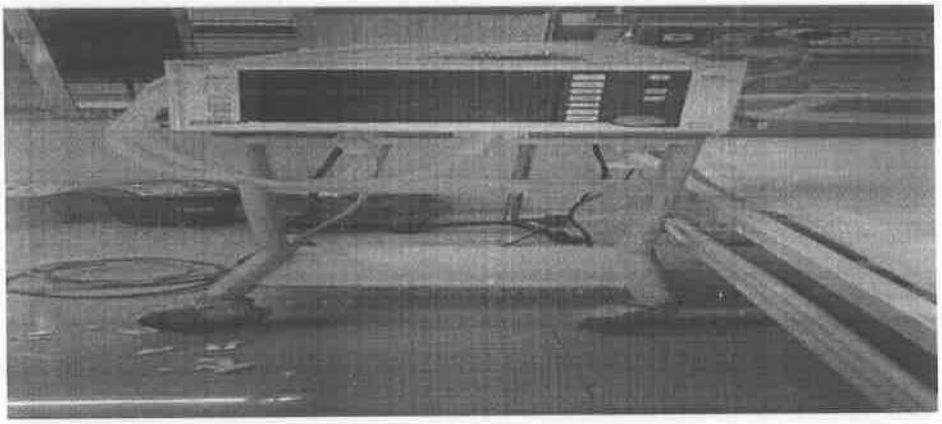

Photo 17: financial help provided to District Administration Janjgir-Champa for procurement of 02 Ventilator in Janjgir District Hospital and Oxygen concentrator 03 nos. (10 litres per nos.) to Covid Health Center, Dabhra & 1 no. to CHC, Chaple.

Undoubtedly, the COVID-19 pandemic has disparate impacts on society, generally hurting lower-income individuals playing as the ostensibly 'essential' workers more, which has further widened the inequality spectrum. For example, frontline workers in healthcare, food service, delivery, and public transportation have been widely recognized as critical for delivering healthcare and keeping the economy going during the pandemic. Despite being

widely applauded, such workers have also often been exposed to infection because of a lack of necessary protection and remain poorly paid and economically vulnerable. During the pandemic, DB Power Pvt. Ltd. has engaged in a wide range of philanthropic CSR actions, likely motivated by both utilitarianism and deontological factors in response to the needs of internal and external stakeholders. As they have provided financial help provided to the District Administration Janjgir-Champa for the procurement of 02 Ventilator in Janjgir District Hospital and Oxygen concentrator 03 nos.

Photo 18: Facilitated with ambulance facility for two months to BMO Dabhra for carrying COVID patients

Photo 19: Provided 1 nos. Refrigerator & 1 nos. Air Cooler at PHC Tundri.

9.4. Social Welfare programmes

Hence the basic objective of the social welfare programme is to support and improve the standard of living of the above-mentioned people and provide them with equal opportunities. Social welfare for the poor and deprived to receive direct benefits for example Women's issues, people living with HIV/AIDS, tribals living in geographically distant areas, people from disadvantaged castes and the economically vulnerable category, who do not have substantial source of income.

Photo 20: On the occasion of the marriage of girls of the plant-affected village (Badadarha & Tundri) 28 sewing machines & 28 dinner sets for each bride were gifted by DB Power Ltd. In, Tundari & Badadarha village DB Power Pvt Ltd, On the occasion of the marriage of girls of the plant-affected village 28 sewing machines & 28 dinner sets for each bride was gifted by DB Power Ltd.

Photo 21: Rs.5000/- financial help to two families for purchasing the refrigerator by President DB Power Limited

Financial help of Rs. 5000-/- each to two families for purchasing the refrigerator by President DB Power Limited.

Photo 22: Meeting organized by DBPL Management with Representative villagers of Badadarha to discuss the needs for Village Development activities for the next Financial Year

Representatives of Villagers and voluntary organizations invited to the meetings have continuously delivered their opinions on village matters. To mitigate problems at the community level.

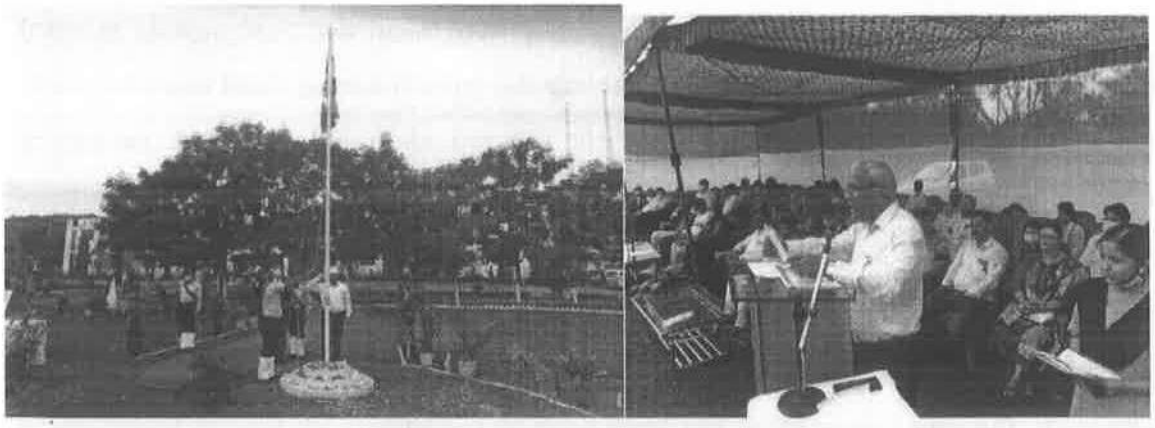

Photo 23: On the Occasion of Independence Day Students of Adopted Villages are felicitated for their academic & other extracurricular achievements

Organizing cultural programs and activities is the desire to progress and motivation for them. And also organize Rangoli, Mehndi, Painting, Essay Writing, and Quiz competitions from time to time at the government schools around the railway corridor

village. Moreover, Students of Adopted Villages are felicitated for their academic & other extracurricular achievements to motivate them.

10.0. Conclusion

Indian companies are now expected to discharge their stakeholder responsibilities and societal obligations, along with their shareholder-wealth maximisation goal. Nearly all leading corporate in India is involved in corporate social responsibility (CSR) programmes in areas like education, health, livelihood creation, skill development, and empowerment of weaker sections of society.[xii]

While we speak a lot about inclusive growth, our negligence toward 70 per cent of Indians who live in rural areas won't help us to achieve the talk. That's why, of late, most of the bodies including the government started focusing on rural development not just because of helping the rural masses but most importantly for helping themselves in sustenance. Dreaming of improving the fate of rural masses without creating necessary infrastructure is just a day- dreaming that will never happen in reality. Thus, in the backdrop of rural development what lies most sternly is rural infrastructure like rural roads, rural water supply, rural housing, rural electrification, irrigation, etc. Government in India is not affluent enough to cater all necessary infrastructures to rural areas for their development. That's why the concepts of public-private partnership (PPP) and corporate social responsibility (CSR) have gained popularity in recent times. Keeping this in background, the DB Power Ltd has started CSR activities with the aim of improving the fate of the masses of nearby areas. Although, the said Power Plant has been serving the society by way of launching a good number of CSR initiatives, the rural infrastructures given by the Power Generation Unit is key to change the lifestyle of the villagers.

This report has attempted to unfold whether the infrastructures provided have impacted the lives of rural masses in a positive way. As analyzed and discussed in previously in report, it is inferred that there is a seeable improvement in the life-style of the villagers due to the village infrastructure facilities provided in the villages of

the DB Power Ltd.

Education, Skill Development and Health have been the prime concern of Indian economy owing to their importance in social sector. Although updated facilities and offerings in these two sectors are being availed of by the affluent society, meeting the hefty expenses required, people living in rural areas are deprived of basic facilities necessary in these two sectors. While the government of India along with the governments of different states has been initiating various schemes to cater the basic needs in education and health, owing to constraints in terms fiscal deficit and administration, the core objective is yet to be materialized. Considering this, potential business houses have been taking up some responsibility in this direction. The power plant in Raigarh of Chhattisgarh (India) has been initiating multiple facilities in these three social sectors. However, facilities offered in the villages affected by DB Power Ltd in the Health sector have been proved to be essential and of paramount importance.

Hence this report has empirically unfolded that the Education, Skill Development and health-related facilities initiated by DB power plant have impacted the health condition of the targeted villagers positively.

The Socio-economic dimension of development paradigm is inadequate without developing the human, financial and social capital because through these three components promotion of well-being is possible. Above mentioned evidence shows that process of Engendering Rights is the key component used by DB power Ltd through SHGs formation in villages. Because if wellbeing indicators like health, education, housing, infrastructure and sustainable livelihood have not taken into consideration formation of SHGs will not be worthy. Hence the process of integrating women for the sustenance of livelihood needs facilitation in social connection, between both members of the SHGs with other community member's.

After analyzing the documents it is evident that by participating in SHGs, women members are able to secure and enhance all three kinds of Capitals namely human, financial because through bonding solidarity arise among SHGs members and they will be able to bridge gaps through savings and credit.

The beginning of 21st century in India has seen the term CSR coming to the forefront of development of discussion. In recent times, the Corporate Social Responsibility is emerging as a significant feature of business philosophy, reflecting the impact of business on society in the context of sustainable development. CSR is a concept whereby companies decide voluntarily to contribute to a better society and a cleaner environment. It is represented by the contributions undertaken by companies to society through their business activities and their social investment. CSR has been making an increasingly prominent impact on the Indian social system by supplementing development projects.

CSR can play a valuable role in ensuring that the invisible hand acts, as intended, to produce the social good. In addition, it seems clear that a CSR program can be a profitable element of corporate strategy, contributing to risk management and to the maintenance of relationships that are important to long-term profitability. In India, many companies or industries have modified their policies, and activities and are engaged in Corporate Social Responsibility (CSR), especially in rural development beyond their financial aspects.

11.0. OVERALL IMPACT ON COMMUNITY OF CSR ACTIVITIES

Chhattisgarh state is situated in Central India and Raipur is the capital of Chhattisgarh. Chhattisgarh is the 10th largest state of India, with an area of 135,190 km2 and ranked as the 16th most-populated state of the country. Chhattisgarh is an agriculturally based state and 80% population stay in rural area. Cooperation is a dynamic movement for socio-economic and rural development. The cooperatives have strong local linkage in the rural area. The cooperatives covered 80% of the rural households and almost 95% of the villages in the state. The cooperatives are the lifeblood of the state's economy and the mechanism for any development programs.

11.1. Rural Infrastructure Programme

In FY 2021-22 DB power Pvt Limited has been started a rural infrastructure programme The funds released under CSR activities by DB power Pvt ltd. The main objective of the fund is to provide rural development and enabling environment. CSR enable them to complete ongoing rural infrastructure projects.

The importance of infrastructure for economic growth and development in rural area can hardly be overemphasized in a developing economy like India. With poor rural infrastructure, even a marginal improvement in its quantity and quality could significantly improve economic development and human well-being. Improving basic infrastructures, such as roads, transport, electricity, telecommunications, housing, health, water and sanitation, is essential for the development and well-being of the rural population. The development of rural infrastructure could promote economic growth, improve the standard of living of the population and reduce the incidence of poverty by generating both farm and non-farm employment and earning opportunities, increasing productivity, providing access to basic goods and services and improving the health and physical condition of people.[xiii] In spite of several public initiatives for infrastructure development in a rural area.

Under the supervision of DB power Pvt ltd, various rural infrastructure has been done. Due to all these works villagers are able to get access to drinking water and transportation has been developed at the village level.

11.2. Educational and Skill Developmental Activities

This result emphasises that the majority of the respondents benefited from vocational training programs under DB Pvt ltd at the village level.

The Sustainable Development Goals (SDGs), launched by the United Nations in 2016 with a mission to carry forward the global development agenda till 2030 and beyond,

emphasize actions for and involvement of younger generations. Because these groups will see through and can suitably contribute to the envisaged sustainable prospects.

This set of 17 interconnected goals with their 169 targets is designed in such a way that youths remain their main stakeholder groups. The fact being young people create the biggest part of the global demography. Now, 43% of the world's population is of people under the age of twenty-five. And, around 90% of them live in poor and developing countries that are stuffed with threats to sustainable development.

This part of population will obviously live longer, that too with the impact of the decisions and actions taken at present. Participating in the development agenda is the "right" of the young generation as they have greater stake in long-term sustainability. Ignoring the issues and role of the youth in the process of dealing with the issues of sustainability can be a risk. Rather, it should be turned into an opportunity by making them serious partners in the Sustainable Development Goals. And, to realize this opportunity youths should be equipped with skills the modern day requires.

Putting this in the context of India, it is one of the youngest nations of the world as 54% of its population is below 25 years of age, and more than 62% of its population is in the working age group (15-59 years). The average age of population in India is around 29 years, much lower in comparison to developed countries like the US, Japan and European nations. In next 15 years, the labour force in industrialized countries will decline by 4% whereas in India it will increase by more than 30%. This can be seen as a challenge as a burden as well as an opportunity as "demographic dividend". In order to avoid that this "demographic dividend" turns a "demographic disaster", the workforce should be imparted with employable skills and knowledge, as a skilled workforce is vital for socio-economic development. Without exaggeration it can be said that India has the potential to be the skill capital of the globe.

For last several decades India is reeling under the crisis of huge skill gap. Disparity between demand and supply of skilled manpower is a major impediment for national economic growth. Every year more than one crore people are joining the country's

workforce whereas less than 25% of them possess relevant skill set needed for jobs across sectors.

According to a survey, 90% of employment opportunities entail vocational skills, but 90% of youths who come out of school or college hold only bookish knowledge. They are qualified, but not rightly skilled for the job. For a growing economy like India, this skill deficit does not augur well. The dream of India becoming a 5 trillion-dollar economy in near future will not be possible if human capital is not properly taken care of. On the brighter side, DB Power Pvt. Ltd. has commenced several skilling initiatives under its Social Responsibility.

11.3. Health, Hygiene & Sanitation

The development of healthcare infrastructure in rural is poor and needs fundamental reforms in order to deal with emerging challenges. The development of infrastructure and healthcare facilities, the position of the workforce, and the quality-of-service delivery are important challenges that are confronting healthcare centres in rural. Some crucial works under DB Power Pvt. Ltd. under health, hygiene and sanitation in which Organized health camp at Project affected & Railway Corridor villages, providing referral ambulance service to nearby villages of the plant to improve health status and reduce morbidity levels in a rural area. Open Community health centre. Organized Sanitation awareness programme and attended to create awareness among villagers. The only way which could lead to the goal of health inclusion is by incorporating impoverished needy rural populations through community participation.

11.4. Social & Welfare Programme

A social welfare system provides assistance to individuals and families in need. Under the supervision of DB Power Pvt ltd, a different program was done for social welfare at the village. However, DB power Pvt ltd did and leads to different work for rural development and improvement of their situation.

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Annexure- VI

HYDROGEOLOGICAL INVESTIGATION REPORT

IN AND AROUND BADADARHA VILLAGE,

BLOCK- DABHRA

DISTRICT – SAKTI (C.G.)

M/S DB POWER LIMITED

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CONTENTS

INTRODUCTION

DB Power Limited is a coal-based thermal power plant located at Village: Badadarha, Block: Dabhra, Shakti district in the state of Chhattisgarh. The plant has produced thermal power having capacity of 1200 MW (2*600 MW). Ministry of Coal, Govt. of India has allocated permanent Coal linkage of 2,497 MTPA from SECL Chaal, Baroud, Dipika, Gevra, kusmunda and Manikpur mines area and from MCL Vasundhara & Kuklda mines to fulfill the requirement for 1200 MW capacity. Water requirement for the project is getting fulfilled from river Mahanadi, which is flowing at a distance of 23 KM from the plant site. The power plant is operating since 2014. The Project was awarded to BHEL for BTG and L & T for BOP and completed the project within time frame.

1.1 OBJECTIVE AND SCOPE OF WORK

1.1.1 Objective and Scope

The broad objective of the present study is to establish the hydrogeological environment of the project area and study the impact on ground water and suggest strategies for mitigation.

The scope of work includes following points

1. Conducting comprehensive hydrogeological studies, chemical analysis of ground and surface water samples from the buffer zone of 05 km radius and particularly downstream side of ash dyke and its impact on the water regime for DBPL, 2 X 600 MW, at Badadarha, Block- Dabhra, District- Shakti, DB Power Limited.
2. Survey and hydrological data collection of key wells of 05 km radius are from the boundary of plant (buffer zone) of existing open wells/bore wells/piezometers and determine and record for each location including extermination of coordinates of the points by GPS and its plotting on map and water levels, pre & post monsoon levels. Yields, use, aquifer tapped etc.
3. Comprehensive hydrogeological assessment studies of the buffer zone discussing its geomorphology, digitized elevation model, geology, nature of water bearing formation sand depth to water table, long term ground water recharge, present ground water exploitation and present status of ground water development.
4. Collection of samples of ground water and few surface samples from the buffer zone for chemical analysis which parameters comprising pH, Color, EC, TDS, Chloride, Sulphate, Calcium, Magnesium, Fluoride, Nitrate, Bicarbonate, Carbonate, Total

Hardness, Total alkalinity and all the heavy and toxic elements including Hg.

5. Preparation of ground water quality report of 05 km radius area of buffer zone based the results of chemical analysis and its different maps showing the different contour maps on important constituents.
6. Hydrological and drainage studies of buffer zone, delineation of its catchment area, catchment yields, particularly of watershed covering the ash dyke.
7. Preparation of ground water contour map of 5 km radius area showing the Ground water flow direction and hydraulic gradient.
8. Submission of draft report covering the findings of the investigations, original data and recommendations for future monitoring.
9. Submission of final report after incorporation of user observations.

1.1.2 Approach and Methodology

To fulfill the above objectives, especially Hydrogeological study in the area, following approach has been adapted as given below:

A detailed Hydrogeological investigation was carried out in & around Plant within 05 km of radius for both Core & Buffer Zone for evaluating the impact of project activity on ground water storage in the area.

Collection and collation of supplementary data viz. soils, geology, geomorphology, drainage etc. for interpretation.

Establishment of observation stations for water level measurements in different seasons as well as water sample collection for determining the quality aspects.

Pumping test data & its interpretation for knowing the hydrogeological parameters, etc.

Evaluation of present ground water scenario as well as future course of action for protecting the natural environment.

2. GENERAL DESCRIPTION OF THE AREA

2.1 LOCATION

M/S DB Power Limited is a 1200 MW (2 X 600 MW) thermal power plant at Village: Badadarha, Taluka:Dabhra, Dist:. Shakti, Chhattisgarh.

The co-ordinates of the Plant are 21°55'33.38"N - 21°54'14.08"N latitudes and 83°11'5214"E to 83°10'45.12"E longitudes. For the present study, an area of 05 km of radius has been demarcated which lies between 21°57'10.40"N - 21°57'47.54"N latitudes and 83°14'15.58"Eto83°08'26.19"E longitudes and falls under the Survey of India Toposheet No. 64 O/1 (1:50000 scale).The location map of the project site and toposheet of study area is given in **Fig. 2.1, 2.2** and the Satellite image map of the area is given in **Fig. 2.3**.

2.2 ACCESSIBILITY

The area is well connected by metaled and un-metaled road as well as Rail networks. Kharsia Railway station, on Mumbai- Howrah Broad Gauge main line of the South-Eastern-Central Railway is situated around 13 km North- Eastern direction from plant site. Jharsuguda is nearest Airport and is about 117 km from the study area which is also approachable by road and rail. The block head quarter is Dabhra.

2.3 DEMOGRAPHY

There are 21 villages within 5 km radius of plant area. The total population as per 2011 Census is 29024 (for 05 km radius buffer zone). Scheduled Caste population of the study area (05km) is 5352 and Scheduled Tribe is 6824, Percentage of literacy is 78.08%.The workers those actually engaged in occupation are 13927. A population detail is presented in table 2.1.

Table 2.1 Population details as per census 2011

Name	No_HH	TOT_P	TOT_M	TOT_F	P_SC	P_ST	P_LIT	TOT_WORK_P
Kharsia - Raigarh								
Adajhar	164	663	314	349	15	0	74.55 %	355
Karpipali	202	712	351	361	73	21	77.71%	264
Kuarmauha	162	666	330	336	152	175	76.32 %	267
Jaimura	404	1,398	691	707	207	275	77.42 %	358
Amapali	83	318	150	168	0	109	71.94 %	91

Basnajhar	361	1,549	790	759	198	518	76.02 %	634
Basanpali	149	582	293	289	107	145	82.08 %	201
Ful Bandhiya	218	797	394	403	431	222	90.65 %	338
Pandripani	211	823	420	403	139	181	77.50 %	320
Sondka	333	1,115	557	558	251	90	82.31 %	325
Tayang	194	730	365	365	68	253	79.85 %	323
Dabhra – Shakti								
Badadarha	436	1,634	857	777	187	276	75.07 %	1,076
Dhurkot	546	2,378	1,200	1,178	1,107	137	67.80 %	1,090
Dumarpali	277	866	448	418	162	151	81.27 %	312
Kanwali	657	2,499	1,244	1,255	232	1,435	70.50 %	1,170
Khairmuda	204	916	469	447	136	95	69.11 %	423
Komi	281	1,118	572	546	137	378	70.89 %	566
Kenapali	323	1,283	664	619	595	84	78.09 %	702
Saraipali	158	456	217	239	69	157	78.16 %	176
Tundri	1,074	3,810	1,936	1,874	327	1,583	74.55 %	1,760
Jaijaipur – Jangir Champa								
Odekera	1,020	4,711	2,345	2,366	759	539	69.56 %	3,176
Total	**7457**	**29024**	**14607**	**14417**	**5352**	**6824**	**78.08%**	**13927**

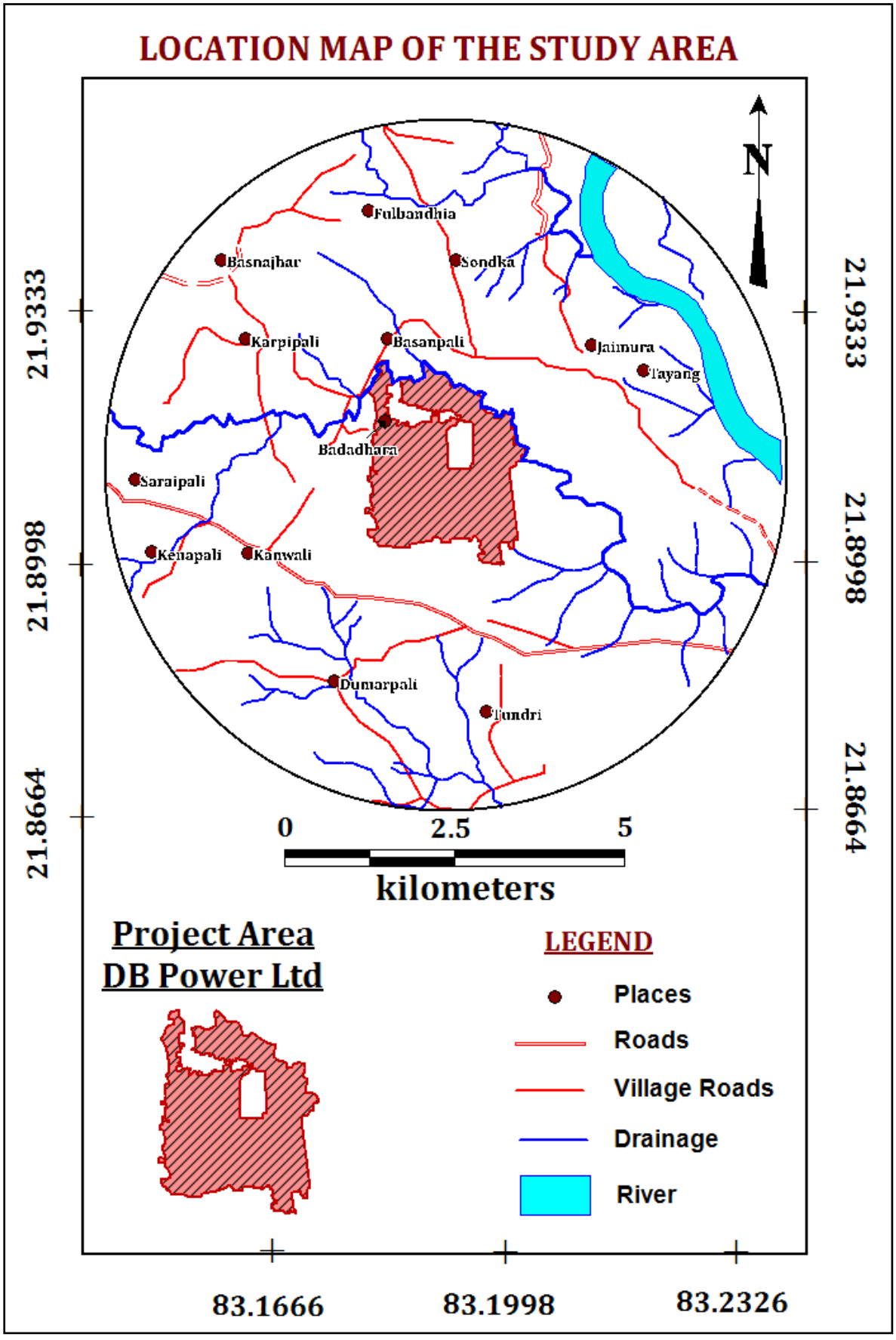


Fig 2.1: Location map the Study area

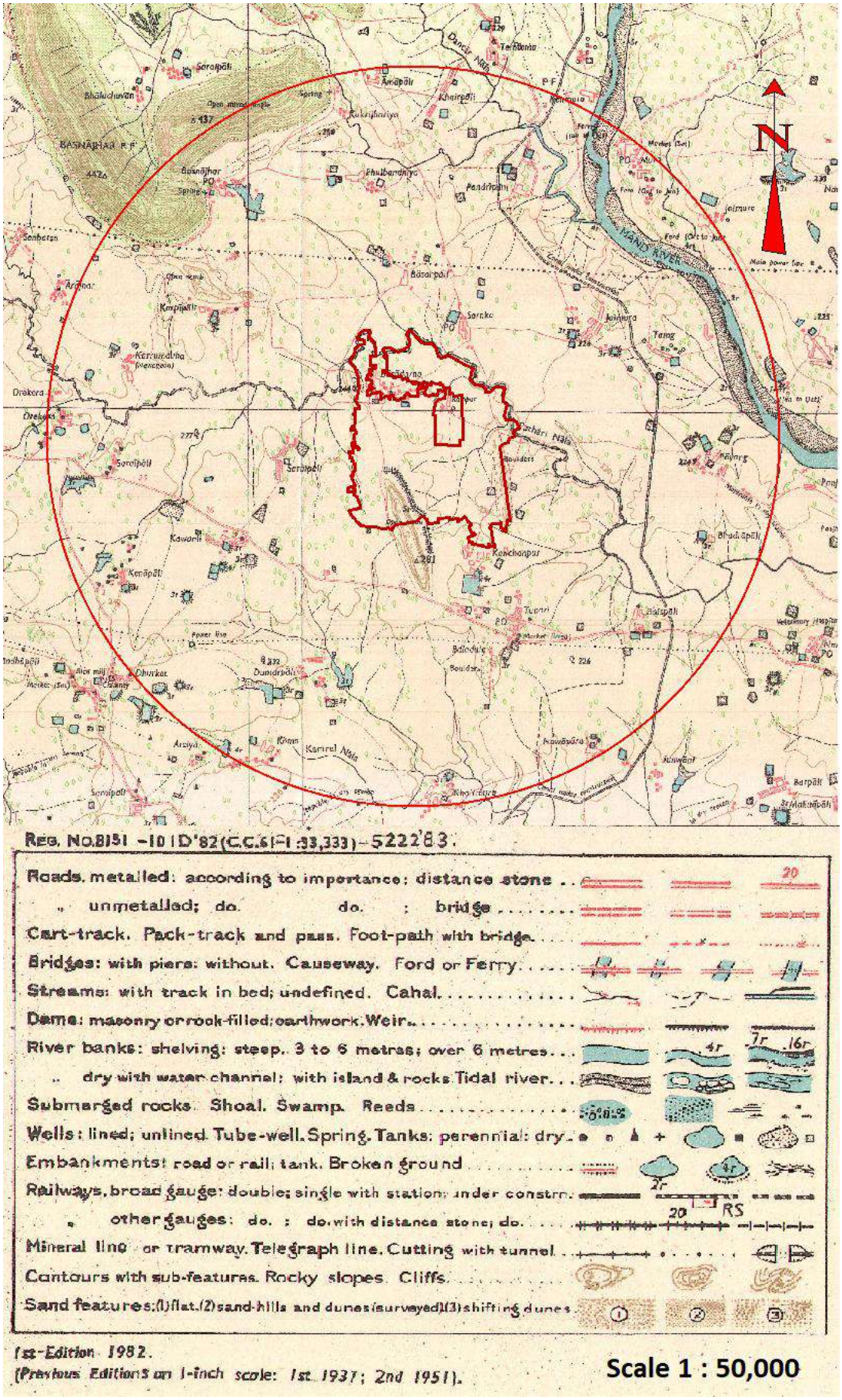


Fig 2.2: Top sheet (1:50000) of the Study area

Fig 2.3: Satellite of the Study area

Fig 2.4: Satellite Map of the Project area

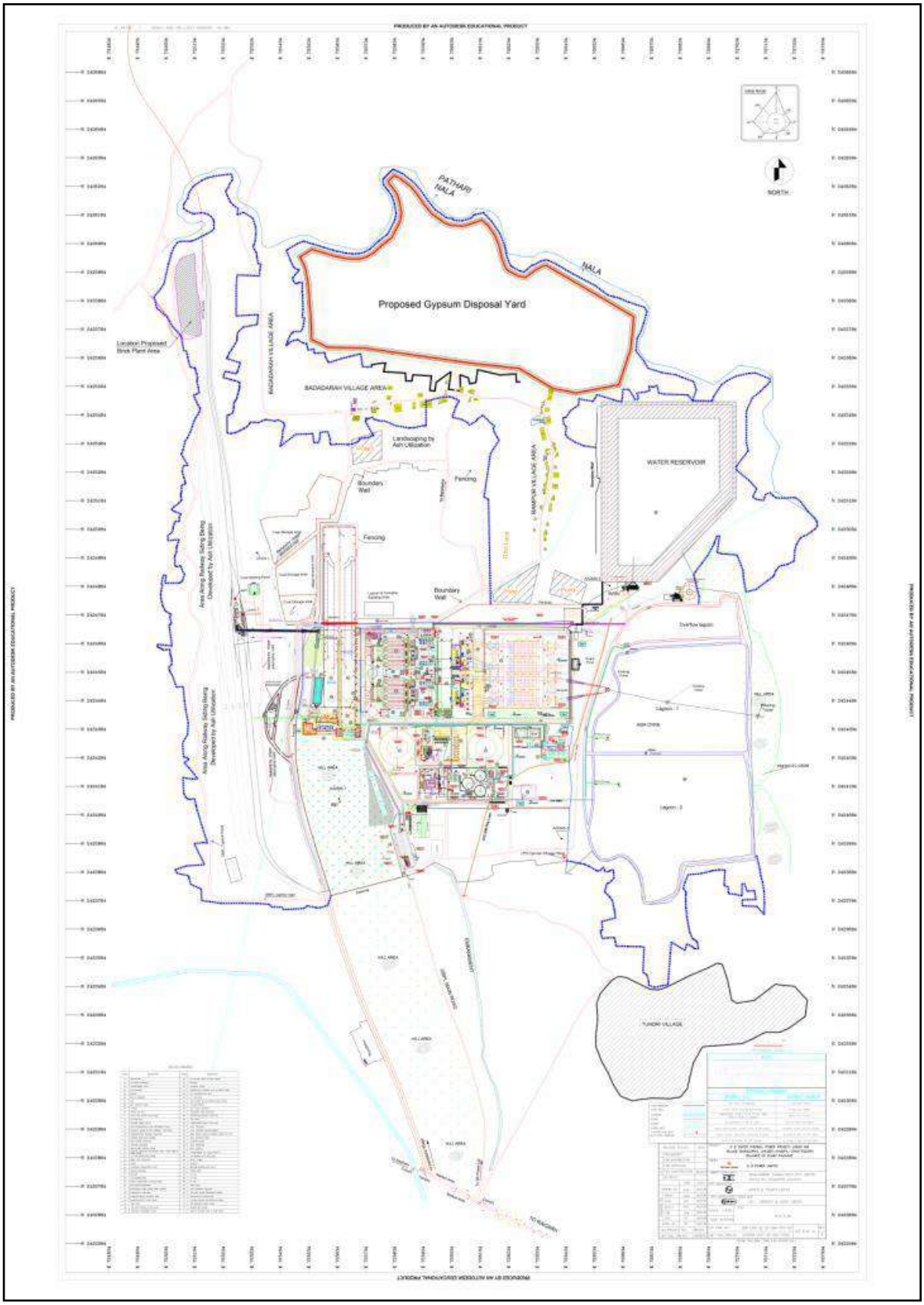


Fig 2.5: Plant Layout

2.4 LAND USE

The Land use / Land cover map for the project area has been prepared using satellite image, the current data will also enable assessing the impact on land use pattern in the study area due to the proposed project activity. Survey of India topo-sheet on 1:50000 scales has been used as a reference map for preparation of base layer data like road, rail network, village and project site and also for geo referencing of satellite image. Land use / Land cover map preparation.

Hybrid technique has been used i.e. visual interpretation and digital image processing for identification of different land use and vegetation cover classes based on spectral signature of geographic feature. Spectral signature represents various land use class. Image interpretation keys are developed based on image characteristics like color, tone, size, shape, texture, pattern, shadow, association etc, which enables interpretation of satellite images for ground feature. Training sites are then assigned based on their spectral signature and interpretation elements. Following classes have been used for the Land use. Land covers Map: Water Bodies, Plantation, Crop Land, Fallow Land, Industry, Human Settlement, Open Scrub, Vegetation, Open waste land, dense scrub & Mine Quarry. The land use/land cover details of the lease and study area are given below in **Table 2.2,** which has been presented in **Fig 2.6**.

Out of the total area taken for the study, nearly 538.79 ha is covered by forested area, only 992.91ha is covered by irrigated area, 9085.95 ha is covered by non-irrigated area. Culturable waste land area comes around 60.20 ha while 520 ha area is covered by area not available for cultivation. The details of land use pattern in the study area within 5 km radius are summarized as below in the **Table 2.2** & Fig **2.6.**

Table 2.2: Land use Pattern of the Study Area (05 km radius from the Project site)

SN	Land use	Area (in Sq KM)	Percentage
1	Agricultural Land-Crop Land-Kharif Crop	90.8595	73.06
2	Agricultural Land-Crop Land-Zaid Crop	3.80495	3.06
3	Agricultural Land-Crop Land-Two crop area	9.92907	7.98
4	Agricultural Land-Fallow-Current Fallow	0.60202	0.48
5	Forest-Deciduous (Dry/Moist/Thorn)-Dense/Closed	5.38796	4.33
6	Wastelands-Scrub land-Open scrub	5.20509	4.19
7	Wastelands-Sandy area-Riverine	1.53606	1.24
8	Build Up-Mining / Industrial area	1.69411	1.36

9	Build Up-Built Up (rural)-Built Up Area (Rural)	2.67511	2.15
10	Build Up-Built Up (Urban)-Transportation	0.140471	0.11
11	Waterbodies-Reservoir/Tanks- Perennial	2.52319	2.03
	Total	124.357531	100

Source: Satellite Imagery

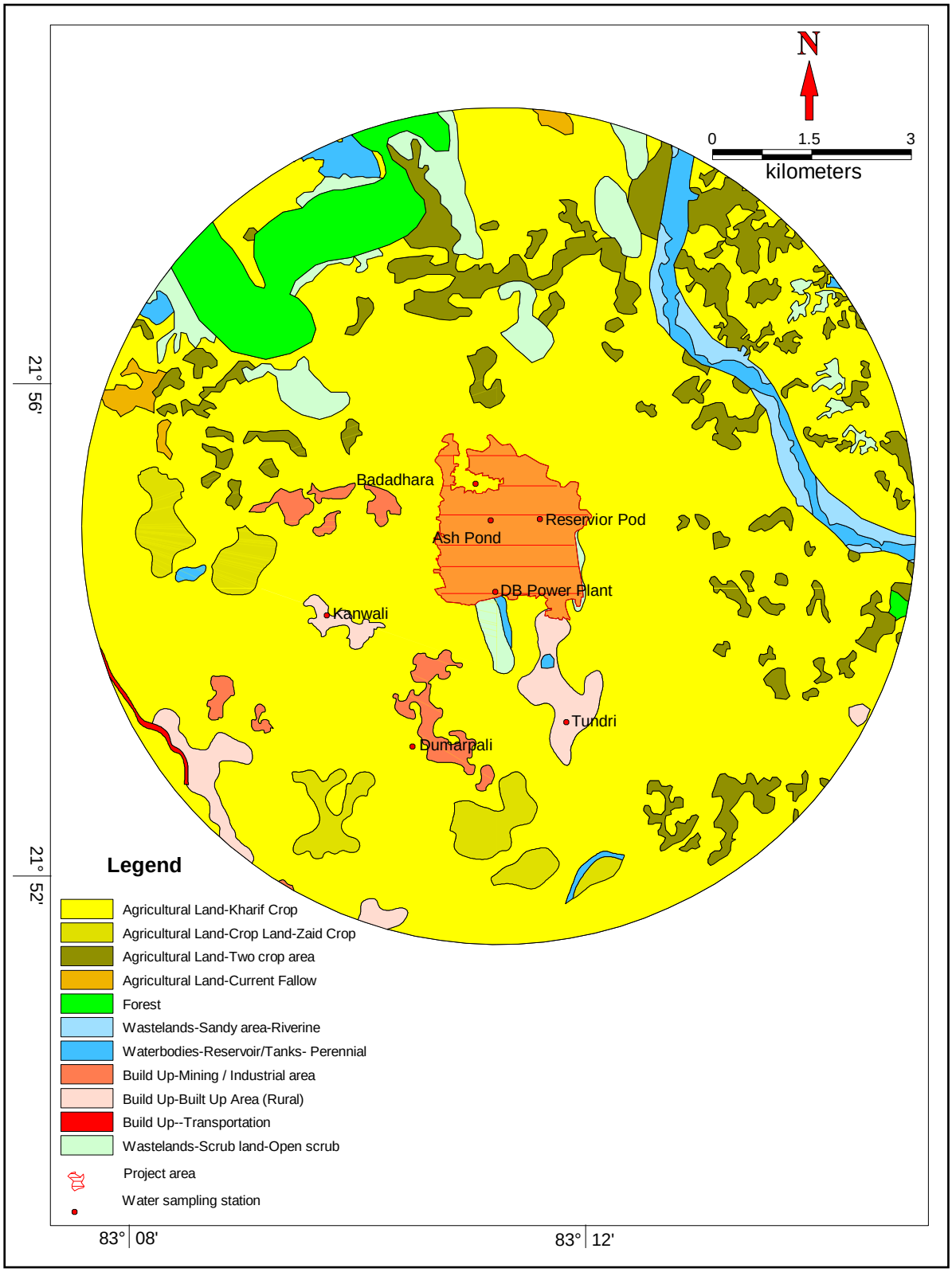


Fig 2.6: Land use map the Study area

2.5 CROPPING PATTERNOF THESTUDYAREA

The study area represents agricultural plain and Green fields and lot of agricultural activities in the surroundings of villages are noticed. Base line data collected from Agriculture Department, Raipur and observed that majority of the area around the 05 Km. radius from the project site is distributed with following crops:

Kharif Crops: - Peddy, Cotton, Wheat, Maize, Jowar, Moong, Sunflower, Soyabean, Groundnut.

Rabi Crops- Gram Wheat, Jow, Tarameera, Sarson, Bhindi, Channa, Pea, Tomato, Palak, Raddish.

Cropping pattern of the area depends upon the climatological conditions and need of the local population of the area. Sometimes cropping pattern may get changed during construction and operational phase because of particular requirement of specified anthropogenic activities.

The study area shows typical agro climatic conditions. In spite of the agriculture being depend mainly on monsoon and underground water, cultivation is the major occupation of this region. The land is mono culture in nature besides the above- mentioned crops, banana, papaya, bar, ginger, methi, tomato, carrots, soya beans etc. are also grown in the area. The growth season of major crops are as shown in table 2.3 given below:-

Table 2.3: Growth seasons of major crops

S.NO.	NAMEOFCROP	PLANTATION MONTH	HARVEST SEASON
1.	PEDDY	JUNE-JULY	OCTOBER
2.	WHEAT	JAN.	MAY
3.	JOWAR	JULY	OCT. -NOV.
4.	COTTON	APRIL	JULY-AUGUST

Most of the crops are grown on small farms (located near the village wells) where generally the work is done manually. A very little mechanized (with tractor) cultivation is also seen at times in certain areas.

2.6 CLIMATE AND SOILS

2.6.1 Climate:

The area enjoys tropical climate with hot summer followed by well-distributed rainfall through South-West monsoon season. The winter commences from December and last till the end of February. The period from March to the end of May is hot season. The monsoon season starts from the middle of June and last till the end of September. The average daily annual normal temperature for the area is 32° C. During the summer Season humidity is lowest i.e. about 32% and is highest during the South-West Monsoon period i.e. about 80%.. About 94 percent of the annual rainfall is received during the period June to October, July and August being the rainiest months. The variation in annual rain fall from year to year is very large on an average the reared 50- 60 rainy days in a year**.** There is only one observatory located in Raipur which is about 240 km away from the study area maintained by Indian Meteorology Department.

2.6.2 Rainfall

During the Year 2009 to 2022 the maximum rainfall recorded 1398.4 mm in the year 2016 and minimum rainfall 866.5 mm had been recorded in the year 2017. Details are as shown in **Table 2.4**. In this year very low rainfall recorder, although ground water of this area falls under safe zone as well as forest is very dense, but precipitation was comparably too less. The average rainfall for last Fourteen year is average 1113.87 mm. Out of the total annual rainfall about 90% of the takes place during the South West Monsoon i.e. among the months June to September. Only 8% of the rainfall takes place during the Winter Season from October to February while only 2% of the rainfall takes place during summer Season.

Table 2.4: Annual Rain Fall (2009-2022)

Sl No	**Year**	**Rain fall (in MM)**
1	**2009**	**963.7**
2	**2010**	**916.6**
3	**2011**	**884.5**
4	**2012**	**1348.1**
5	**2013**	**1146.7**
6	**2014**	**1423.9**
7	**2015**	**1027.7**
8	**2016**	**1398.4**
9	**2017**	**866.5**
10	**2018**	**1036.6**
11	**2019**	**1157.1**
12	**2020**	**1240**
13	**2021**	**1295.4**
14	**2022**	**889**
Average		**1113.87**

2.7 SOILS

Only one soil categories are present in the study area namely Ultisols, (red & yellow Soils) Soil map of the study area is presented in **Fig 2.7**.

i. 2.7.1: Ultisols

The Indian equivalent of this soil found in study area is Lateritic and red yellow soil. It is exposed in all parts in the area. It is the ultimate product of continuous weathering of minerals in a humid climate. This is a highly weathered and leached acid soil with high levels of clay below top layer. They are characterized by a humus-rich surface horizon and by a layer of clay that has migrated below the surface horizon. This soil has variety of clay minerals but in many cases the dominant mineral is Kaolinite. This clay has good bearing capacity and no shrink-swell property. They are red to yellow in color and are quite acidic having pH less than 5. The red and yellow color results from the accumulation of iron oxide which is highly insoluble in water.

Alluvial Soils are found along the river course.

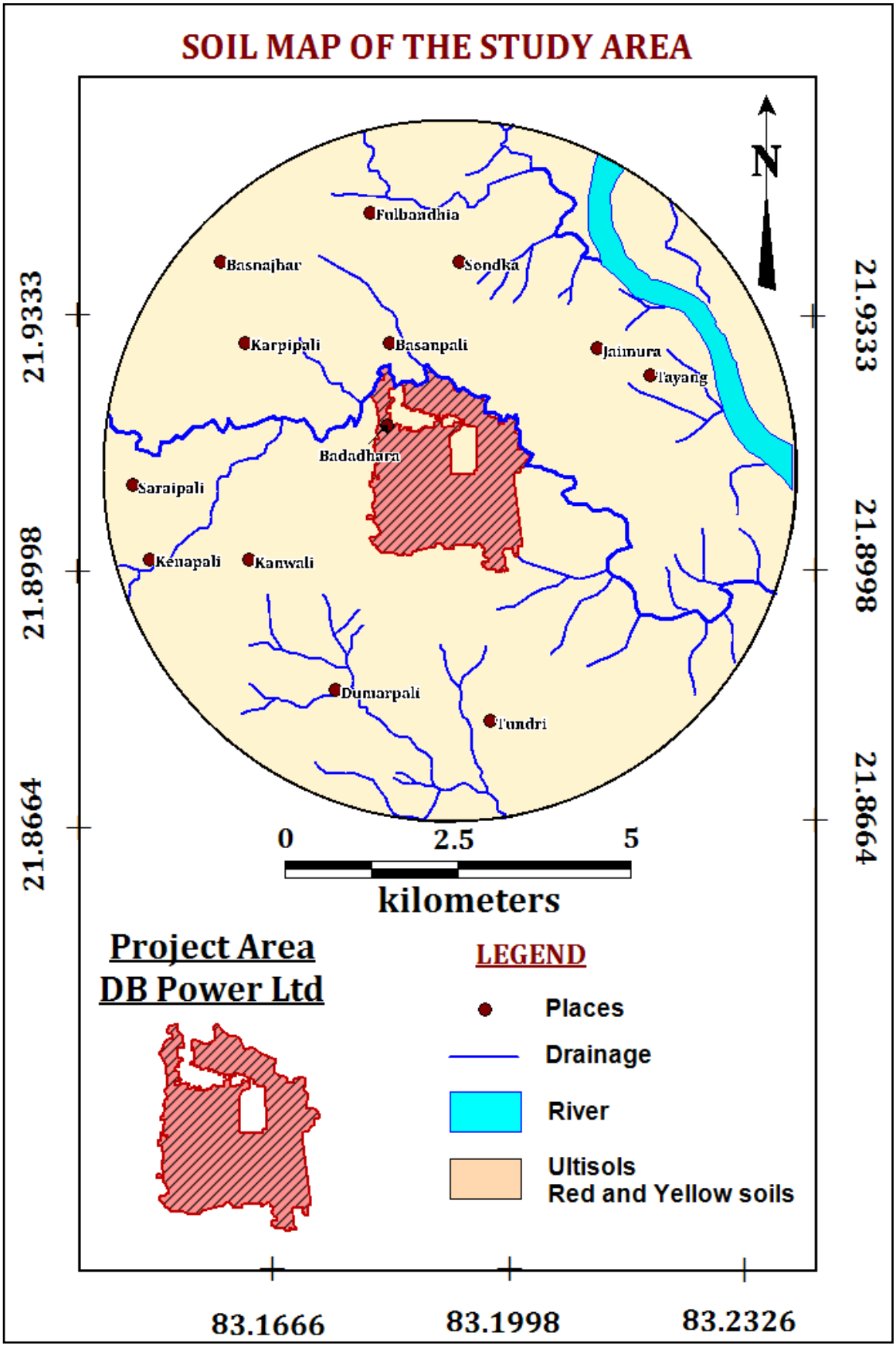


Fig 2.7: Soil map of the Study area

2.8 .DRAINAGE AND GEOMORPHOLOGY

2.8.1 Drainage

The area is drained by tributaries of Mand River. Mand River is flows from North to South-East Direction of project area. Thus the project area is in the interfluves zone of Dantar Nala, Pathari Nala & Mand River. The Mand River is a tributary of the Mahanadi in India. It joins the Mahanadi in Chandarpur, in Chhattisgarh, 28 km from the Odisha border and before the river reaches the Hirakud Dam. This tributary system comes under Mahanadi basin. The drainage pattern in the area is sub-parallel and dendritic in nature with medium drainage density indicating the formations in the area are moderately porous& permeable in nature and are having moderate surface run-off. The drainage density in the central part near to project area is low as compare to remaining area. The drainage map of the study area is presented in **Fig 2.8**.

The study area is characterized by flat undulating terrain with regional slope to the north-east. The average elevation in the southern portion is around 270 m while in the central parts is 310 m amsl. The average land slope of the area is works out about 4m per km from top sheets (1:50000 scale), Survey of India.

Drainage network are universal feature of landscape on the earth. Various environmental factors such as climate, relief, lithology, and vegetation play a considerable role in the development of drainage basin. Watershed geomorphology helps in understanding the physical and hydrological behavior of the river regime.

2.8.2 Geomorphology:

Geo-morphologically the study area comes under Pediplain, Denudation Hills & Floods Plan. The Physiography of the basin is controlled by geological formations namely Sandstone and shale.

The rocks were exposed to renewed post depositional activities and were subjected to intensive and extensive sedimentation, peneplanation and denudation during Pre-Quaternary and Quaternary time. In response to lithology of rocks, the alchemical composition, the irrelative deposition, tectonic setup, they were chiseled into various geomorphic and hydro-geomorphic surfaces; in this case Pediplain and Denudation hills. The feature Denudation Hills are formed in the north-western part of the study area. This unit is controlled by fractures, joints and lineaments. Flood Plain is also developed along the river courses. It is formed by extensive deposition of alluvium by major river system. This unit is normally flat/gently undulating land

surface and located along river courses. The elevation of the study area is 210-225 m amsl. Generally the slope is towards the eastern side of the study area.

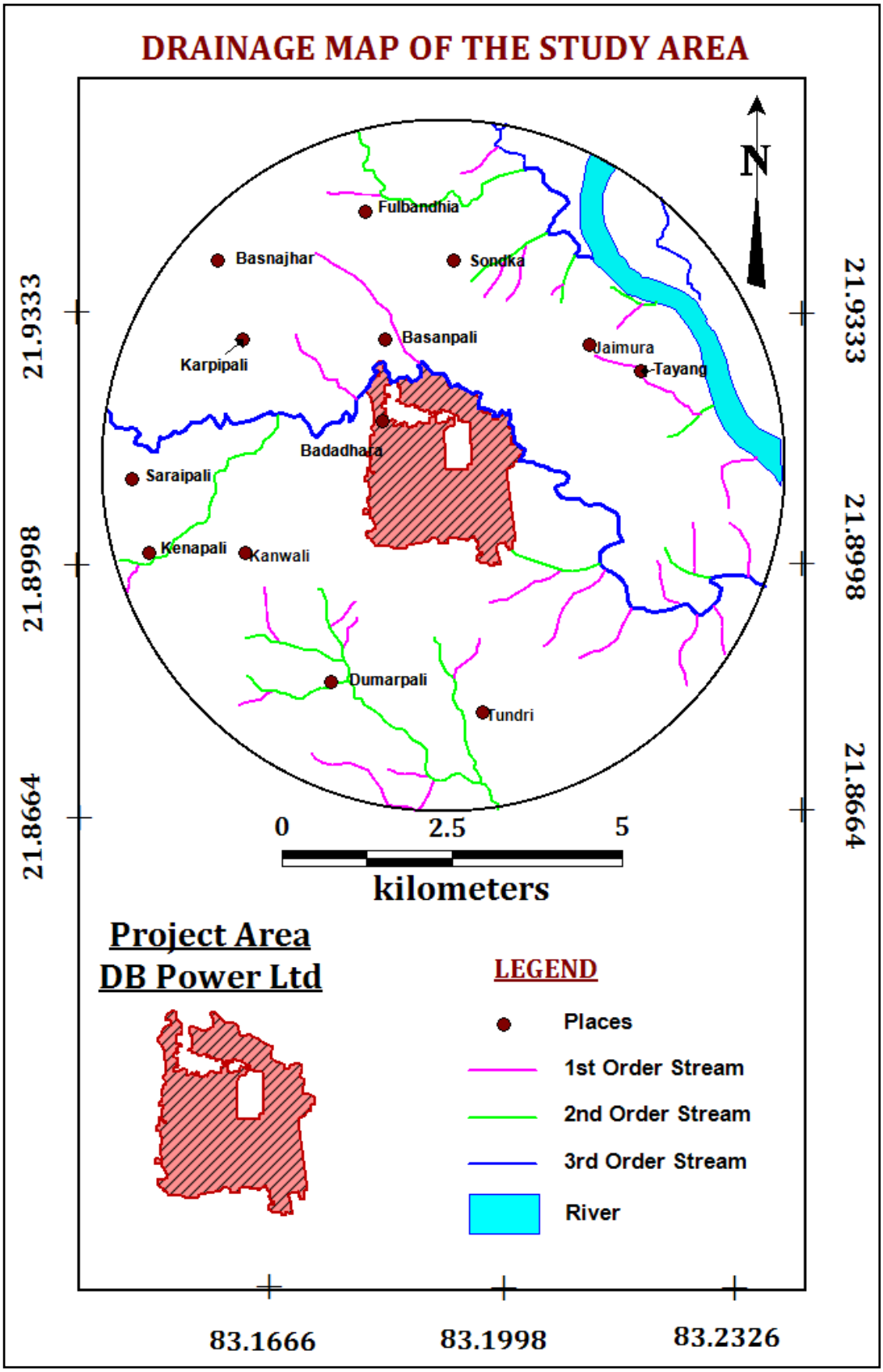


Fig 2.8: Drainage map of the Study area

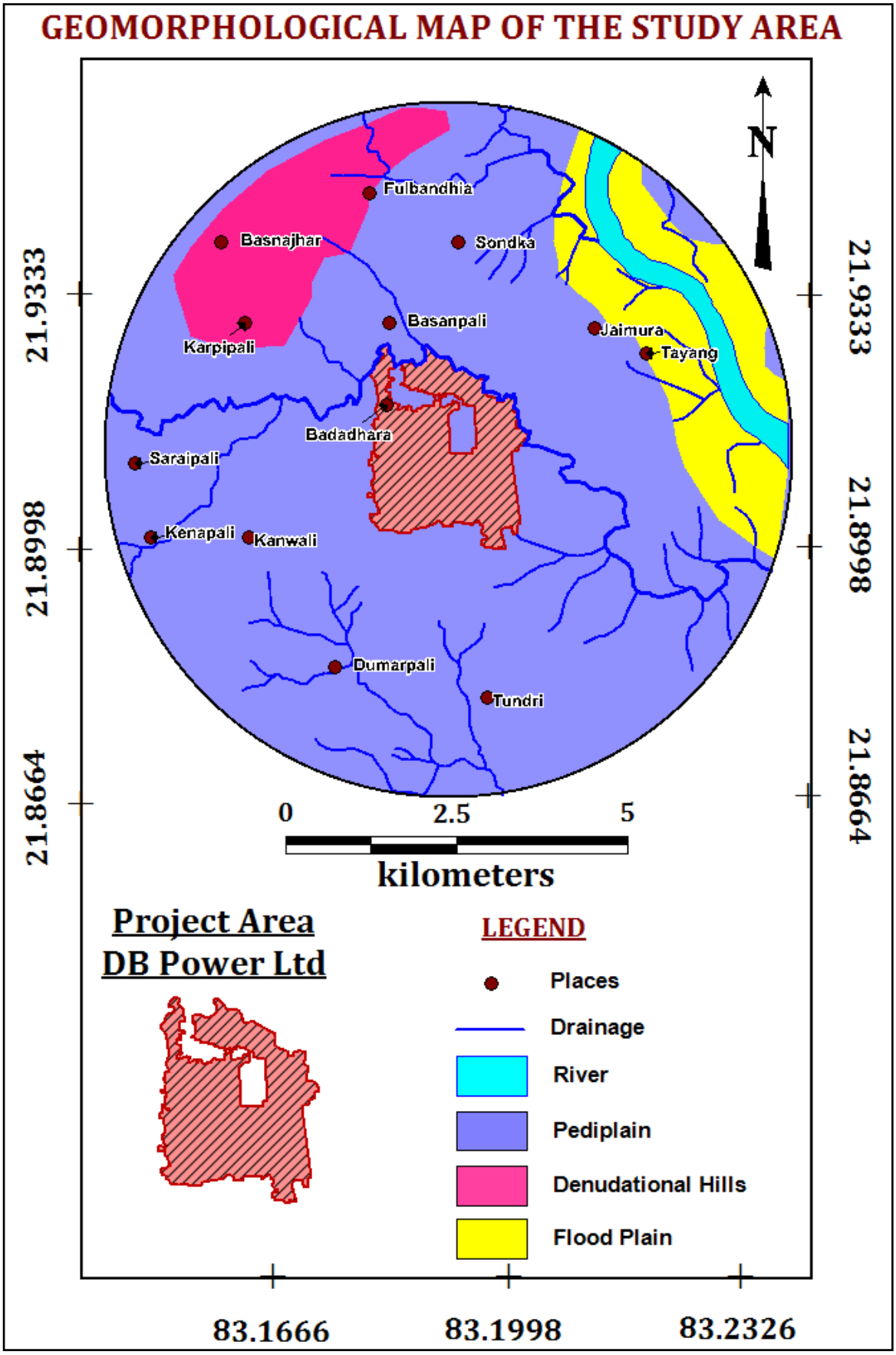


Fig 2.9: Geomorphological map the Study area

3. GEOLOGY

The rocks of the Chhattisgarh super group represented by limestone, Sandstone and shale. A thin layer of alluvium/ laterite belonging to Quaternary period is found on the top surface**.** The generalized stratigraphic sequence of formation in and around the area is given in **Table 3.1** below.

Table-3.1 Generalized stratigraphic sequence of Janjgir-Champa District

Age	Supergroup	Group	Formation	Lithology
QUATERNARY	Recent to sub-recent		Alluvium and Laterite	Sand, Silt, Clay and lateritic Soil
PROTEROZOIC	Chhattisgarh Supergroup	Raipur Group	Maniyarifm	Gypsiferous Shale
			Hirrifm	Dolomitic limestone
			Tarengafm	Shale & Dolomite
			Chandifm	Limestone & Shale
			Gunderdehifm	Shale
			Raigarh	**Shale,Limest.,Sandstone & Conglomerate**
			Charmuriafm	Limestone & Shale
		Chandrapur Group	Kanspatharfm	Sandstone, Siltstone Shale &Conglomerate
			Choparadihfm	
			Lohardifm	
		Bilari group Sonakhan gr Baya group	Intrusive, lakhadabri, Jonk&Chikhali	Quartz veins, basic dyke, Meta basalt Schist & Gneisses
ARCHAEAN	Basement crystallines- Granite, gneisses ,granulite and Amphibolite			

ii. 3.1.1 Basement Crystalline:

The basement crystallines belongs to Archaean age mainly consists of Granite, gneisses, granulite, phyllites and amphibolites. At places it is intruded by quartz veins. The overlying sedimentaries belongs to Chhattisgarh Super group of rocks. The contact between the Achaeans and the sedimentaries is faulted along the western margin of the basin.

iii. 3.1.2 Chhattisgarh Super group:

The crescent shaped Chhattisgarh basin within the Central Indian Craton can be subdivided into a small Baradwarproto-basin in the east and main Hirriproto -basin in the west. The entire succession of Chhattisgarh super group is divided into three groups. Lowermost Pairi group consists of sandstone, conglomerate, limestone and shale overlies unconformably on crystalline group and developed in the Baradwarproto-basin. The middle Chandrapur group un- conformably overlying the Singhora group or older basement and consists of arenite formations and third is Raipur group at the top, comprising argillite-carbonate suite of rock.

iv. 3.1.2.1 Chandrapur group:

The sequence of Chandrapur group shows a variable thickness ranging from 20 m to as much as 90 m. The maximum thickness is attained in SE part of the basin, thinning westward as well as NE side and directly overlying the crystalline basement.

v. 3.1.2.2 Raipur group:

The Raipur group comprising of predominantly argillite sequence conformably overlies the Chandrapur group with a gradational contact. The group has been subdivided into six sub-division representing three cycles of carbonate-argillite sediments as follows

Charmuria formation- dominantly carbonate sequence and is conformably overlain by Gunderdehi formation.

Gunderdehi formation- dominantly a calcareous argillite purple coloured shale with intercalated limestone is dominant member.

Chandi formation- comprise a major stromatolytic limestone sequence developed around southern side of Hirri sub-basin as arcuate outcrop pattern and is medium to course grained dolomitic limestone.

Tarenga formation- conformably overlies the Chandi formation and comprise cherty shale, calcareous shale and argillaceous dolomite, green and white clay.

Hirri formation- conformably overlies the Tarenga formation in south and Pandaria formation(coalesce of Charmuria, Gunderdehi, Chandi and tarenga formation) in the north. At places intra-formational conglomerate, dolomite and black shale contained gypsum as layer parallel to bedding.

Maniyari formation- named after the river along which the rock is best developed. It represents the closing phase of deposition in Chhattisgarh basin and consists of lower gypsiferous grey siltstone and shale followed by reddish brown calcareous and non-calcareous shale with limestone and dolomite.

vi. Recent to sub-recent:

3.1.3.1 Laterite:

Insitu and rolled laterite occurs at many places in isolated patches. These are blanket deposits and few centimeters to few meters in thickness. The ferruginous rock formations of Chhattisgarh Supergroup are responsible for the formation of thin capping of laterite due to leaching and concentration of iron oxide from sandstone of Chandrapur group and also of shale of Raipur group.

3.1.3.2 Alluvium:

The alluvium consists of sand, silt and clay. The sands are fine to coarse grained and poorly sorted. The alluvial soils are mostly of residual in nature and are the weathered products of shale and limestone. The thickness of soil varies from few centimeters to over 10m in places.

3.2 LOCAL GEOLOGY:

The area is underlain by thin layer alluvial/laterite belonging to Quaternary period. Thick pile of rocks belonging to Raipur group of Younger Proterozoic period consisting of shale, underlie the alluvial sediments **(Fig 3.1).** The formation have general strike in NE-SW direction with very low dips of 2°to 3° due NW. Two sets of vertical joints trending in N50°E- S50°W and NE-SW direction are prominent in the area. The gap between joint plain is large from few centimeters to 5meters and are mostly interconnected. The lithological characters of various formations present in the study area are described as follows:

3.2.1: Raigarh Formation: The formation is widely developed in Baradwar sub-basin, comprising dominantly friable calcareous purple shale with limestone intercalations. The formation can be classified into a lower shale flaggy carbonate-arenite member which is followed upward by a purple calcareous shale member. Unlike Hirri sub-basin, the bedded flaggy limestone gradually changes in its outcrop width and further east it pinches out occurring as pockets and lenses in the purple shale above the Chandarpur arenite. At places, arenite lenses and bands are also present in the member. The upper member is mainly purple calcareous shale with limestone as well as arenite lenses. Mud cracks and ripple marks are the common structures. One of the mappablearenite members is Dhurkotarenite occurring within the shale and comprises conglomerates and sandstone. Conglomerate consists of clasts of quartz, shale, jasper and chert embedded in siliceous matrix. This grades to a sandstone which is coarse to medium grained containing argillaceous and calcareous matrix. The dark grey dolomite in subsurface grades to light grey to cement limestone. A thin friable green sandstone unit occurs in SariaBorda area of Baramkela block. They also described presence of dolostone around Raigarh town. Some Stromatolitic limestones within this formation in Raigarh district indicate extension of Bamandih Formation upto Raigarh district. In the study area there are two types of rock formation are found.

1. Raigarh Sandstone

2. Raigarh Shale

Raigarh Sandstone is found in the central, Northern and North-Western part of the study area.

Raigarh Shale is found in Southern, Eastern and western part of the study area.

vii. 3.2.2: Soil/Alluvium:

Along The river course is underlain by alluvial residual soil covers which are loam and sandy loam. The thickness of overburden varies from 2 to 6 m. In order to understand the geological sequence fully well in the project site geological map of study area are present in **Fig 3.1.**

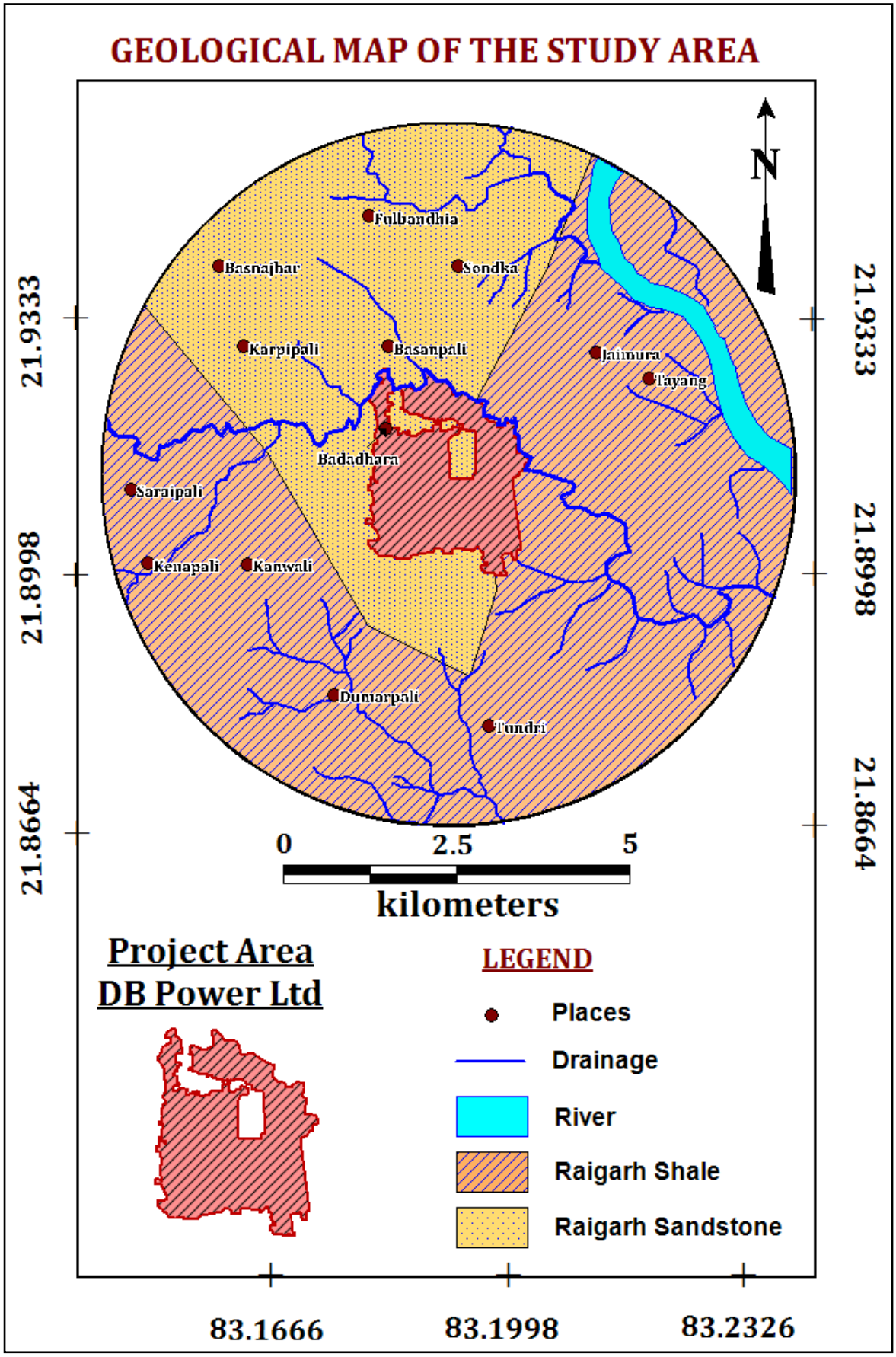


Fig 3.1: Geological map of the Study area

4. HYDROGEOLOGY

4.1 INTRODUCTION

Ground water occurrence is highly influenced by underlying geological formations and their hydro-geological characteristic. Weathered and fractured zones present in the rocks or formation provides scope of ground water occurrence, storage and its movement. Hydrogeology of the area broadly describes the disposition of aquifers, occurrence of ground water its movement, yield potential of water bearing formations, groundwater regime conditions in space and time etc. Detailed hydro-geological investigation has been carried out in and around the project area for elucidating the hydrogeology and establishing the interrelationships between various hydraulic parameters.

4.2 GROUND WATER OCCURRENCE AND AQUIFER SYSTEMS

In the study area, ground water occurs under phreatic or unconfined condition in weathered portion of rocks and semi-confined to confined conditions in fractures/cavernous part of rocks i.e. Sandstone and shale at depths. The shallow aquifers occur within an average depth of 25 m. The configuration of water table in the shallow aquifer follows the topography due to which the ground water movement is generally towards valleys or topographic low. The water bodies such as tanks, canals and streams also influence the occurrence and movement of ground water in shallow aquifers. The shallow aquifers of the area are mostly developed by way of dug wells in the area with depth ranges from 7 to 16 m. In general the yield of dug wells ranges from 25 to 40m^3/day. Deeper aquifer in the area mainly formed of Raipur group of rocks constituted of Raigarh formation comprising Sandstone and shale. The deeper aquifers of the area are mostly developed by way of bore wells with depth range from 50 to 80 m. In general, the yield of bore wells ranges from 1 to 5 lps.

4.3 WATER TABLE CONFIGURATION AND FLOW DIRECTION

The flow direction is of two directions i.e. in western, central and northern part of the study area it is towards East Direction and in southern part of the study area it is towards North-East direction indicating the surface water divide in the central portion of the study area near to project area.

The water table elevation in the study area ranges between 210 to 225 mamsl indicating more or less the plain terrain. North-Eastern part of the area is having low altitude of water table elevation i.e. 210 mamsl while water table elevation increases to western side & is maximum i.e. 225 mamsl. The gradient of water table is variable. In the area the yield ranges between1 to 5 lps in Central, Northern, North-Eastern & North-western indicating the area is covered by Sandstone while in major part of the area it is below 1 lps which is covered with shale. Contour map & Hydrogeological map is given at **Fig.4.1 and 4.2 r**espectively.

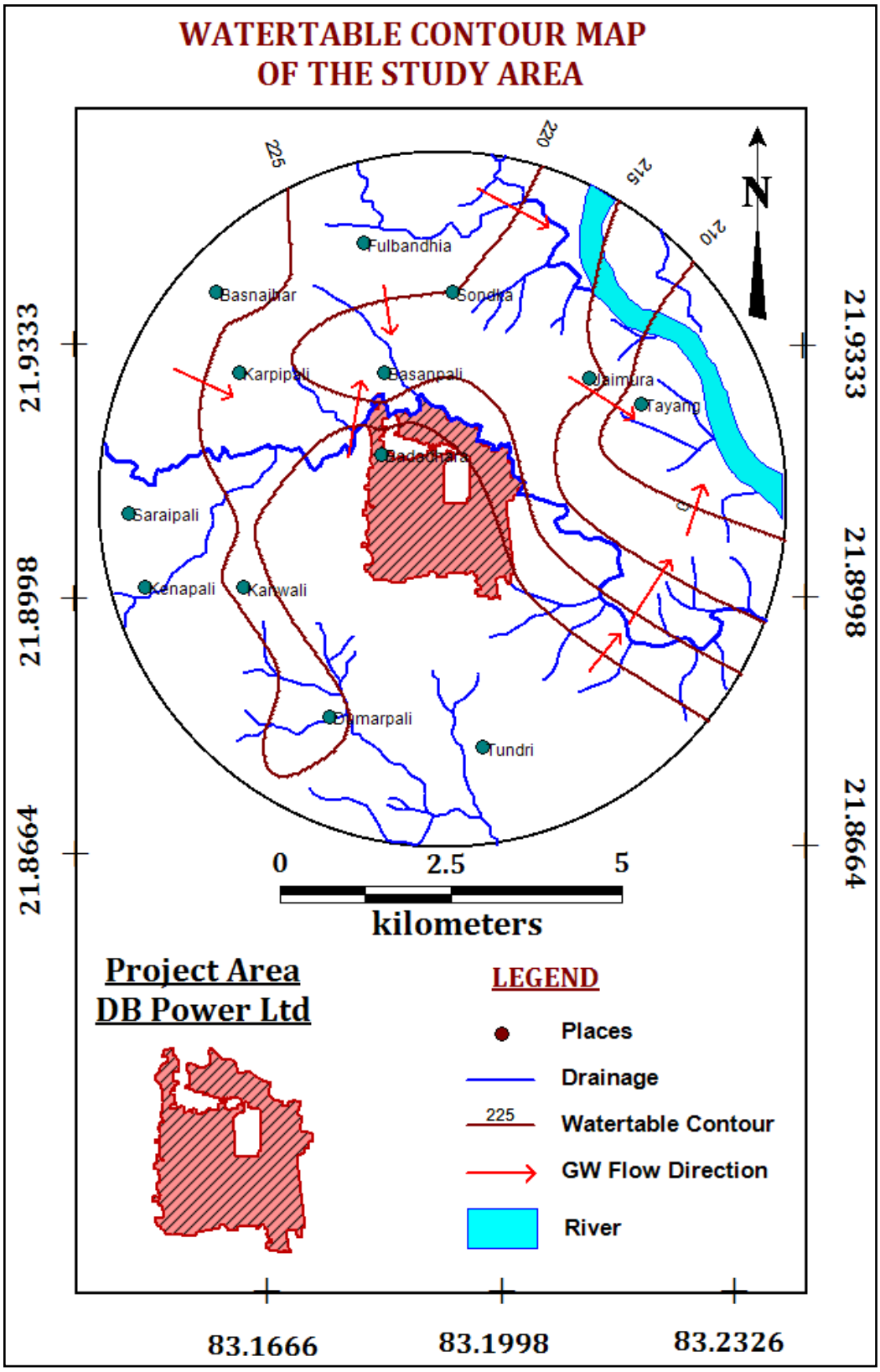


Fig 4.1 Water table contour and ground water flow direction

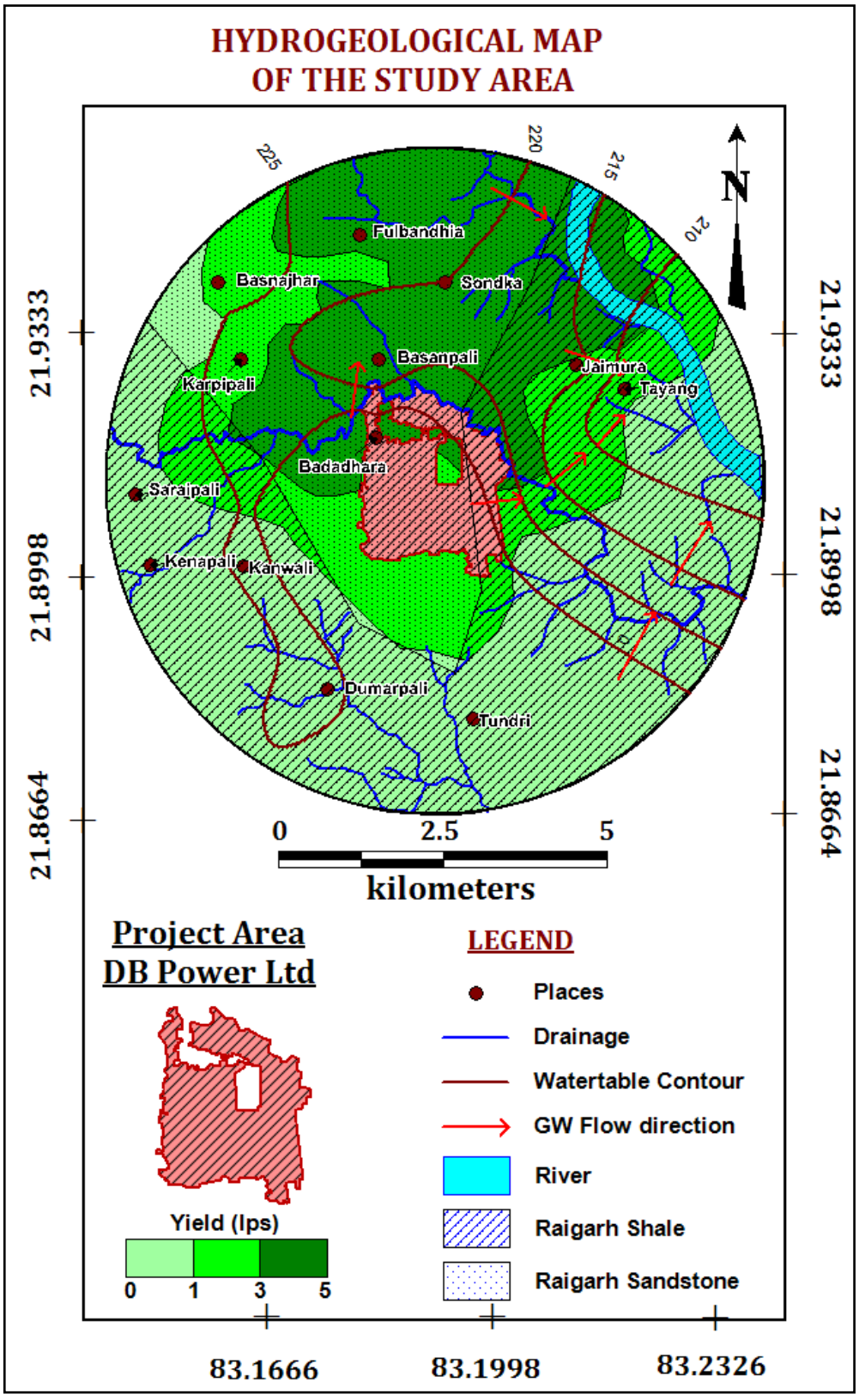
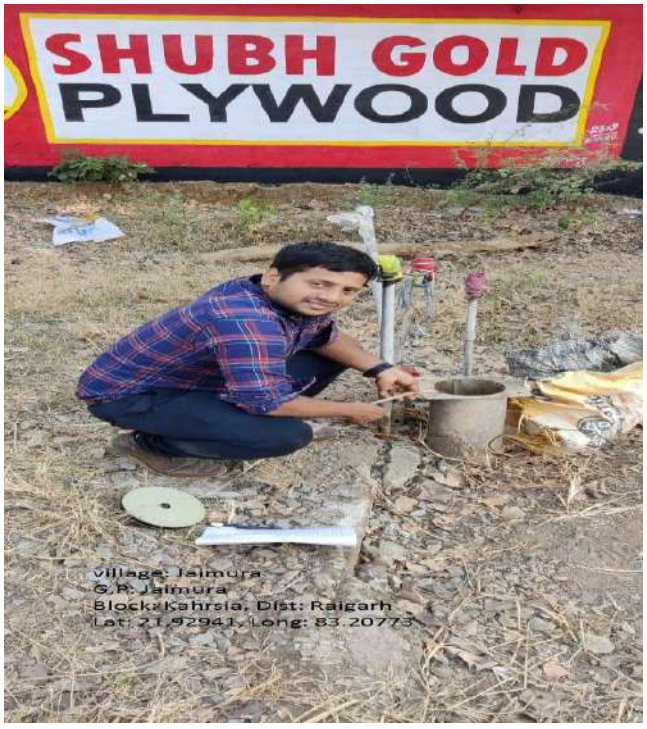


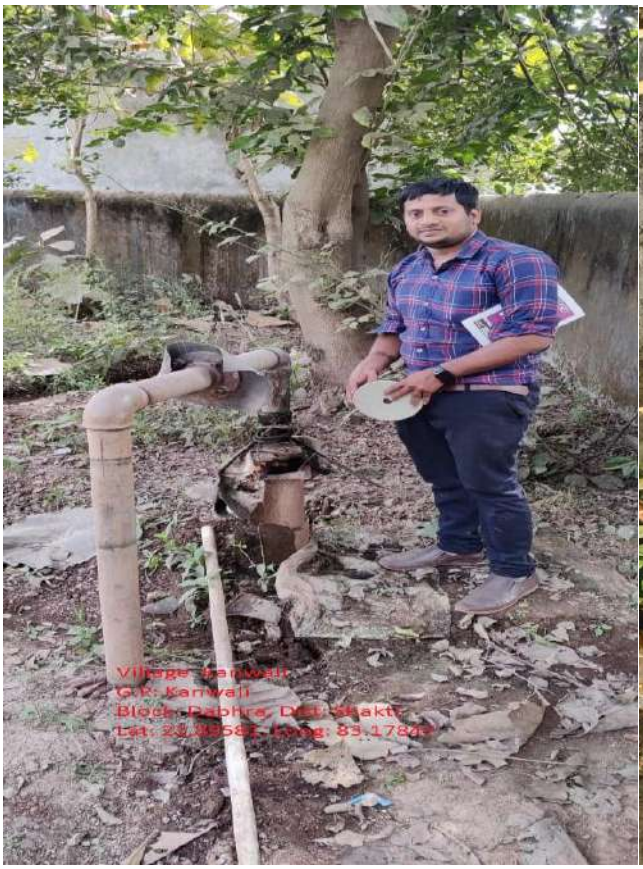
Fig 4.2: Hydrogeological Map of the Study area

4.4 GROUND WATER REGIME MONITORING

The monitoring of ground water regime is of immense help in management of the water resources as well as protecting the ground water storage. Such study envisages regular monitoring of water level at selected locations to observe the changes in ground water level and variation in ground water quality with respect to time and space. It is pertinent to say that any development of ground water resources in a particular area would bring changes in ground water regime if input to the ground water system is not balanced with output from the same system.

The study aims to observe the changes in ground water levels and quality with respect to the ground water development, which in turn would help in identifying the appropriate measures to be adopted for artificial recharge to ground water and neutralize the impact of the excessive ground water development. In the present report, the monitored data has been presented and the overall picture of ground water regime behavior due to continuous abstraction of ground water has been analyzed for the year 2019-20. Ground water regime monitoring was carried out two times in a year i.e. May, and November. The water level data of the month of May and November are taken as levels of pre-monsoon and post-monsoon respectively, Data presented and analysed for pre and postmonsoon water level data. The photographs of the some monitoring stations are indicated in **plate: I**, which was taken during the collection of water level of ground water in all four seasons.

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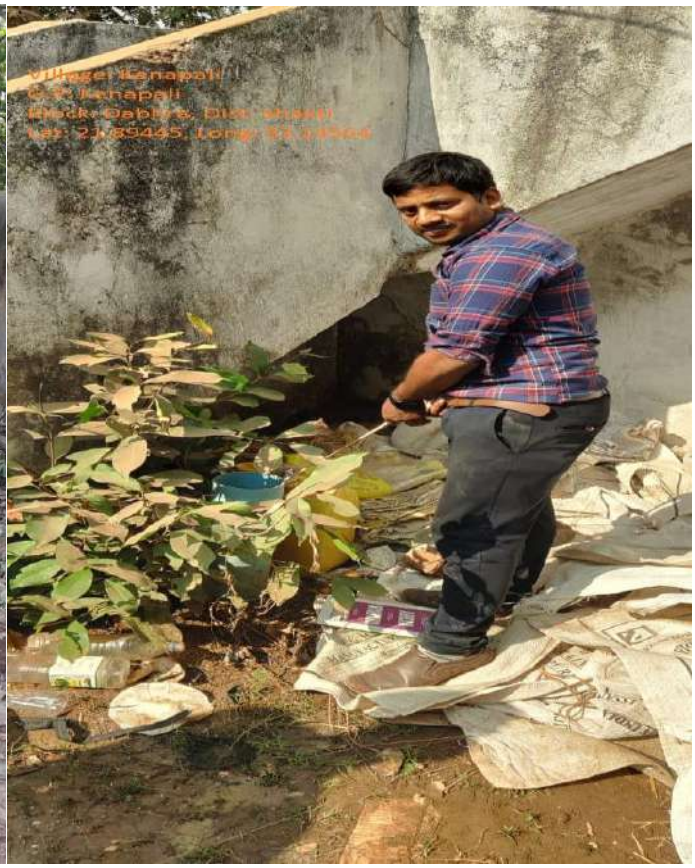
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G.P: Kanapali
Block: Pabhra, Dist: Shakti
Lat: 21.89445, Long: 83.14904


Village: Amapali
G.P: Amapali
Block: Kharsia, Dist: Raigarh
Lat: 21.9562, Long: 831865


सतनाम भवन आदर्श ग्राम फूलबांधिया
कार्य का नाम - सामुदायिक भवन निर्माण
(सतनामी समाज)
ग्राम - फूलबंधिया
कार्य एजेंसी - कार्यपालन अभियंता
ग्रा.या.सेवा संभाग रायगढ़
मद /योजना - मुख्य मंत्री घोषणा मद
प्र.स्वी. राशि - 15.00 लाख
निविदा राशि - 11.55 लाख
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G.P: Pandripani
Block: Kharsia, Dist: Raigarh
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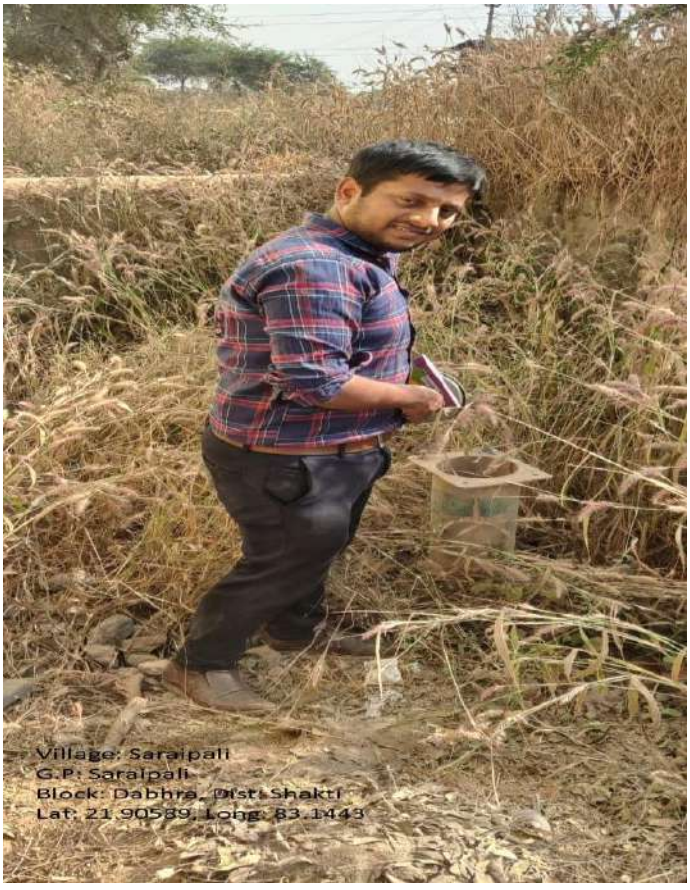
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Village: Tayang
G.P: Jaimura
Block: Kharsia, Dist: Raigarh
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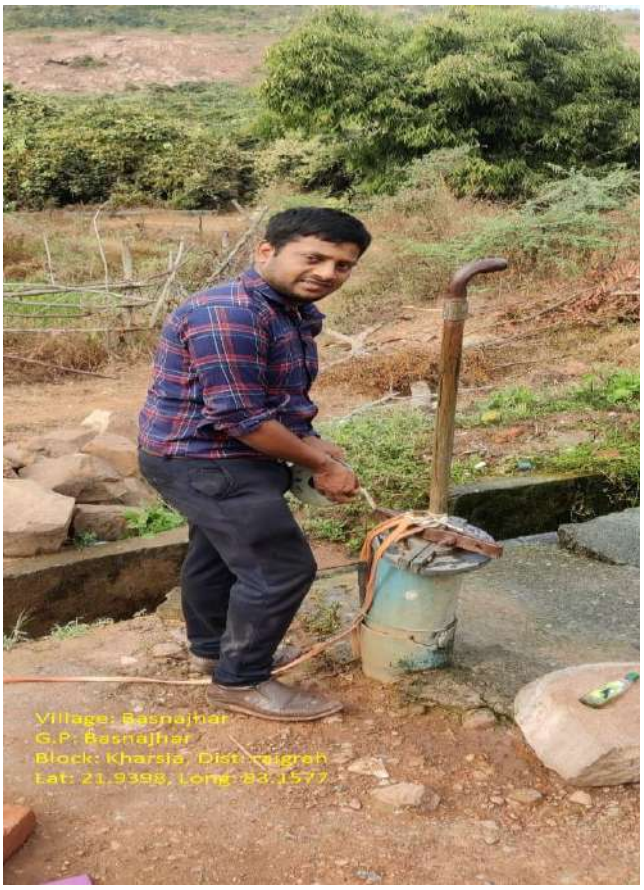
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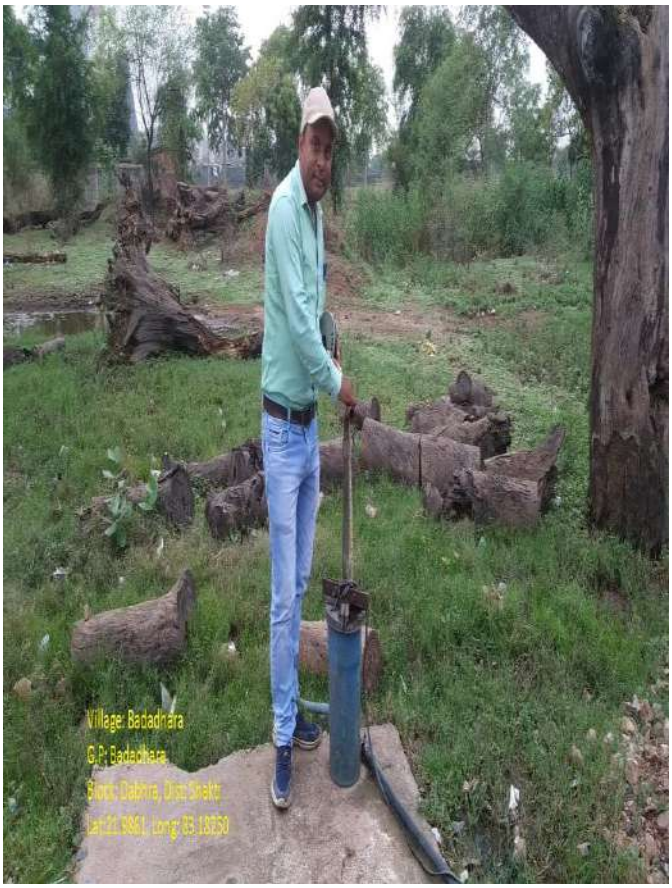
G.P: Basnajhar
Block: Kharsia, Dist: raigarh
Lat: 21.9398, Long: 83.1577


Village: Badadhara
G.P: Badadhara
Block: Dabhra, Dist: Sakti


Village: Sondka
G.P: Sondka
Block: Kharsia, Dist: Raigarh
Lat:21.9375, Long: 83.18999


DISE CODE 22060511213 N
CG13AR0425
Village: Tundri
G.P: Tundri
Block: Dabhra, Dist: Shakti
Lat:21.89234, Long: 83.18507

4.4.1 Distribution of monitoring stations

To study the change in ground water regime in and around study area, total of 14 monitoring wells were established at different locations for regular monitoring of ground water level. The basic details of these monitoring wells are presented in **Table 4.1** and their distribution is presented in **Fig 4.3.**

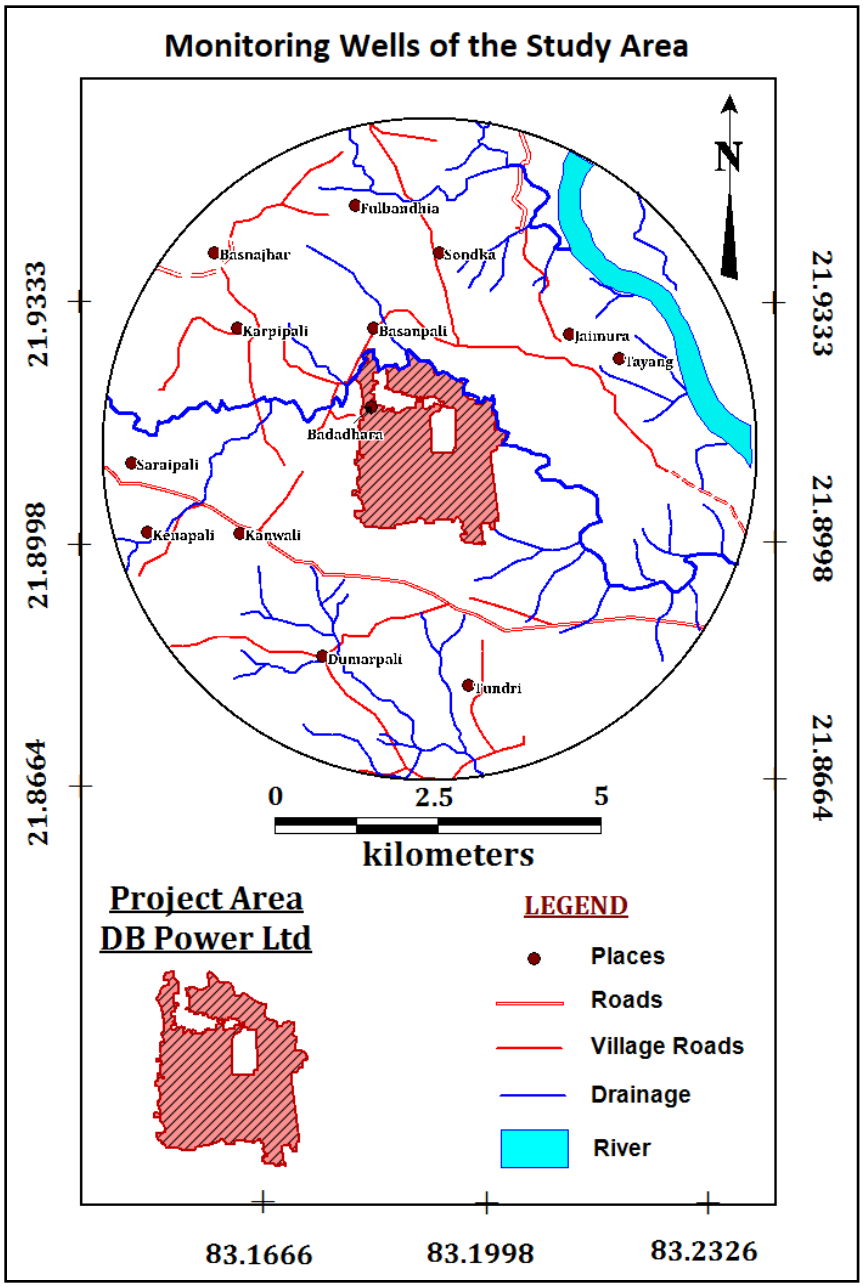


Fig 4.3: location of monitoring wells of the Study area

Table 4.1 : Basic details of established monitoring wells

Sl No.	Village	G.P.	Block	District	RL Of ground level (mamsl)	DIA (m)
1	Amapali	Kherpali	Kharsia	Raigarh	232	2.4 Mtr
2	Sondka	Sondka	Kharsia	Raigarh	233	6 Inch
3	Badadhara	Badadhara	Dabhra	Shakti	231	6 Inch
4	Basnajhar	Basnajhar	Kharsia	Raigarh	241	8 Inch
5	Fulbandhia	Pandripani	Kharsia	Raigarh	232	6 Inch
6	Karpipali	Kanmuna	Kharsia	Raigarh	234	6 Inch
7	Tundri	Tundri	Dabhra	Shakti	236	6 Inch
8	Basanpali	Sondka	Kharsia	Raigarh	223	6 Inch
9	Kenapali	Kenapali	Dabhra	Shakti	237	5 inch
10	Saraipali	Saraipali	Dabhra	Shakti	239	6 Inch
11	Kanwali	Kanwali	Dabhra	Shakti	232	6 Inch
12	Dumarpali	Dumarpali	Dabhra	Shakti	232	6 Inch
13	Tayang	Jaimura	Kharsia	Raigarh	221	2.0 mtr
14	Jaimura	Jaimura	Kharsia	Raigarh	224	6 inch

5. ANALYSIS OF WATER LEVELS

5.1 INTRODUCTION

Ground water levels or piezometric heads is resultant of all input and output to ground water system with defined boundaries. Ground water is a dynamic system. The parameters required to be monitored during ground water regime monitoring are ground water level or piezometric heads and chemical quality. These are subject to change due to natural and or anthropogenic causes with respect to dime and space. Rainfall, natural recharge to ground water, ground water draft and seepage from surface water bodies plays important roles in changes in ground water level fluctuations. The quality of water is being recharge, nature of host rock and dilution/concentration of ground water impacts the changes in ground water quality. Monitoring of ground water quality and temperature are one of the essential components for ground water regime monitoring. The monitored data is analyzed in time and space to assess the changes and a relationship is established to determine the impact of ground water development and recharge to the system.

5.2 GROUND WATER LEVELS:

The configuration of the water table depends upon by topography, geology, climate, water yielding and water bearing properties of rocks in the zones of aeration and saturation, which control ground water recharge. The upper surface of the zone of saturation is the water table. In case of wells penetrating confined aquifers, the water level represents the pressure or piezometric head at that point. Ground water monitoring network planning is basic step for ground water regime monitoring and further, for assessment of groundwater resources and planning for development and management programs. The groundwater, being hidden resource can only be analyzed through its signatures in the form of water level fluctuations. The systematic and regular monitoring of groundwater levels can bring out the changes taking place in the regime. The data so generated are of immense help for regional groundwater flow modeling for planning and management of ground water resources and its sustainability. Modeling provides necessary information to the user agencies to frame contingency plans in case of unfavorable groundwater recharge situation.

The data have also immense utility in implementing the legal provisions of groundwater regulation, and to substantiate expert advice in legal issues arising out of conflicting interests of ground water

users. Ground water regime data of different seasons have been collected for the year 2022, analyzed for every set of measurements and discussed with maps in following sections.

viii. 5.2.1 Analysis of water levels (2022)

The water level data collected two times during the year 2022 from the observation wells in core zone as well as buffer zone is presented in **Table 5.1.**

Table 5.1: Depth to water levels monitored in the study area (during 2022)

Sl No.	Village	Latitudes	Longitudes	Post monsoon depth to water 2022 level (mbgl)	Pre monsoon depth to water level 2022 (mbgl)	Fluctuation May 2022 Vs Nov 2022 (m)	RL of pre monsoon water level (mamsl)
1	Amapali	21.9562	83.1865	4.0	8.5	4.5	223.5
2	Sondka	21.9375	83.18999	11.2	12.46	1.26	220.54
3	Badadhara	21.9861	83.18250	1.8	3.68	1.88	227.32
4	Basnajhar	21.9398	83.1577	11.20	13.20	2	227.8
5	Fulbandhia	21.95049	83.318282	6.3	9.0	2.7	223
6	Karpipali	21.92944	83.16250	9.2	13.12	3.92	220.88
7	Tundri	21.89234	83.18507	4.3	6.9	2.6	229.1
8	Basanpali	21.93292	83.18507	1.8	6.45	4.65	216.55
9	Kenapali	21.89445	83.14564	4.7	8.20	3.5	228.8
10	Saraipali	21.90589	83.1443	5.2	7.20	2	231.8
11	Kanwali	21.89581	83.17847	7.55	10.23	2.68	221.77

Sl No.	Village	Latitudes	Longitudes	Post monsoon depth to water 2022 level (mbgl)	Pre monsoon depth to water level 2022 (mbgl)	Fluctuation May 2022 Vs Nov 2022 (m)	RL of pre monsoon water level (mamsl)
12	Dumarpali	21.88683	83.17648	2.5	8.0	5.5	224
13	Tayang	21.92738	83.22467	6.9	10.10	3.2	210.9
14	Jaimura	21.92941	83.20773	9.4	11.60	2.2	212.4

5.2.1.1 Post-monsoon Depth to Water level (November' 2022)

The depth to water level map has been prepared based on ground water monitoring data of Nov 2022. On perusal of the data and map given at Fig.5.1, it is observed that the overall depth to water level remains between 1.8 and 11.20 meters below ground level. The post-monsoon depths to water level range of 4 to 6 mbgl are observed at Kenapali, Saraipali, Amapali & Tundri villages. Ground water levels more than 6 mbgl are observed in the villages Tayang, Karpipali, Fulbandhia, Jaimura, Kanwali & Basnajhar Villages. Water level less than 4 mbgl are observed in the remaining parts of the study area.

5.2.1.2 Pre-monsoon Depth to Water level (May' 2022)

The depth to water level map has been prepared based on ground water monitoring data of May 2022. From the perusal of Table 5.1, it is observed that the overall depth to water level remains between 3.68 to 13.20 meters below ground level. The pre-monsoon depth to water levels ranges Below 5 mbgl is observed in Badadhara villages. Water levels are between 5 - 10 mbgl is observed in the villages namely Amapali, Basanpali, Saraipali, Kenapali, Dumerpali & Tundri, Fulbandhia villages. Water level greater than 10 mbgl is observed in the remaining parts of the study area as shown in Fig 5.2.

5.2.1.3 Seasonal water level fluctuation (Nov.' 2022 Vs May' 2022).

Based on the pre-monsoon & post-monsoon data water level fluctuation in the study area is calculated & respective map (as shown in Fig 5.3) has also been prepared. It is observed that in the study area water level fluctuation varies from 1.26 to 5.5 meters.

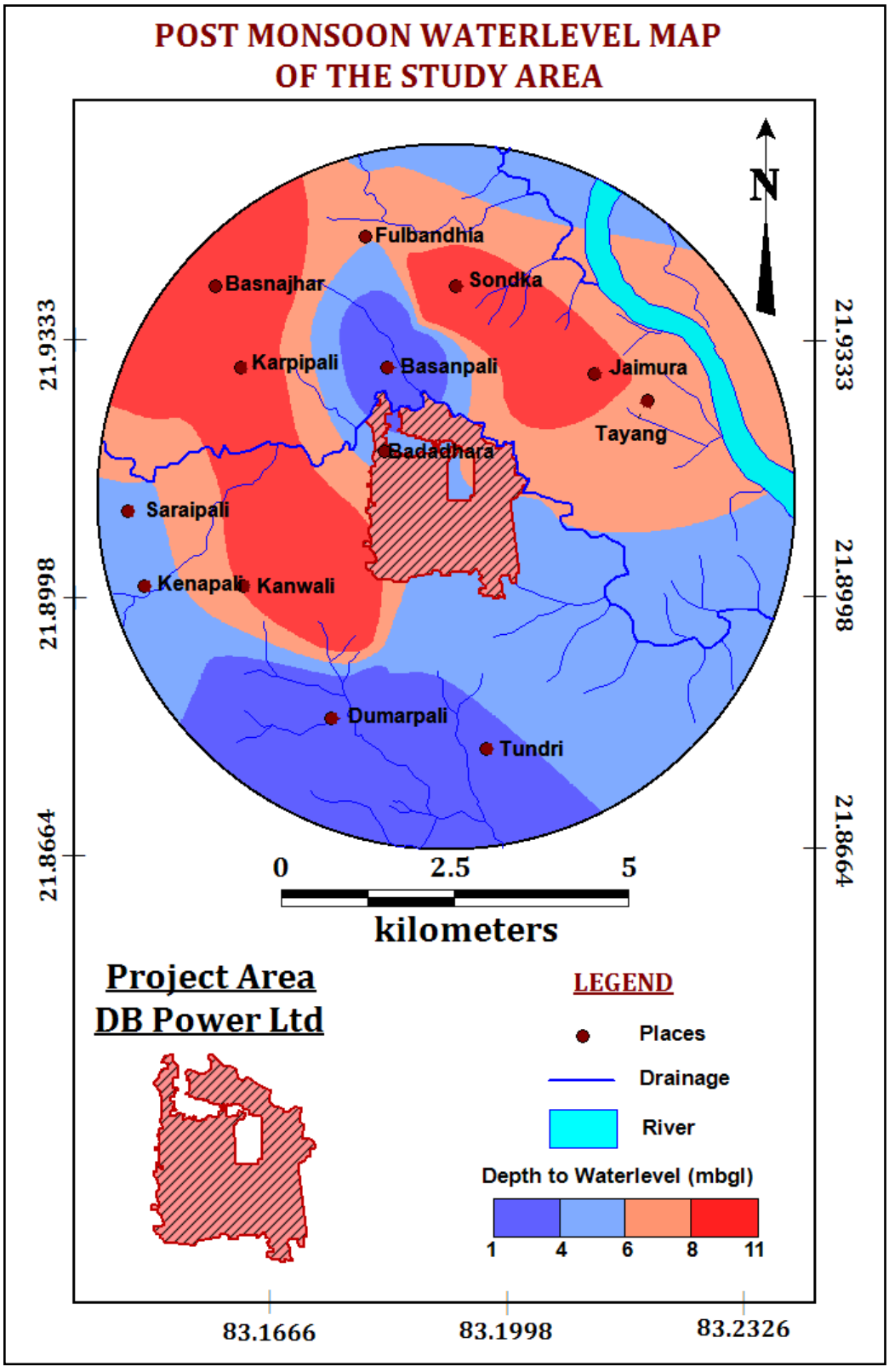


Fig.5.1: Post-monsoon Depth to Water level map (Nov'2022)

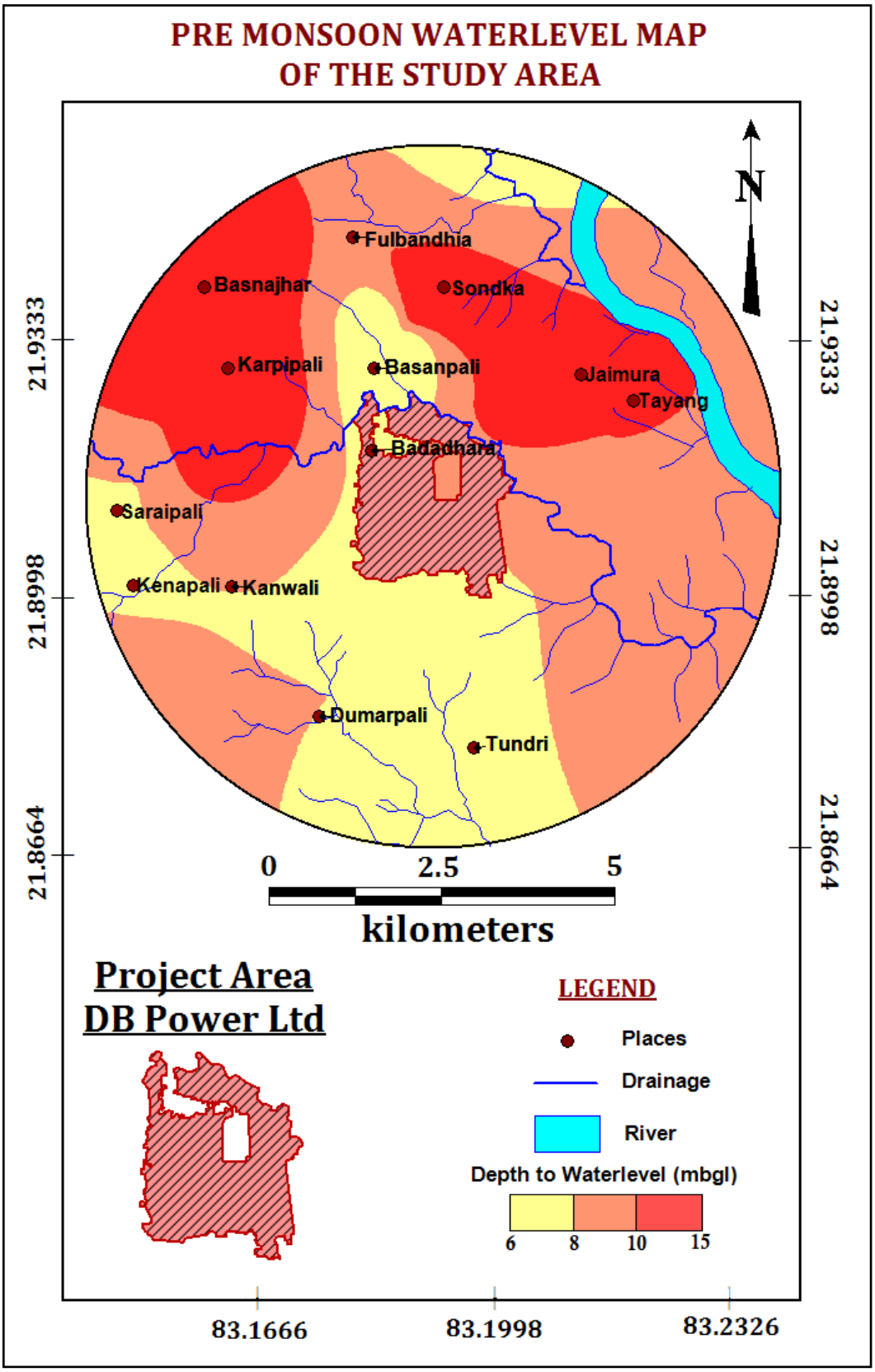


Fig.5.2: Pre-monsoon Depth to Water level map (May'2022)

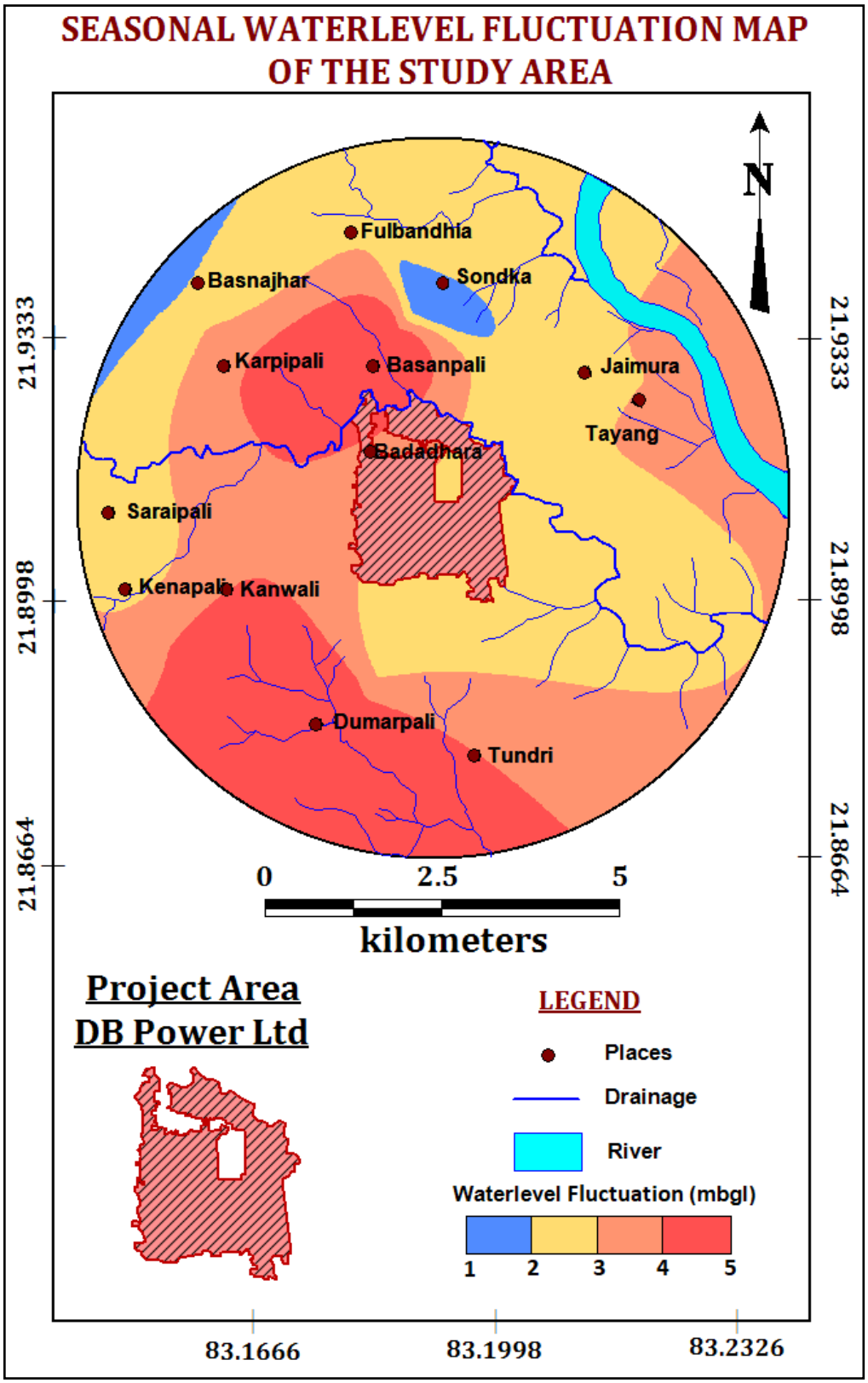
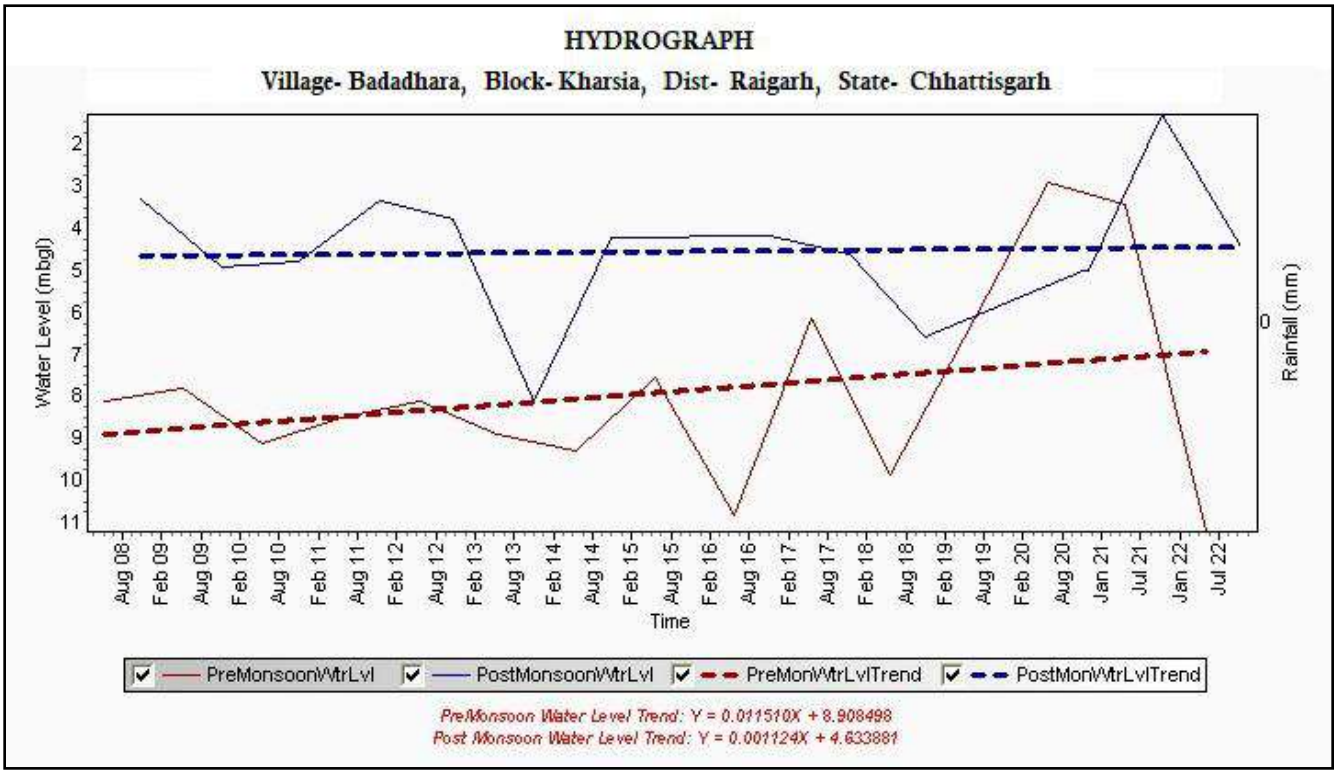
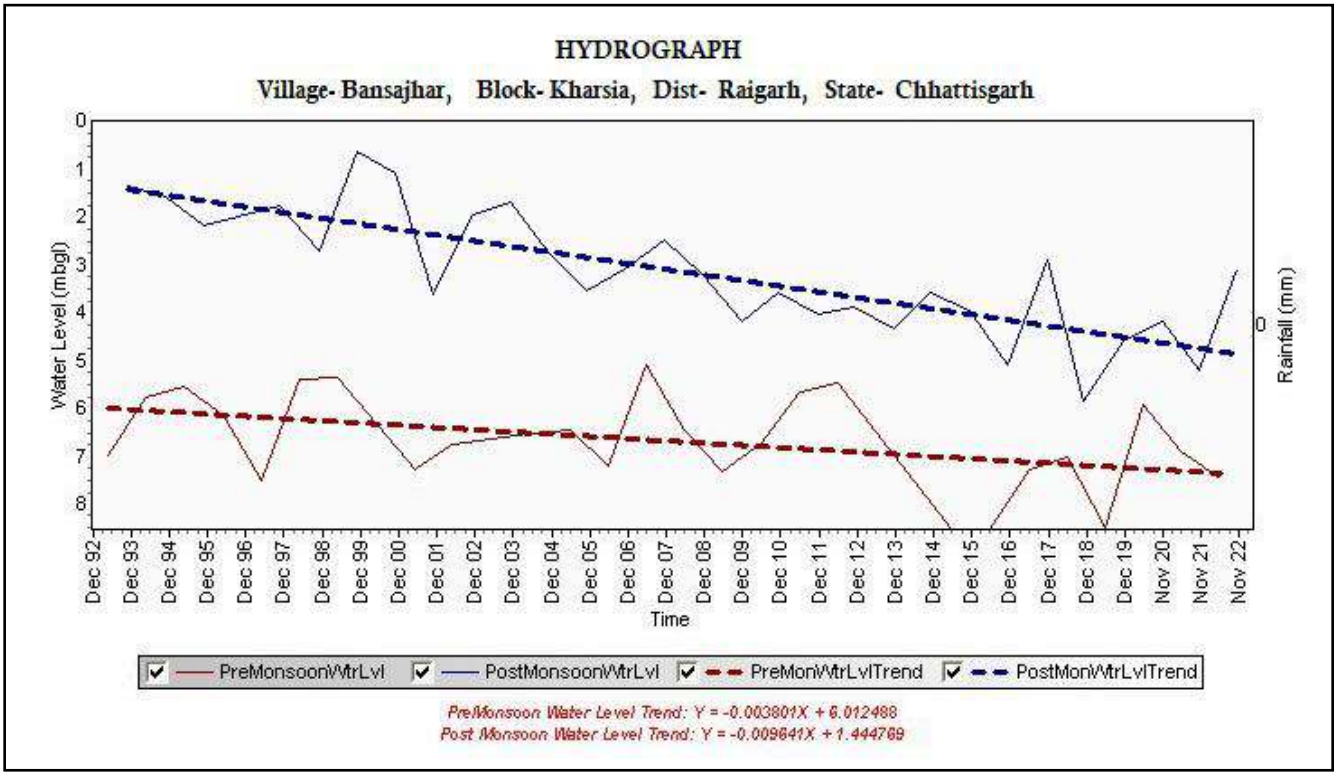


Fig 5.3: Seasonal Water Level Fluctuation map (Nov.' 2022 Vs May' 2022)

5.2. Ground Water Trends or Hydrographs of the Study Area





5.3 AQUIFER PARAMETERS:

Pumping test has been carried out for determination of aquifer parameters accurately. The aquifer parameters of study area covered by Sandstone are described below.

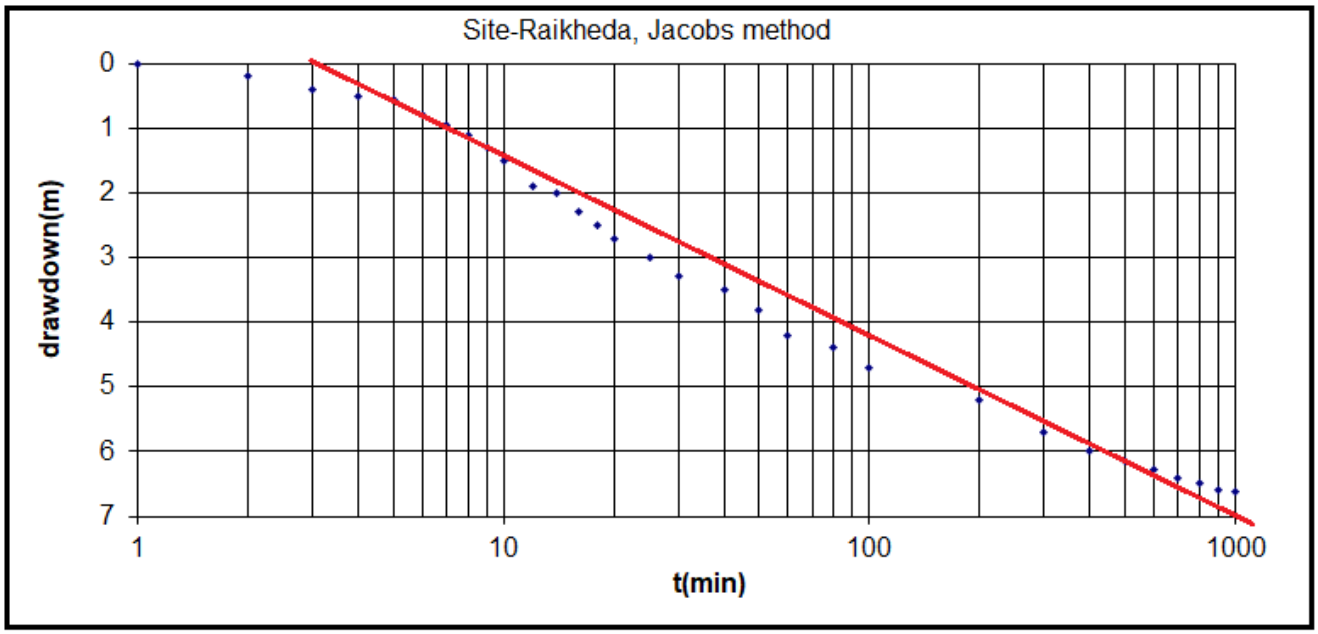
The transmissivity values of phreatic aquifer tapped in open well in general varies from 4 to 8.5 m^2/day while specific capacity ranges from 15 to 40 lpm/m/day. However for deep aquifer the transmissivity ranges from 15-32 m^2/day and at places it ranges up to 40m^2/day.

To verify the aquifer parameters of the aquifer present in the area pumping test has been carried out on a private /public bore well at Badadharha village (close to Project). The results and data interpretation is discussed below

Village	Badadharha
Block	Dabhra
	Janjgir-
District	Champa
State	Chattisgarh
Duration of test	1000 minutes
Capacity of pump	5 hp
Distance of OW from pump well	45 m.
Thickness of the aquifer	10
MP(magl)	0.8
SWL(mbmp)	6.5
Discharge(lps)	5

Table 5.2: Pumping Data observation well						
Sl.no.	Time since pumping started (min)	Tape Reading (m)		DTW (mbmp)	Draw Down (m)	Remarks
		Hold	Cut			
1	1	20	13.50	6.50	0.00	
2	2	20	13.30	6.70	0.20	
3	3	20	13.10	6.90	0.40	
4	4	20	13.00	7.00	0.50	
5	5	20	12.95	7.05	0.55	
6	6	20	12.70	7.30	0.80	
7	7	20	12.55	7.45	0.95	
8	8	20	12.40	7.60	1.10	
9	9	20	12.20	7.80	1.30	
10	10	20	12.00	8.00	1.50	
11	12	20	11.60	8.40	1.90	
12	14	20	11.50	8.50	2.00	
13	16	20	11.20	8.80	2.30	
14	18	20	11.01	8.99	2.49	
15	20	20	10.80	9.20	2.70	
16	25	20	10.50	9.50	3.00	
17	30	20	10.20	9.80	3.30	
18	40	20	10.00	10.00	3.50	
19	50	20	9.68	10.32	3.82	
20	60	20	9.30	10.70	4.20	
21	80	20	9.10	10.90	4.40	
22	100	20	8.80	11.20	4.70	
23	200	20	8.30	11.70	5.20	
24	300	20	7.80	12.20	5.70	
25	400	20	7.50	12.50	6.00	
26	500	20	7.35	12.65	6.15	

27	600	20	7.22	12.78	6.28	
28	700	20	7.09	12.91	6.41	
29	800	20	7.00	13.00	6.50	
30	900	20	6.90	13.10	6.60	
31	1000	20	6.88	13.12	6.62	



The pumping test data has been analyzed by Jacob's straight line method of the pumping data of the observation well. The calculation is given below.

Formulae: $T= 2.3Q/4\pi\Delta s$

$K==T/b$ &

$S= 2.25\ T\ t_o/r^2$

Where,

T =kD = Transmissivity, m^2/day

K =Permeability

B= Thickness of aquifer

Q = Discharge m^3/day

r = Distance (m) between PW & OW

Δs = Slope of straight line per log cycle of time

S = Storage coefficient

t_o= time in days at zero drawdown

On the basis of above formulae, the calculated parameters are as follows.

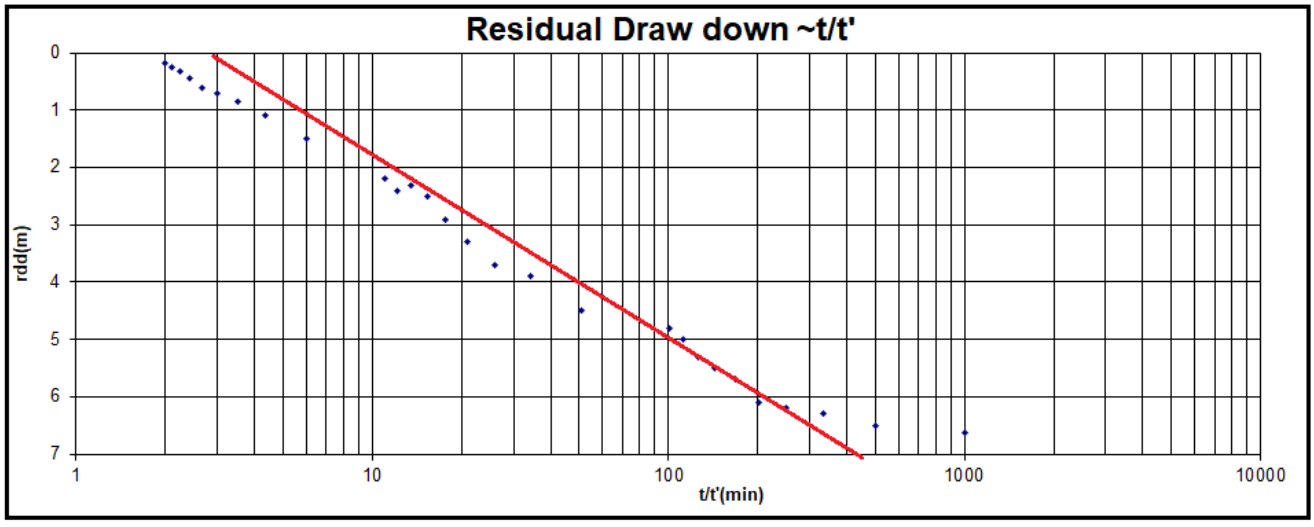
T= 30.42 m^2/day, K=2.3765 m/day&

S= 7.041 $X10^{-5}$

Table 5.3: Recuperation Data

Time since pumping started in min(t)	Time since pumping stopped in min (t')	t/t'	Tape reading (m)		DTW (mbmp)	RDD (m)	Remarks
			Hold	Cut			
1001	1	1001.00	20	6.88	13.12	6.62	
1002	2	501.00	20	7	13	6.5	
1003	3	334.33	20	7.1	12.9	6.4	
1004	4	251.00	20	7.29	12.71	6.21	
1005	5	201.00	20	7.4	12.6	6.1	
1006	6	167.67	20	7.5	12.5	6	
1007	7	143.86	20	7.66	12.34	5.84	
1008	8	126.00	20	7.89	12.11	5.61	
1009	9	112.11	16	4.1	11.9	5.4	
1010	10	101.00	16	4.5	11.5	5	
1020	20	51.00	16	5	11	4.5	
1030	30	34.33	16	5.6	10.4	3.9	
1040	40	26.00	16	5.8	10.2	3.7	
1050	50	21.00	16	6.2	9.8	3.3	

1060	60	17.67	16	6.6	9.4	2.9	
1070	70	15.29	16	6.99	9.01	2.51	
1080	80	13.50	16	7.18	8.82	2.32	
1090	90	12.11	16	7.1	8.9	2.4	
1100	100	11.00	16	7.3	8.7	2.2	
1200	200	6.00	16	8	8	1.5	
1300	300	4.33	16	8.4	7.6	1.1	
1400	400	3.50	16	8.64	7.36	0.86	
1500	500	3.00	16	8.8	7.2	0.7	
1600	600	2.67	16	8.9	7.1	0.6	
1700	700	2.43	16	9.05	6.95	0.45	
1800	800	2.25	16	9.18	6.82	0.32	
1900	900	2.11	16	9.26	6.74	0.24	
2000	1000	2.00	16	9.32	6.68	0.18	



Formulae:

$T = 2.3Q/4\pi\Delta s$, $K = T/b$&

$S = 2.25\ T\ t_o/r^2$

On the basis of above formulae, the calculated parameters are as follows.

$T = 30.42\ m^2/day$, $K = 2.3765\ m/day$& $S = 7.041 \times 10^{-5}$

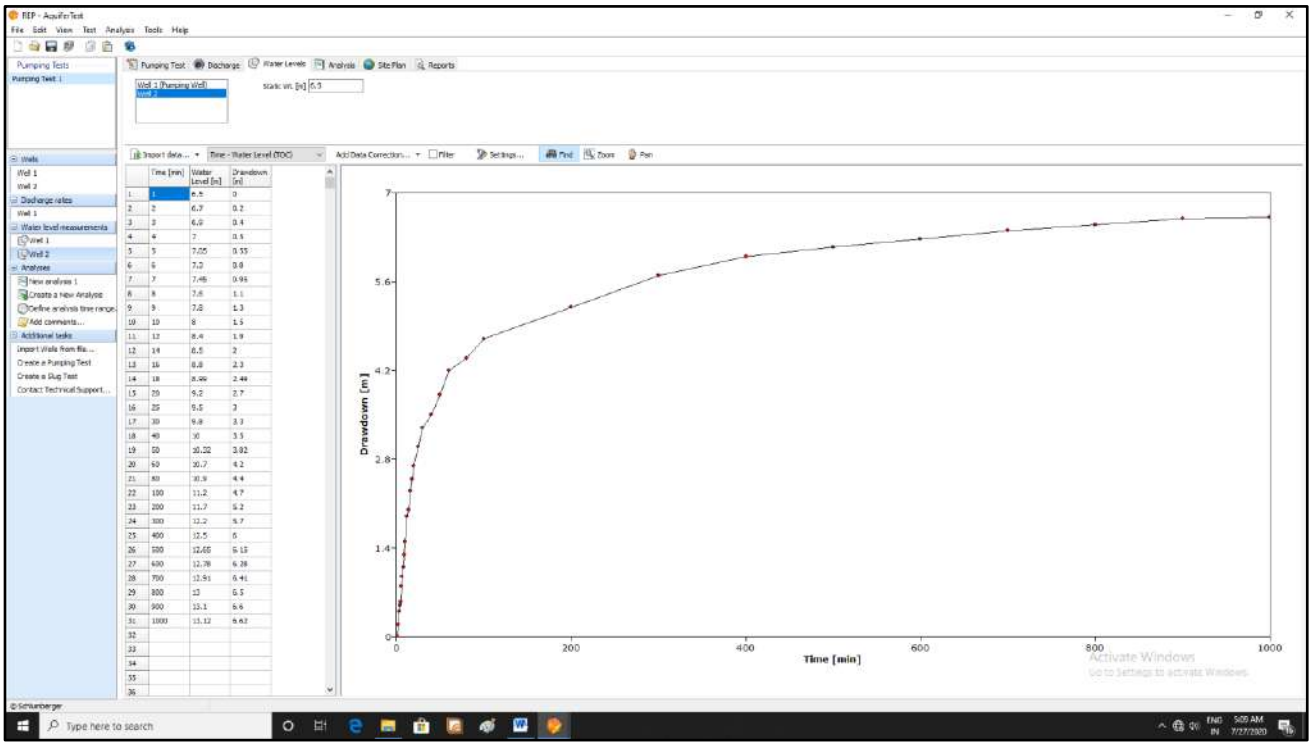


Fig 5.4: Pumping water level data plot in Aquifer test soft ware

6. SURFACE GEOPHYSICAL SURVEY

Surface geophysical survey comprised of one Vertical Electrical Sounding (VES) has been conducted at the project of M/S DB Power Ltd, Village-Badadhara, Block-Dabhra, District-Shakti , Chhattisgarh on 12.01.2022 to know the subsurface condition in the area. The VES location is given in the location map. The VES location is given in Fig No: 6.1.

Fig6.1: Location Map of Geophysical Survey

6.1 Resistivity Survey:

Using Ohm's law electrical resistivity of sub-surface geologic formation is determined through artificially energizing the subsurface and carrying measurements on the ground surface. Contrast in resistivity value of an individual layer with the surrounding or effective presence (dependent of its relative resistivity and thickness) makes it detectable.

In the electrical resistivity method, a known amount of electrical current (I) is sent into the ground through a pair of electrode (called current electrodes) and the potential (δV) developed because of the resistance offered by the subsurface due to the passage of this current is measured across another pair of electrodes (potential electrodes) planted into the ground. The ratio between the potential measured and the corresponding current sent into the ground yields the resistance 'R' of the ground to a depth depending upon the spacing between the two current electrodes. Through the multiplication of this value of `R' by a geometric factor a parameter called the apparent resistivity "ρ_a" is computed. Both the parameters, apparent resistivity 'ρ_a' and the resistance 'R' contain the information on the geo-electric characteristics of the subsurface. In practice, there exist several configurations but most commonly used are the Wenner and Schlumberger configurations.

In this survey microprocessor based resistivity meter CRM-500 was used. For the present study Vertical Electrical Sounding (VES) have been carried out using Schlumberger configuration.Maximum spreads were 200m (AB) for sounding.

6.2 Vertical Electrical Sounding (VES)

VES is a process by which the depth investigation is made. In this, the centre is fixed and the measurements are made by successively increasing the electrode spacing. The apparent resistivity values obtained with increasing values of electrode separations are used to estimate the thickness and resistivity's of the subsurface formations. In Schlumberger sounding arrangement (Figure-6), all the four electrodes are kept in a line symmetrically over a point '0', with inner (Potential) electrodes kept closer. For increasing the depth of investigation the current electrodes C_1 and C_2 are moved apart symmetrically from the centre point `0' keeping the potential electrodes fixed. The separation between the potential electrodes is changed only when the potential between them drops to allow value during the course of sounding. The apparent resistivity for each electrode separation is calculated by multiplying the resistance `R' with Schlumberger configuration factor 'K' (which is called as geometrical factor).

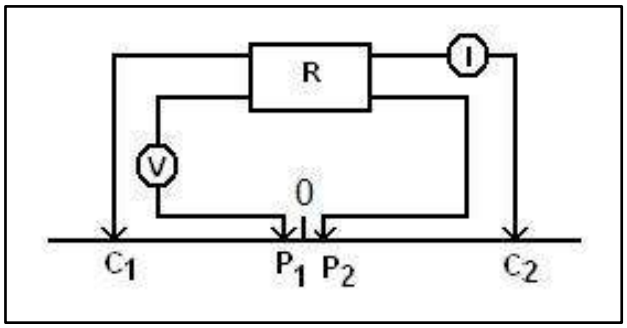


Fig 6.2 (A): Schlumberger electrode configuration

The formula is: $\rho_a = \pi R \{(C_1C_2/2)^2 - (P_1P_2/2)^2\} / P_1P_2$ or $\rho_a = KR$

Where 'K' is the geometric factor for Schlumberger configuration,

C_1C_2 is current electrode spacing

P_1P_2 is potential electrode spacing

Equipment

The geophysical methods are useful in constructing a picture of the subsurface hydrogeological conditions in totally virgin areas. It is based upon measurement of earth electrical properties. In the present study the resistivity surveys have been carried out by using Aquameter CRM 500 an indigenous microprocessor based Resistivity Meter (Fig.-6.2 B).

Aquameter CRM 500 is a high power version (40 Watt) which is useful for any type of soil specially preferred for low resistivity soil of the coastal region. It can penetrate current down to 500 meters. It is a popular instrument, because of its single button operation deep penetration, accurate and reliable result, even in adverse field conditions. The instrument has a facility to measure self-potential (SP) which is useful in mineral prospecting and environmental studies.

Fig 6.2 (B): Aquameter CRM 500

6.3 Data Analysis and Interpretation

Surface geophysical survey comprised of two Vertical Electrical Sounding (VES) has been conducted at the premises of M/S DB Power Ltd, , Village-Badadhara, Block-Dabhra, District-Jangir-Champa on 10.10.2020 to know the subsurface condition in the area. The observed resistance values from the instrument have been multiplied with geometric factor (K) to get the apparent resistivity values for each electrode spacing. The apparent resistivity values for different potential dipole were brought to single common potential dipole. The field apparent resistivity data were plotted on log-log graph paper against the half current electrode separation to get the VES curves (X axis-C1C2/2 value and Y axis apparent resistivity value).

These data of $C_1C_2/2$ and apparent resistivity were interpreted with the help of two layer master curve by curve matching technique and further checked with the help of IPI2WIN software. The final results were corroborated with the known hydrogeological conditions existing in the area. The geoelectric layer parameters (layer resistivity and layer thickness) were obtained for each VES. The field data of VES and field curves of VES are given in Table 6.1 and Fig-6.3, 6.4 & 6.5.

6.4 Discussion of result

The VES has been carried out at the premises of M/S D B Power Ltd, , Village-Badadhara, Block-Dabhra, District-Jangir-Champa, Chhattisgarh on 10.10.2020 (See fig.1). DDR-3 Resistivity Meter has been used for conducting the VES. Schlumberger configurations have been used for conducting the VES survey. The maximum current electrode spread for conducting VES was 200m (AB).

The data is plotted on double logarithmic graph paper and matched with standard curves to know the true resistivity and thickness of various layers. The data is also interpreted by Computer using IPI2WIN software to verify the results of partial curve matching. From interpreted results of VES is discussed below.

VES-1:

It is an HA type curve and it has four layer. The topmost soil layer having resistivity value of 120 Ω-m is top whereas the second layer may be weathered Sandstone with resistivity of 80 Ω-m. The third layer is hard and compact sandstone with resistivity of 485 Ω-m. The last layer may be shale having resistivity of 66 Ω-m. The thickness of topmost layer is 3.05 m, second layer is 8.7 m and the third layer thickness is 21.5 m.

VES-2: It is also an HA type curve and it has four layer. The topmost soil layer having resistivity value of 106 Ω-m is top whereas the second layer may be weathered Sandstone with resistivity of 85 Ω-m. The third layer is hard and compact sandstone with resistivity of 296 Ω-m. The last layer may be shale having resistivity of 79 Ω-m. The thickness of topmost layer is 1.36, second layer is 67.8 m and the third layer thickness is 28.7 m.

VES-3:

It is also an HA type curve and it has four layer. The topmost soil layer having resistivity value of 87 Ω-m is top whereas the second layer may be weathered Sandstone with resistivity of 68 Ω-m. The third layer is hard and compact sandstone with resistivity of 419 Ω-m. The last layer may be shale having resistivity of 60 Ω-m. The thickness of topmost layer is 2.01, second layer is 6.7 m and the third layer thickness is 19.2 m.

Table-6.1: Interpreted Results of VES

VES No	Layer Resistivity (in Ohm-m)				Layer Thickness (in m)			Probable Fracture Zones
	ρ_1	ρ_2	ρ_3	ρ_4	h_1	h_2	h_3	
VES-1	120	80	485	66	3.05	8.7	21.5	17 to 21 m and 47-50 m
VES-2	106	85	296	79	1.36	7.8	28.7	15 to 19 m and 38-42 m

VES-3	87	68	419	60	2.01	6.7	19.2	22 to 26 m and 43-48 m

Conclusions & Recommendations

From the interpretation of resistivity survey data we got the following outcome.

The thickness of topsoil varies from 1.36 to 3.05 m with resistivity range of 87 to 120 Ω-m.

The thickness of weathered sandstone from 6.7 to 8.7 m with resistivity range of 68 to 85 Ω-m.

The thickness of hard sandstone from 19.2 to 28.7 m with resistivity range of 296 to 485 Ω-m.

The last layer is shale resistivity range of 60 to 79 Ω-m.

At point VES-1 probable fracture zones are there in between 17 to 21 m and 47 to 50 m.

At point VES-2 probable fracture zones are there in between 15 to 19 m and 38 to 42 m.

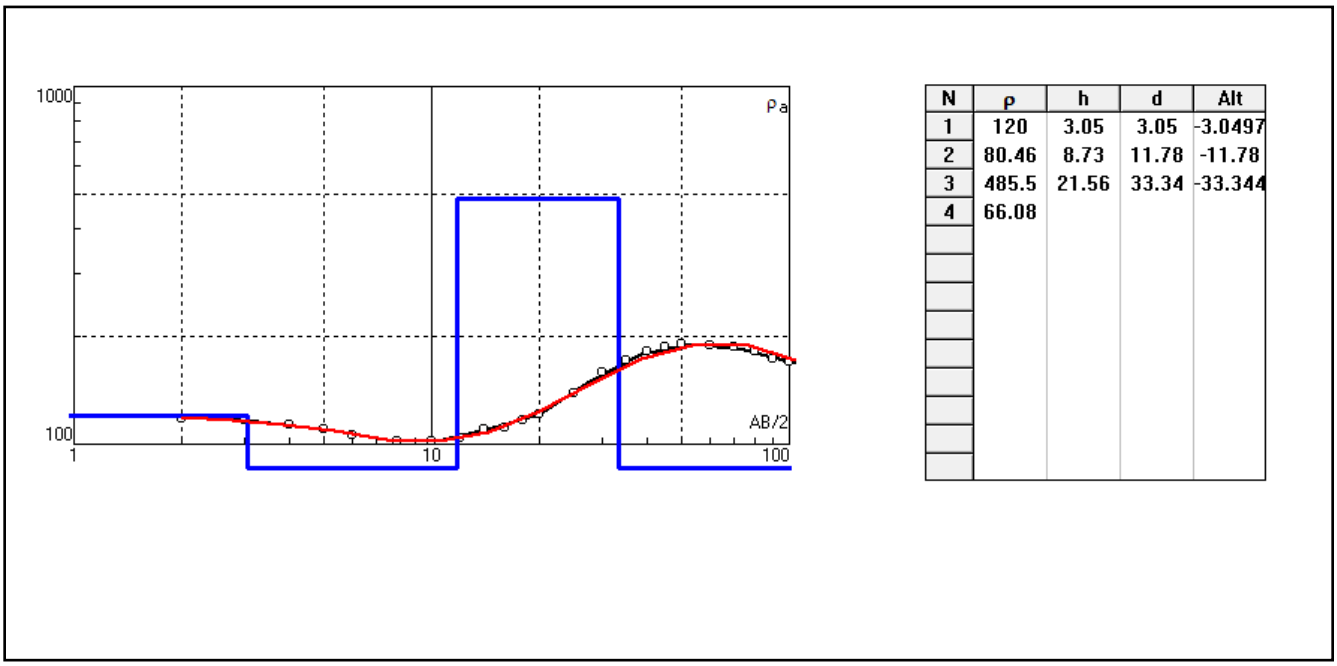
At point VES-3 probable fracture zones are there in between 22 to 26 m and 43-48 m.

Bore hole may be drilled down to 100m to get a good amount of ground water.

Table-6.2: VES Data

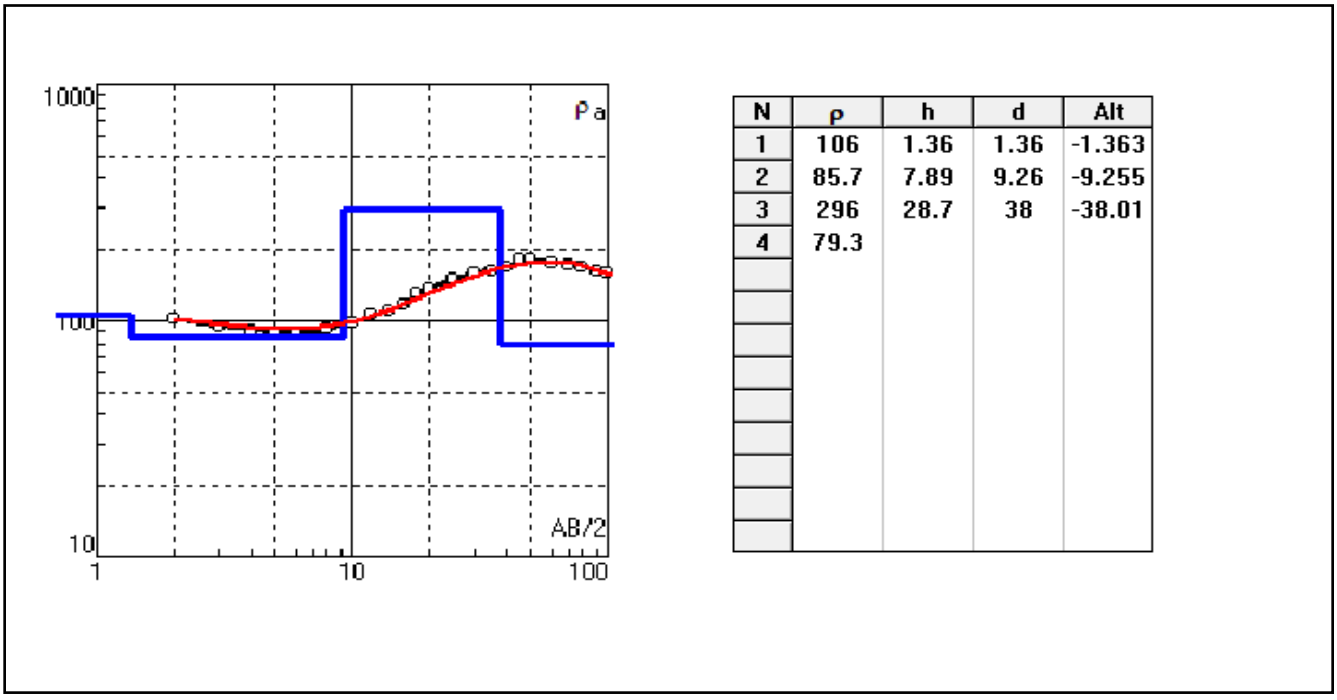
VES1		**VES2**		**VES 3**	
Location: Karpipali village		**Location:** Sonka Village		**Location:** Fulbandhia Village	
Latitude: N 21°56'14.5"		**Latitude:** N 21°56' 11.99"		**Latitude:** N 21°56’ 11.9"	
Longitude: E 83°11'36.5"		**Longitude:** E 83°11' 1.03"		**Longitude:** E 83°11' 31.04"	
Date: 10.10.2020		**Date:** 10.10.2020		**Date:** 10.10.2020	
Altitude: 234m		**Altitude:** 235m		**Altitude:** 239 m	
AB/2	**App. R**	**AB/2**	**App. R**	**AB/2**	**App. R**
2	118	2	102.36	2	91.42
3	117.12	3	94.35	3	83.26

4	113.2	4	91.47	4	82.47
5	110.36	5	88.47	5	75.48
6	106.45	6	89.74	6	78.46
8	102.36	8	92.47	8	82.15
10	102.34	10	97.48	10	90.15
12	103.49	12	106.49	12	94.26
14	110.48	14	111.05	14	99.45
16	111.32	16	116.87	16	108.64
18	116.32	18	131.56	18	117.45
20	121.45	20	137.56	20	125.63
25	139.35	25	149.74	25	135.29
30	158.34	30	158.94	30	148.65
35	171.45	35	162.47	35	151.42
40	181.47	40	170.23	40	162.38
45	187.45	45	182.36	45	168.47
50	190.32	50	183.26	50	170.32
60	188.47	60	176.49	60	166.52
70	186.47	70	173.45	70	163.29
80	181.47	80	168.49	80	158.49
90	172.65	90	161.23	90	148.75
100	170.16	100	159.74	100	149.52



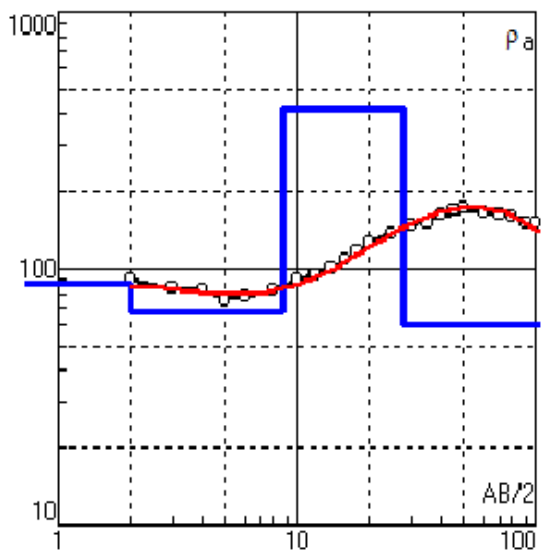
N	ρ	h	d	Alt
1	120	3.05	3.05	-3.0497
2	80.46	8.73	11.78	-11.78
3	485.5	21.56	33.34	-33.344
4	66.08			

Fig-6.3: VES Curve and interpreted results at Badadhara (Near Urja Road, Inside plant area) (VES 1)



N	ρ	h	d	Alt
1	106	1.36	1.36	-1.363
2	85.7	7.89	9.26	-9.255
3	296	28.7	38	-38.01
4	79.3			

Fig-6.4:VES Curve and interpreted results at Badadhara (Near Resevior, Inside Plant Area) (VES 2)



N	ρ	h	d	Alt
1	87.3	2.01	2.01	-2.007
2	67.9	6.73	8.73	-8.733
3	419	19.2	27.9	-27.89
4	60.5			

Fig-6.5:VES Curve and interpreted results at Badadhara (Near Coal Yard, Outside of plant area)(VES3)

FIG 6.6: PHOTOGRAPHS OF GEOPHYSICAL SURVEY IN DIFFERENT LOCATION IN STUDY AREA

7. ARTIFICIAL RECHARGE AND RAIN WATER HARVESTING

Artificial recharge to ground water through scientifically designed structures has been proven as a viable option for augmentation of ground water resources. It also provides an opportunity to utilize the surplus monsoon run-off which otherwise lost to sea unutilized.

Artificial recharge aims at augmenting the natural replenishment of ground water storage by some method of construction, spreading of water, or by artificially changing natural conditions. It is useful for reducing overdraft, conserving surface run-off, and increasing available ground water supplies. Recharge may be incidental or deliberate, depending on whether or not it is a by-product of normal water utilization. Artificial recharge is becoming increasingly necessary to ensure sustainable ground water supplies to satisfy the needs of a multi-pronged demand. The benefits of artificial recharge can be both tangible and intangible.

The concept of rainwater harvesting involves 'tapping the rainwater where it falls'. A major portion of rainwater that falls on the earth's surface runs off into streams and rivers and finally into the sea. The technique of rainwater harvesting involves collecting the rain from localized catchment surfaces such as roofs, plain/sloping surfaces etc., either for direct use or to augment the ground water resources depending on local conditions. Construction of small barriers across small streams to check and store the running water also can be considered as water harvesting.

During monsoon season, whatever rainwater is collected in the premises of project area, i.e. through, Building/roof area, Road/Paved area, Green belt area and Open land will be utilized to recharge the ground water. It is proposed to implement rain water harvesting structures at feasible, viable and sustainable location, catchment wise by diverting the runoff that is generated from the roof area, paved area, roads and green belt area for recharging into the specified recharge structure for putting into ground water system. The runoff generated from the two catchments needs to be suitably diverted through storm water drains to the recharge structures in order to augment the ground water. Overflow water from recharge structures is to be stored into two proposed ponds to be constructed at the western fringe of the plant area as a water conservation measures. Special care needs to be taken for locating the recharge structures and water conservation storage ponds so that the ground water augmentation as well as conservation is optimal. Implementation of water conservation structures and recharge mechanism shall ensure the balance between the discharge vis-à-vis recharge relationships of the aquifer system and provide the sustainable ground water supply. Based on the site plan and the land

use pattern of the project area, the computation of runoff for each unit has been worked out and the details are tabulated below.

Total Area available for recharge – **2549521.8 sq.m.**

Rainfall – 1100 mm. (60-65 rainy days)

Formations –Shale & Sandstone.

7.1. Runoff Available for Recharge:

7.1.1: Surrounding area of 5 K.m. from Plant Boundary:

S. N.	Land use type	Area (m^2)	Rainfall (m)	Amount of water that received Through Rain (Cub meter)	Co-efficient of runoff	Quantity of Rainwater (m^3)
1.	Build - up Area	4509691	1.10	4960660.1	0.85	4216561.08
2.	Green belt area Approx.	5387960	1.10	5926756	0.15	889013.4
3.	Open land area	6741150	1.10	7415265	0.20	1483053
4.	Water Bodies	2523190	1.10	2775509	0.60	1665305.4
5.	Agriculture Land	105195540	1.10	115715094	0.30	34714528.2
6.	Total Area	**124357531**	……	……	…….	42968461.08
6.	Assuming 10% is not Suitable for recharge, hence available quantum of Rain water for Recharge is about **38671614.97 m^3** [90% **42968461.08 m^3**]					

From the above, it is observed that a total potential of **38671614.97** cum of rainfall runoff can be collected from the surrounding of 5 k.m. radius from plant boundary.

7.1.2: Recharge from Plant Complex Area:

S. N.	Land use type	Area (m^2)	Rainfall (m)	Amount of water that received Through Rain (Cub meter)	Co-efficient of runoff	Quantity of Rainwater (m^3)
1.	Construction area	1003621.28	1.10	1103983.40	0.85	938385.89
2.	Green belt area Approx.	837700.02	1.10	921470.02	0.15	138220.50
3.	Open land area	465388.1	1.10	511926.91	0.20	102385.38
4.	Raw Water Reservoir	242811.6	1.10	267092.76	0.60	160255.65
5.	Total Area	**2549521**	……	……	…….	1339247.42
6.	Assuming 10% is not Suitable for recharge, hence available quantum of Rain water for Recharge is about **1205322.67 m^3** [90% **1339247.42 m^3**]					

From the above, it is observed that a total potential of **1205322.67** cum of rainfall runoff can be harvested at feasible, viable and sustainable location annually.

Plant Complex area:

The main interest in rainwater harvesting methods is the collecting and conserving rainwater at an

early stage in the water cycle to ensure the best use of rainfall before it runs away into rivers and groundwater, or disappears as evaporation. The appropriate choice of rainwater harvesting and artificial recharge techniques depends on the amount of rainfall and its distribution, land topography, soil type, vadose zone thickness and its hydraulic characteristics, depth and type of aquifers, hydraulic parameters of aquifer systems, source and quality of recharge water, and socio-economic factors, among others; these factors tend to be location specific.

Thus, the selection of water harvesting structures and artificial recharge methods strongly depends on local conditions, which calls for proper scientific investigations prior to the design and execution of artificial recharge and/or rainwater harvesting schemes. Water harvesting methods include such widely differing practices as 'roof top water harvesting', 'land surface water harvesting' and 'groundwater harvesting'. On the other hand, a variety of methods have been developed to artificially recharge groundwater and mostly of combinations of direct surface, direct subsurface or indirect recharge techniques. Commonly used artificial recharge techniques, however, are through drainage canals, from surface water bodies like ponds and lakes, recharge through pits/shafts and tube wells/ bore wells etc.

The increasing stress on ground water needs, preventive measures like rain water harvesting structures and recharge measures are to be taken. It has been found that the plant areas of M/S DB Power Limited offers enough scope and options for rain water harvesting and recharge measures. In view of this, detailed topographical, hydro-geological and hydrological study has been undertaken in the area, so as to formulate a comprehensive recharge plan outlining measures with recommended site specific designs for rain water conservation and recharge measures along with the implementing modalities.

Since, the selection and design of artificial recharge and water harvesting structures are highly dependent on the local feasible and suitable conditions and the availability of local materials for their construction. A successful design of artificial recharge and rain water harvesting structures necessitates proper understanding of hydrology and hydro-geology of the project area.

Total recharge potential of **1205322.67** cum of rainfall runoff can be harvested at feasible, viable and sustainable location annually, based on hydrogeological condition trench and recharge pits use for ground water artificial recharge.

The plant is already constructed recharge trench & recharge reservoir to recharge the ground water of the study area.

Fig 7.1: Rain water Harvesting in the plant premises

Fig 7.2: Piezometric Point for Ground water level Monitoring in the plant area

7.3: Stages of Ground water Development:

The Total Ground water Storage, net annual ground water availability (ham), ground water draft (ham), ground water for future use (ham) and stage of ground water development (%) is given in table 7.2 & 7.3.

Total Area of Assessment Unit (Ha) is 65230. Total Annual Ground Water (Ham) Recharge is 3776.16. Annual Extractable Ground Water Resource (Ham) is 3492.13. Total Extraction (Ham) is 2103.11. Net Ground Water Availability for future use (Ham) is 1334.54. Stage of Ground Water Extraction (%) is 60.22.

As per ground water resources data the Block Shakti is categorized as **safe zone**.

Table: 7.2: Ground Water Resource of Shakti Tehsil

Assessment Unit Name	Total Area of Assessment Unit (Ha)	Recharge Worthy Area(Ha)	Recharge from Rainfall-Monsoon Season	Recharge from Other Sources-Monsoon Season	Recharge from Rainfall-Non Monsoon Season	Recharge from Other Sources-Non Monsoon Season	Total Annual Ground Water (Ham) Recharge	Total Natural Discharges (Ham)
In ham								
Shakti	**65230**	**34231**	**1753.88**	**897.42**	**22.11**	**1102.75**	**3776.16**	**284.03**

Table: 7.3: Ground Water Resource of Shakti Tehsil

Assessment Unit Name	Annual Extractable Ground Water Resource (Ham)	Ground Water Extraction for Irrigation Use (Ham)	Ground Water Extraction for Industrial Use (Ham)	Ground Water Extraction for Domestic Use (Ham)	Total Extraction (Ham)	Annual GW Allocation for for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)
In ham								
Shakti	**3492.13**	**1599.968**	**0**	**503.1375**	**2103.11**	**557.62**	**1334.54**	**60.22**

Ground water recharge by rainfall infiltration Method

Rrf= NAR x A x rfi, Where Rrf= Recharge from Rain fall, NAR= Normal Annual Rainfall, A= Area of unit in ha

RIF = Rain fall infiltration Factor

Total Annual water availability= Rain fall recharge + seepage from irrigation + Recharge from tanks/Ponds

Net ground water availability = total recharge – Base Flow

Total Annual Demand in Ham = Population X Average Per Capita Consumption (60) X 365/1000 X 10000

Ground Water Draft for Irrigation = Number of Ground Water Structure X Unit Draft in Ham

Ground Water Balance = Annual Utilizable GW Resource – Gross Ground Water Draft

Stage of Ground Water Development = Gross Ground Water Draft X 100/ Annual Utilizable GW Resource

8. GROUND WATER QUALITY

The suitability of ground water for drinking/irrigation/industrial purposes is determined keeping in view the effects of various chemical constituents present in water on the growth of human being, animals, and various plants and also on industrial requirement. However, many ions are very essential for the growth of plants and human body but when present in excess, have an adverse effect on health and growth. For estimation of the quality of ground water, 7 ground water samples have been collected in study area. The ground water samples were analysed for major as well as heavy chemical constituents. The ranges of different chemical constituents present in ground water are given in **Table 8.1 and location of sampling is given in fig 8.1**.

Table 8.1: Village wise chemical constituents

Village	**Desirable limit**	**Permissible limit**	Reservior Pond	Ash Pond	Main gate Pond Water	Badadadhra Village	Basanpali Village	Jaimura Village River Water	Tayang village	Tundri village
G.P.			Badadadhra	Badadadhra	Badadadhra	Badadadhra	Sandka	Jai mura	Jaimura	Tundri
Block			Dabhra	Dabhra	Dabhra	Dabhra	Dabhra	Dabhra	Dabhra	Dabhra
Dist			Shakti	Shakti	Shakti	Shakti	Shakti	Shakti	Shakti	Shakti
Latitude			N 21.91500	N 21.91166	N 21.90194	N 21.91916	N 21.93000	N 21.91916	N 21.92527	N 21.89250
Longitude			E 83.19	E 83.19	E 83.187	E 83.18	E 83.18	E 83.23444	E 83.21916	E 83.19166

			333	333	50	416	055			
Sample taken from			Surface Water	Surface Water	Surface Water	Ground water	Ground water	Surface Water	Ground water	Ground water
PH Value	6.5-8.5	No relaxation	8.01	7.53	7.3	6.46	7.41	6.83	7.28	7.58
Turbidity (NTU)	1	5	<1	6	30	3	28	26	<1	8
Conductivity	>1000	3200	310	960	200	690	530	140	1100	380
Total Disolved Solid (mg/l)	500	2000	170	510	110	370	280	70	600	210
Total Hardness (as Caco3) (mg/l)	200	600	60	312	60	170	188	40	416	76
Calcium (Ca) (mg/l)	75	200	20.04	87.37	16.03	60.12	64.12	12.8	145.89	22.44
Calcium Hardness in (mg/l)	-	-	49.99	217.99	39.99	149.99	159.99	31.93	363.99	55.99
magnesium (As mg) (mg/l)	30	100	2.43	22.84	4.86	4.86	6.81	1.9	12.63	4.86
Magnesium Hardness (As mg) (mg/l)	-	-	10.01	94.01	20.01	29.01	28.01	8.07	52	20.01
Carbonates As c03	-	-	64.94	41.49	48.7	84.78	241.67	39.68	194.83	104.63

Bi-carbonates as Hco3	-	-	96.62	61.73	72.86	126.14	319.39	59.04	289.87	155.67
chloride (As Cl) (mg/l)	250	1000	23.8	87.98	13.45	102.47	19.66	23.8	169.76	23.8
Total Alkalinity (as Caco3) (mg/l)	200	600	79.2	50.6	59.4	103.4	261.8	48.4	237.6	127.6
Fluride (as F) (mg/l)	1	1.5	1.47	4.08	1.74	1	0.62	0.48	1.21	1.55
Sulphate (As So4) (mg/l)	200	400	28.87	125.59	27.44	56.48	10.33	20.92	55.24	12.43
iron (as Fe) (mg/l)	1	No relaxation	0.85	0.38	2.45	0.16	2.4	4.98	0.15	0.1
Nitrate (As No3) (mg/l)	45	No relaxation	1.11	6.62	3.85	2.69	1.11	3.65	2.36	1.22
Sodium (Na) (mg/l)	-	-	4	9	8	12	4	12	29	6
Potasium (K) (mg/l)			1	3	1	4	2	5	11	2

Table 8.2: Village wise chemical constituents

SN	Parameters	Prescribed limits as per IS 10500		Observed value	
		Desirable limit	Permissible limit	Min	Max
1	PH Value	6.5-8.5	No relaxation	6.46	8.01
2	Turbidity (NTU)	1	5	<1	30
3	Conductivity	>1000	3200	140	1100
4	Total Disolved Solid (mg/l)	500	2000	70	600
5	Total Hardness (as Caco3) (mg/l)	200	600	40	312
6	Calcium (Ca) (mg/l)	75	200	12.8	145.89
7	Calcium Hardness in (mg/l)	-	-	31.93	363.99
8	magnesium (As mg) (mg/l)	30	100	1.9	22.84
9	Magnesium Hardness(As mg) (mg/l)	-	-	8.07	94.01
10	Carbonates As c03	-	-	39.68	194.83
11	Bi-carbonates as Hco3	-	-	59.04	289.87
12	chloride (As Cl) (mg/l)	250	1000	13.45	169.76
13	Total Alkalinity (as Caco3) (mg/l)	200	600	48.4	261.8
14	Fluride (as F) (mg/l)	1	1.5	0.48	4.08
15	Sulphate (As So4) (mg/l)	200	400	12.43	125.59
16	iron (as Fe) (mg/l)	1	No relaxation	0.1	4.98
17	Nitrate (As No3) (mg/l)	45	No relaxation	1.11	6.62
18	Sodium (Na) (mg/l)	-	-	4	29
19	Potasium (K) (mg/l)			1	11

According to above table, majority of chemical constituent of all samples are within permissible limit and suitable for drinking, irrigation and industrial use.

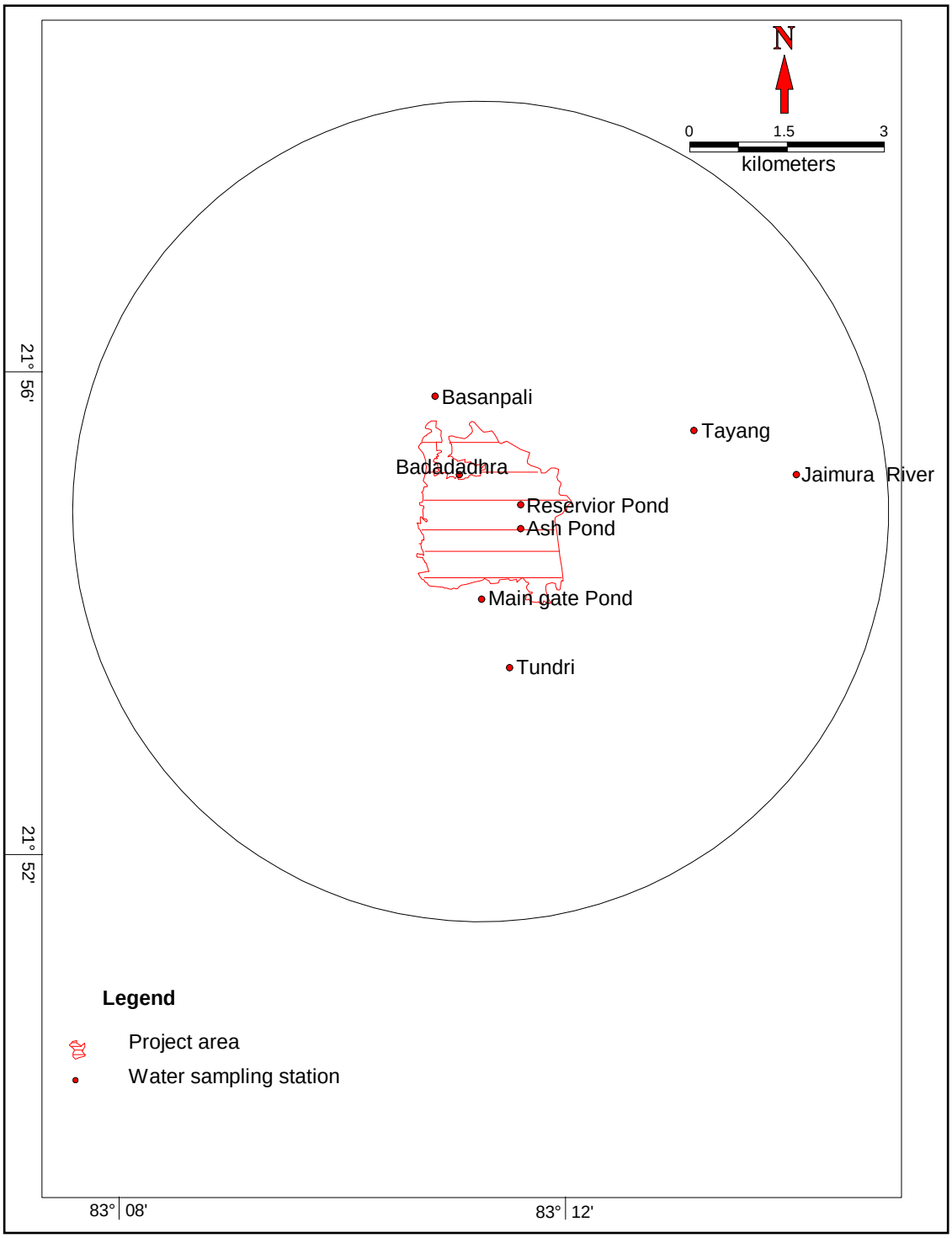


Fig 8.1 location of water sampling stations

Geochemical Classification of Ground Water

The geochemical classification of ground water, of study area has been carried out by using Piper Diagrams the ground water is of Ca/Mg-CO3/HCO_3 type. The analysis of ground water samples collected from the area suggests that type of water in the major part is bicarbonate dominating type, The type of ground water found in each ground water sample collected is given in the **Table 8.3**

Table 8.3. The type of ground water

SN	Sample ID	Station ID	X	Y	Water Type	pH	El. Cond. uS/cm	TDS (mg/l)
1	SW1	Reservior Pond	83.1933	21.9150	Ca-Mg-CO3-HCO3	8.01	310	170
2	SW2	Ash Pond	83.1933	21.9117	Mg-Ca-SO4-Cl	7.53	960	510
3	SW3	Main gate Pond	83.1875	21.9019	Mg-Ca-CO3-HCO3	7.3	200	110
4	SW4	Badadadhra	83.1842	21.9192	Ca-Mg-Cl-CO3-HCO3	6.46	690	370
5	SW5	Basanpali	83.1806	21.9300	Ca-Mg-CO3-HCO3	7.41	530	280
6	SW6	Jaimura River	83.2344	21.9192	Mg-Ca-CO3-HCO3-Cl	6.83	140	70
7	SW7	Tayang	83.2192	21.9253	Ca-Mg-CO3-Cl-HCO3	7.28	1100	600
8	SW8	Tundri	83.1917	21.8925	Mg-Ca-CO3-HCO3	7.58	380	210

SUITABILITY OF GROUND WATER FOR DRINKING AND IRRIGATION PURPOSES

The suitability of ground water for drinking purpose

The suitability of ground water for drinking purpose is determined keeping in view the effects of various chemical constituents present in water on the biological system of human being. The standards proposed by the Bureau of Indian Standards (BIS) for drinking water (BIS-2012, revised) were used to decide the suitability of ground water that occur in study area for drinking purpose. The classification of ground water samples falling below desirable limit (DL), between desirable & maximum permissible limit (DL-MPL) and above maximum permissible limit (MPL) for drinking water purpose limit is shown in the following **Table 8.4**

Table 8.4: Classification of Ground Water Samples for Drinking Purposes.

Parameters	Drinking water Standards (IS-10500-91, Revised 2012)		Total No. of GW Samples	Samples (< DL)		Samples (DL-MPL)		Samples (>MPL)	
	Desirable Limit (DL)	Maximum Permissible Limit (MPL)		No.	%	No.	%	No.	%
PH	6.5-8.5	No relaxation	8	0	0	8	100	0	0
TDS (mg/L)	500	2000	8	6	75	2	25	0	0
TH (mg/L)	300	600	8	6	75	2	25	0	0
Ca (mg/L)	75	200	8	6	75	2	25	0	0
Mg (mg/L)	30	100	8	8	100	0	0	0	0
Cl (mg/L)	250	1000	8	8	100	0	0	0	0
SO_4 (mg/L)	200	400	8	8	100	0	0	0	0
NO_3 (mg/L)	45	-	8	8	100	0	0	0	0

It is observed from the above **table 8.4**, that than 100 % of samples are suitable for drinking purposes. Therefore, it is concluded that the potability of ground water in study area.

The suitability of ground water for Irrigation purpose

Water is one of the most important constituents, which is required for plant growth, which not only provides the liquid for food processing of the plants but also provides important nutrients for the growth of the plants. But when concentration of ions, are found in excess in the water, it affects the plant growth and reduces the plant yield. Therefore, it is necessary to know the quality of the water before applying in the field, so that the maximum crop yield can be obtained.

Sodium Adsorption Ratio (SAR)

SAR is an expression pertaining to cation makes up of water and soil solution and is used for characterizing the sodium hazard of irrigation water. The main problem with high sodium concentration is its effect on soil permeability & water irrigation. Sodium also contributes directly to

the total salinity of the water and may be toxic to sensitive crops such as fruit trees. SAR is calculated from the following equation-

$$SAR = \frac{Na^{+}}{\sqrt{(Ca^{2+} + Mg^{2+})/2}}$$

Where the concentration of cations are expressed in meq/L.

Residual Sodium Carbonate (RSC)

Water containing carbon dioxide on way gets saturated with carbon dioxide and forms bicarbonates. The excess bicarbonates of Mg and Ca are precipitated out as carbonates. This produces impermeability to the top soil. Bicarbonate concentration of water has been suggested as additional criteria of suitability of irrigation water. Residual sodium carbonate is determined by using the following formula.

RSC = (CO3+ HCO3) - (Ca+Mg)

The suitability of ground water of study area for irrigation purpose was considered on the basis of U. S Salinity diagram in which electrical conductivity value in μS/cm at 25°C upto 2250 μS/cm at 25°C is plotted on one axis and the SAR values upto 10 on the other. The electrical conductivity and the corresponding SAR & RSC values of each ground water sample collected from the study area is given in the **Table 8.5**, and the EC and SAR values are plotted in **Wilcox Diagram (Fig 8.2)** and **Piper(Fig 8.3).**

The number of ground water samples based on Sodium Absorption Ratio (SAR) characteristics falling under Good, Good to Permissible, Doubtful & Bad (Unsuitable) categories is shown in the following **Table 8.5**

From the Table 8.5, it is observed that 100% of samples show SAR values below 10 and falling in the Low Sodium (alkali) Hazard Zone (S1). Such type of water can be used for irrigation on almost all soils with little danger of development of sodium exchangeable problem. Out of 8 samples collected from study area all samples having EC above < 2250 μS/cm at 25° .

The High Salinity Water (C3) cannot be used on soils with poor drainage. Even with adequate drainage, special management for salinity control may be required and plants with good salt tolerance should be selected.

Table 8.5: Classification of ground water for irrigation based on SAR values					
EC microsiemens/cm at 25°C		SAR Value			
		<10 (S1)	10-18 (S2)	18-26 (S3)	>26 (S4)
	Quality	Good	Good to Permissible	Doubtful	Bad (Unsuitable)
	Total No. of GW Samples	No. of samples	No. of samples	No. of samples	No. of samples
< 100	-	-	-	-	-
100-250 (C1)	2	2	-	-	-
250-750 (C2)	4	4	-	-	-
750-2250 (C3)	2	2	-	-	-
2250-5000 (C4)	-	-	-	-	-
> 5000	-	-	-	-	-
Total	8	8			
Overall Percentage		100%			

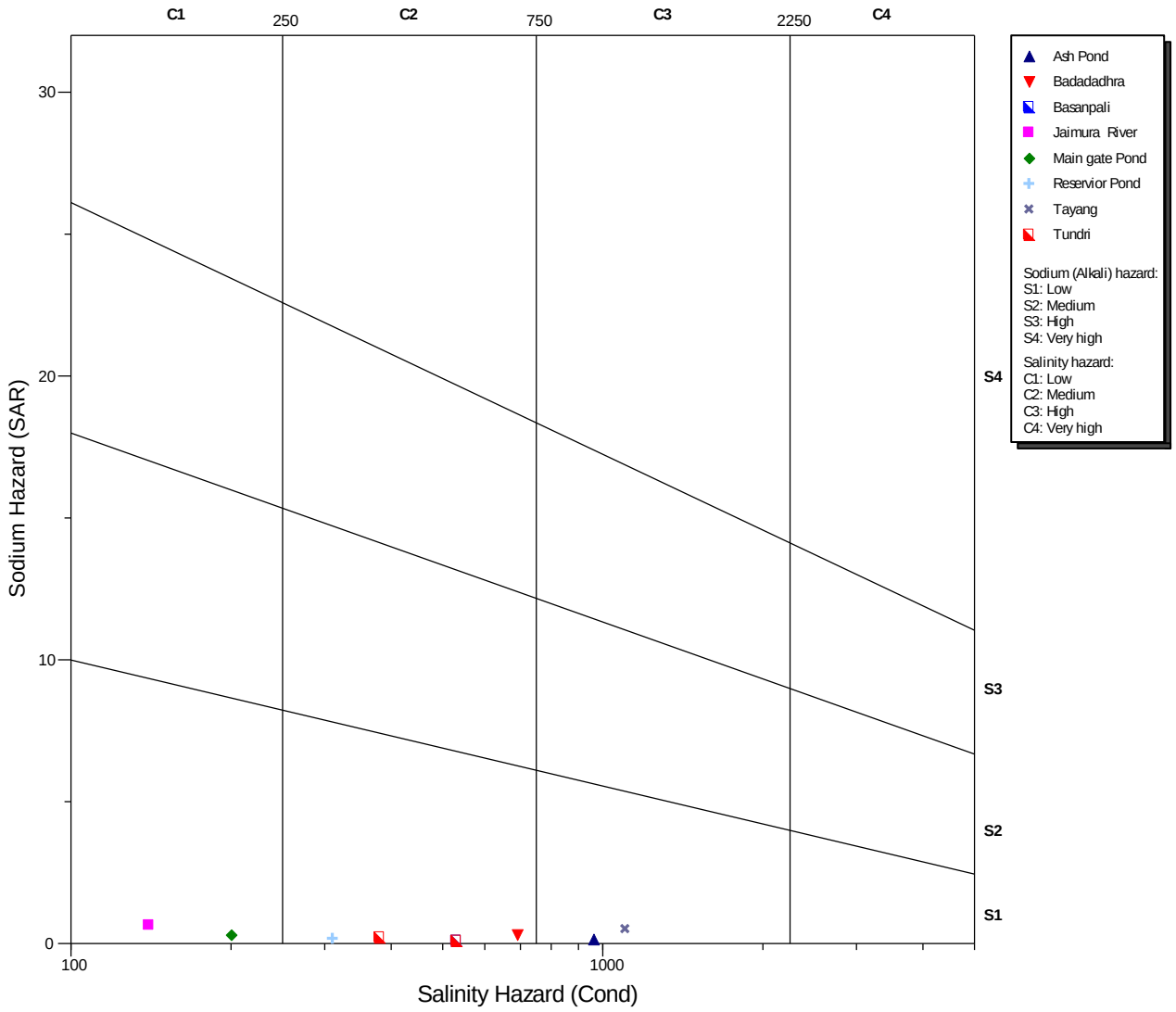


Fig 8.2 Wilcox Diagram

The Very High Salinity Water (C4) is not at all suitable for irrigation under ordinary conditions, but may be used occasionally if the soil is permeable by providing adequate drainage and irrigation water must be applied in excess to provide considerable leaching and very salt tolerant crops should be selected.

Based on above **table 8.5**, ground water samples are classified with respect to salinity and sodium hazard and is presented in **Table 8.6.**

Table 8.6: Classification of ground water samples with respect to salinity and sodium hazards			
Type of Classification	**Characteristics**	**No. of samples falling**	**%**
C1S1		2	25
C1S2			
C2S1	Medium salinity and low sodium water	4	50
C3S1	High salinity and low sodium water	2	25
C4S1	Very high salinity and low sodium water		
Total		**8**	**100**

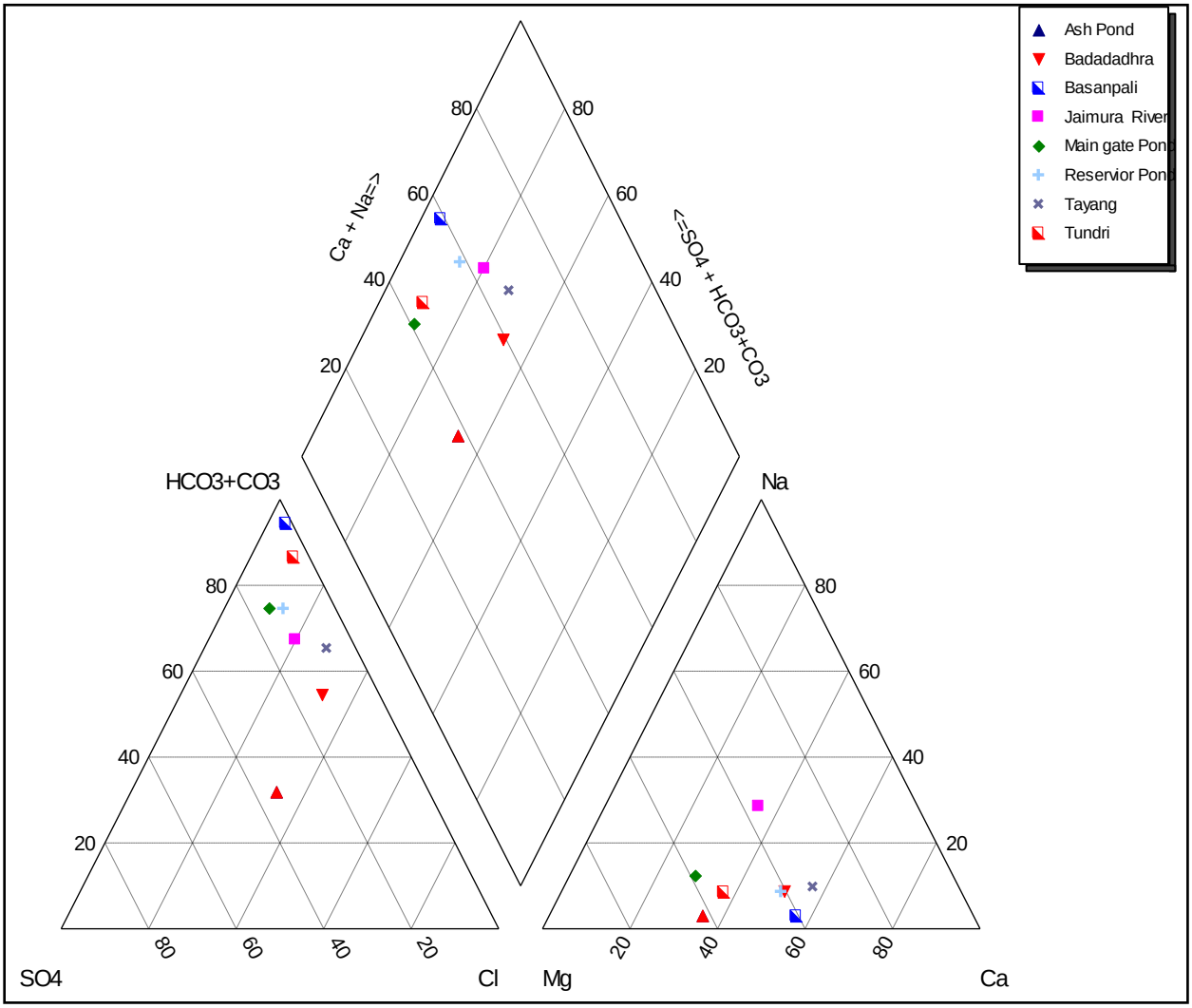


Fig 8.3: Trainer piper diagram

The iso-conductivity map of ground water has been prepared and presented as **Fig 8.4**. On perusal of the iso-conductivity, it is observed that the electrical conductivity for shallow Aquifer in study area ranges from 140 μMhos/cm (Jaimura river sample) to 1110 μMhos/cm (Tayang), the electrical conductivity for shallow aquifer is within Permissible Limit (750-2250 μMhos/cm @ 25°C) **Fig 8.4.**

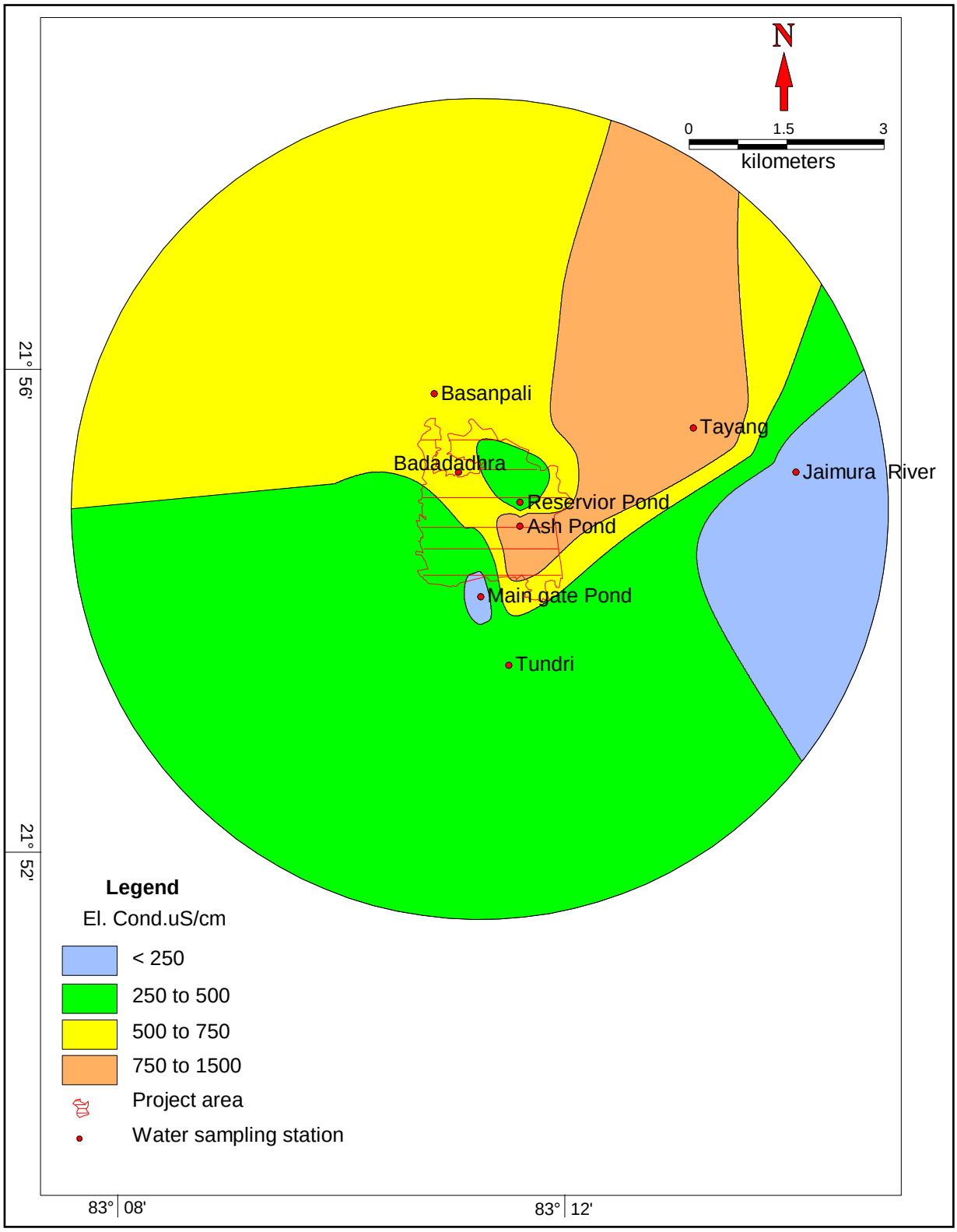


Fig 8.4: Iso-conductivity map of ground water

Fig 8.5: Water Sampling in Plant premises and buffer Zone of the Study Area

9. CONCLUSIONS & SUMMARY

DB Power Limited is a coal-based thermal power plant located at Village: Badadarha, Block: Dabhra, Shakti district in the state of Chhattisgarh. The plant has produced thermal power having capacity of 1200 MW (2*600 MW).

The area is drained by tributaries of Mand River. The project area is in the interfluves zone of Dantar Nala, Pathari Nala & Mand River.

The study area is characterized by flat undulating terrain with regional slope to the north-east and south west. The average elevation in the southern portion is around 280m while in the north is 275 mamsl. The average land slope of the area is works out about 4 per km from toposheets (1:50000scale), Survey of India.

Geo-morphologically the study area comes under Pediplain, Denudation Hills & Floods Plan. The Physiography of the basin is controlled by geological formations namely Sandstone and shale.

In the area, ground water occurs under phreatic or unconfined condition in weathered portion of rocks and semi-confined to confined conditions in fractures/cavernous part of rocks i.e. Sandstone & shale at depths.

In the Post monsoon period it is observed that the overall depth to water level remains between 1.6 and 9.10 meters below ground level. The post-monsoon depths to water level range of 4 to 6 mbgl are observed at Kenapali, Saraipali, Jaimura & Kanwali villages. Ground water levels more than 6 mbgl are observed in the villages Tayang, Karpipali, Fulbandhia & Basnajhar Villages. Water level less than 4 mbgl are observed in the remaining parts of the study area.

it is observed that the overall depth to water level remains between 1.8 and 11.20 meters below ground level. The post-monsoon depths to water level range of 4 to 6 mbgl are observed at Kenapali, Saraipali, Amapali & Tundri villages. Ground water levels more than 6 mbgl are observed in the villages Tayang, Karpipali, Fulbandhia, Jaimura, Kanwali & Basnajhar Villages. Water level less than 4 mbgl are observed in the remaining parts of the study area.

it is observed that the overall depth to water level remains between 3.68 to 13.20 meters below ground level. The pre-monsoon depth to water levels ranges Below 5 mbgl is observed in Badadhara villages.

Water levels are between 5 - 10 mbgl is observed in the villages namely Amapali, Basanpali, Saraipali, Kenapali, Dumerpali & Tundri, Fulbandhia villages. Water level greater than 10 mbgl is observed in the remaining parts of the study area.

In the study area water level fluctuation varies from 1.26 to 5.5 meters.

The flow direction is of two directions i.e. in western, central and northern part of the study area it is towards East Direction and in southern part of the study area it is towards North-East direction indicating the surface water divide in the central portion of the study area near to project area.

The shallow aquifers of the area are mostly developed by way of dug wells in the area with depth ranges from 7 to 16 m. In general the yield of dug wells ranges from 25 to 40m^3/day. Deeper aquifer in the area mainly formed of Raipur group of rocks constituted of Raigarh formation comprising Sandstone and shale.

In the area the yield ranges between1 to 5 lps in Central, Northern, North-Eastern & North-western indicating the area is covered by Sandstone while in major part of the area it is below 1 lps which is covered with shale.

The aquifer parameters of the study area covered by sandstone for deep aquifer the transmissivity values of phreatic aquifer tapped in open well in general varies from 4 to 8.5m^2/day while specific capacity ranges from 15 to 40 lpm/m/day. However for deep aquifer the transmissivity ranges from 15-32 m^2/day and at places it ranges up to 40m^2/day.

Total recharge potential of **1205322.67** cum of rainfall runoff can be harvested at feasible, viable and sustainable location annually, based on hydrogeological condition trench and recharge pits use for ground water artificial recharge. The plant is already constructed recharge trench & recharge reservoir to recharge the ground water of the study area.

The detailed chemical analysis for water samples drawn at seven locations of plant study area (Ash Dyke ponds, reservoir pond and various villages) for non-metallic ingredients like pH, Turbidity, TDS, TSS, CaCO3, Ca, Cl, Mg, SO4 & SiO2 and metallic ingredients like, Hg,,Mn,Zn, Fe, & Cr etc. were done in-2020.

From the chemical analysis of water it is observed that than 100 % of samples are suitable for drinking purposes.

It is observed that 100% of samples show SAR values below 10 and falling in the Low Sodium (alkali) Hazard Zone (S1). Such type of water can be used for irrigation on almost all soils with little danger of development of sodium exchangeable problem

The geochemical classification of ground water, of study area has been carried out by using Piper Diagrams the ground water is of Ca/Mg/Na-HCO_3 Cl type. The analysis of ground water samples collected from the area suggests that type of water in the major part is bicarbonate dominating type, The suitability of ground water of study area for irrigation purpose was considered on the basis of U. S Salinity diagram in which electrical conductivity value in μS/cm at 25°C upto 5000 μS/cm at 25°C is plotted on one axis and the SAR values upto 30 on the other. The electrical conductivity and the corresponding SAR & RSC values of each ground water sample collected from the study area.

It is observed that 100% of samples show SAR values below 10 and falling in the Low Sodium (alkali) Hazard Zone (S1). Such type of water can be used for irrigation on almost all soils with little danger of development of sodium exchangeable problem. Out of 15samples collected from study area is having EC above > 2250 μS/cm at 25°.

The High Salinity Water (C3) cannot be used on soils with poor drainage. Even with adequate drainage, special management for salinity control may be required and plants with good salt tolerance should be selected.

The Very High Salinity Water (C4) is not at all suitable for irrigation under ordinary conditions, but may be used occasionally if the soil is permeable by providing adequate drainage and irrigation water must be applied in excess to provide considerable leaching and very salt tolerant crops should be selected.

On perusal of the iso-conductivity, it is observed that the electrical conductivity for shallow Aquifer in study area ranges from 140 μMhos/cm (Jaimura river sample) to 1110 μMhos/cm (Tayang), the electrical conductivity for shallow aquifer is within Permissible Limit (750-2250 μMhos/cm @ 25°C)

The present study reveals that there is no adverse impact of Ash Pond on ground water regime of the area both on water levels as well as water quality.

Annexure

CENTRE FOR GROUND WATER RECHARGE TESTING LABORATORY

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Mobile No. : +91 9424203354, +91 7000664898, +91 9424203408
Email : cgwrtestinglab@gmail.com, cgwr.raipur@gmail.com Website : www.cgwr.in

TEST REPORT

TEST REPORT NO:CGWR/WLT/4896

Customer Name and Address-

M/S. D.B. POWER LTD.
NANDELI ROAD, VILL -BADADARHA,
DIST-JANJGIR CHAMPA (C.G.)

Date of Reporting : 14/07/2022
SRF No: CGWR/SRF/WTL/1652
Job Order No: CGWR/WTL/4896
Date of receipt sample: 12/07/2022
Start Date of Testing : 13/07/2022
End Date of Testing : 14/07/2022

Sample detail : BORE WELL WATER	Sample ID: BADA DHARA (BORE WELL) N 21°55'09.02" E 83°11'03.34"	Sample Quantity: 1Ltr	Container : Plastic

Environment Condition -: Temp27^{0}C / Humidity-53%

Sl. No	PARAMETERS	TEST METHOD	UNIT	DRINKING WATER IS:10500-2012		TEST RESULT
				DESIRABLE	MAXIMUM	
A.	*Chemical Parameter*					
1.	pH	APHA 23rd Edition 2017- 4500-H+ A.	-	6.5 to 8.5	No relaxation	6.46
2.	Turbidity	APHA 23rd Edition 2017 -2130 B.	NTU	1	5	3
3.	Conductivity	APHA 23rd Edition 2017- 2510 A.	µs/cm	>1000	3200	690
4.	Total Dissolve Solids	APHA 23rd Edition 2017-2540 C.	mg/l	500	2000	370
5.	Total Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	200	600	170
6.	Calcium as Ca	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	75	200	60.12
7.	Calcium Hardness	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	-	-	149.99
8.	Magnesium as Mg	APHA 23rd Edition 2017- 2340-C	mg/l	30	100	4.86
9.	Magnesium Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	-	-	29.01
10.	Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	84.78
11.	Bi-Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	126.14
12.	Chloride	APHA 23rd Edition 2017- 4500- Cl- B.	mg/l	250	1000	102.47
13.	M- Alkalinity	APHA 23rd Edition 2017 -2320 B.	mg/l	200	600	103.4
14.	Fluoride as F	APHA 23rd Edition 2017- 4500-F D.	mg/l	1.0	1.5	1
15.	Sulphate as SO4	APHA 23rd Edition 2017- 4500 SO4 - E.	mg/l	200	400	56.48
16.	Iron	APHA 23rd Edition 2017 -3500--B	mg/l	0.3	No relaxation	0.16
17.	Nitrate	IS 3025 (Pt.34):1988/RA 2003	mg/l	45	No relaxation	2.69
18.	Sodium	APHA- 23rd Edition 2017-3500 Na-B	mg/l	-	-	12
19.	Potassium	APHA- 23rd Edition 2017- 3500 K-B	mg/l	-	-	4

Reviewed by

ChinmayeeMohanty (Sr. Chemist)

Centre For Ground Water Recharge Testing Laboratory CGWRTL

Authorized Signature

SaritaPanigrahi (QM)

Statements:

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2. The test results reported in this report are valid at the time of and under the stated condition of measurement.
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Mobile No. : +91 9424203354, +91 7000664898, +91 9424203408
Email : cgwrtestinglab@gmail.com, cgwr.raipur@gmail.com Website : www.cgwr.in

TEST REPORT

TEST REPORT NO:CGWR/WLT/4900

Customer Name and Address-

M/S. D.B. POWER LTD.
NANDELI ROAD, VILL -BADADARHA,
DIST-JANJGIR CHAMPA (C.G.)

Date of Reporting : 14/07/2022
SRF No: CGWR/SRF/WTL/1652
Job Order No: CGWR/WTL/4900
Date of receipt sample: 12/07/2022
Start Date of Testing : 13/07/2022
End Date of Testing : 14/07/2022

Sample detail : POND WATER	Sample ID: MAIN GATE POND WATER N 21°54'07.4" E 83°11'15.2"	Sample Quantity: 1Ltr	Container : Plastic

Environment Condition -: Temp27^{0}C / Humidity-53%

Sl. No	PARAMETERS	TEST METHOD	UNIT	DRINKING WATER IS:10500-2012		TEST RESULT
				DESIRABLE	MAXIMUM	
A.	*Chemical Parameter*					
1.	pH	APHA 23rd Edition 2017- 4500-H+ A.	-	6.5 to 8.5	No relaxation	7.30
2.	Turbidity	APHA 23rd Edition 2017 -2130 B.	NTU	1	5	30
3.	Conductivity	APHA 23rd Edition 2017- 2510 A.	µs/cm	>1000	3200	200
4.	Total Dissolve Solids	APHA 23rd Edition 2017-2540 C.	mg/l	500	2000	110
5.	Total Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	200	600	60
6.	Calcium as Ca	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	75	200	16.03
7.	Calcium Hardness	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	-	-	39.99
8.	Magnesium as Mg	APHA 23rd Edition 2017- 2340-C	mg/l	30	100	4.86
9.	Magnesium Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	-	-	20.01
10.	Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	48.7
11.	Bi-Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	72.46
12.	Chloride	APHA 23rd Edition 2017- 4500- Cl- B.	mg/l	250	1000	13.45
13.	M- Alkalinity	APHA 23rd Edition 2017 -2320 B.	mg/l	200	600	59.4
14.	Fluoride as F	APHA 23rd Edition 2017- 4500-F D.	mg/l	1.0	1.5	1.74
15.	Sulphate as SO4	APHA 23rd Edition 2017- 4500 SO4 - E.	mg/l	200	400	27.44
16.	Iron	APHA 23rd Edition 2017 -3500--B	mg/l	0.3	No relaxation	2.45
17.	Nitrate	IS 3025 (Pt.34):1988/RA 2003	mg/l	45	No relaxation	3.85
18.	Sodium	APHA- 23rd Edition 2017-3500 Na-B	mg/l	-	-	8
19.	Potassium	APHA- 23rd Edition 2017- 3500 K-B	mg/l	-	-	1

Reviewed by

ChinmayeeMohanty (Sr. Chemist)

Centre for Ground Water Recharge Testing Laboratory CGWRTL

Authorized Signature

SaritaPanigrahi (QM)

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Email : cgwrtestinglab@gmail.com, cgwr.raipur@gmail.com Website : www.cgwr.in

TEST REPORT

TEST REPORT NO:CGWR/WLT/4897

Customer Name and Address-

M/S. D.B. POWER LTD.
NANDELI ROAD, VILL -BADADARHA,
DIST-JANJGIR CHAMPA (C.G.)

Date of Reporting : 14/07/2022
SRF No: CGWR/SRF/WTL/1652
Job Order No: CGWR/WTL/4897
Date of receipt sample: 12/07/2022
Start Date of Testing : 13/07/2022
End Date of Testing : 14/07/2022

Sample detail :POND WATER	Sample ID: ASH POND N 21°54'42.3 E 83°11'36.4"	Sample Quantity: 1Ltr	Container : Plastic

Environment Condition -: Temp27^{0}C / Humidity-53%

Sl. No	PARAMETERS	TEST METHOD	UNIT	DRINKING WATER IS:10500-2012		TEST RESULT
				DESIRABLE	MAXIMUM	
A.	*Chemical Parameter*					
1.	pH	APHA 23rd Edition 2017- 4500-H+ A.	-	6.5 to 8.5	No relaxation	7.53
2.	Turbidity	APHA 23rd Edition 2017 -2130 B.	NTU	1	5	6
3.	Conductivity	APHA 23rd Edition 2017- 2510 A.	µs/cm	>1000	3200	960
4.	Total Dissolve Solids	APHA 23rd Edition 2017-2540 C.	mg/l	500	2000	510
5.	Total Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	200	600	312
6.	Calcium as Ca	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	75	200	87.37
7.	Calcium Hardness	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	-	-	217.99
8.	Magnesium as Mg	APHA 23rd Edition 2017- 2340-C	mg/l	30	100	22.84
9.	Magnesium Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	-	-	94.01
10.	Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	41.49
11.	Bi-Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	61.73
12.	Chloride	APHA 23rd Edition 2017- 4500- Cl- B.	mg/l	250	1000	87.98
13.	M- Alkalinity	APHA 23rd Edition 2017 -2320 B.	mg/l	200	600	50.6
14.	Fluoride as F	APHA 23rd Edition 2017- 4500-F D.	mg/l	1.0	1.5	4.08
15.	Sulphate as SO4	APHA 23rd Edition 2017- 4500 SO4 - E.	mg/l	200	400	125.59
16.	Iron	APHA 23rd Edition 2017 -3500--B	mg/l	0.3	No relaxation	0.38
17.	Nitrate	IS 3025 (Pt.34):1988/RA 2003	mg/l	45	No relaxation	6.62
18.	Sodium	APHA- 23rd Edition 2017-3500 Na-B	mg/l	-	-	9
19.	Potassium	APHA- 23rd Edition 2017- 3500 K-B	mg/l	-	-	3

Reviewed by

ChinmayeeMohanty (Sr. Chemist)

Centre For Ground Water Recharge Testing Laboratory CGWRTL

Authorized Signature

SaritaPanigrahi (QM)

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Mobile No. : +91 9424203354, +91 7000664898, +91 9424203408
Email : cgwrtestinglab@gmail.com, cgwr.raipur@gmail.com Website : www.cgwr.in

TEST REPORT

TEST REPORT NO:CGWR/WLT/4894

Customer Name and Address-

M/S. D.B. POWER LTD.
NANDELI ROAD, VILL -BADADARHA,
DIST-JANJGIR CHAMPA (C.G.)

Date of Reporting : 14/07/2022
SRF No: CGWR/SRF/WTL/1652
Job Order No: CGWR/WTL/4894
Date of receipt sample: 12/07/2022
Start Date of Testing : 13/07/2022
End Date of Testing : 14/07/2022

Sample detail : RIVER WATER	Sample ID: JAIMURA RIVER N 21°55'09.4" E 83°14'04.6"	Sample Quantity: 1Ltr	Container : Plastic

Environment Condition -: Temp27°C / Humidity-53%

Sl. No	PARAMETERS	TEST METHOD	UNIT	DRINKING WATER IS:10500-2012		TEST RESULT
				DESIRABLE	MAXIMUM	
A.	*Chemical Parameter*					
1.	pH	APHA 23rd Edition 2017- 4500-H+ A.	-	6.5 to 8.5	No relaxation	6.83
2.	Turbidity	APHA 23rd Edition 2017 -2130 B.	NTU	1	5	26
3.	Conductivity	APHA 23rd Edition 2017- 2510 A.	µs/cm	>1000	3200	140
4.	Total Dissolve Solids	APHA 23rd Edition 2017-2540 C.	mg/l	500	2000	70
5.	Total Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	200	600	40
6.	Calcium as Ca	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	75	200	12.8
7.	Calcium Hardness	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	-	-	31.93
8.	Magnesium as Mg	APHA 23rd Edition 2017- 2340-C	mg/l	30	100	1.9
9.	Magnesium Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	-	-	8.07
10.	Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	39.68
11.	Bi-Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	59.04
12.	Chloride	APHA 23rd Edition 2017- 4500- Cl- B.	mg/l	250	1000	23.8
13.	M- Alkalinity	APHA 23rd Edition 2017 -2320 B.	mg/l	200	600	48.4
14.	Fluoride as F	APHA 23rd Edition 2017- 4500-F D.	mg/l	1.0	1.5	0.48
15.	Sulphate as SO4	APHA 23rd Edition 2017- 4500 SO4 - E.	mg/l	200	400	20.92
16.	Iron	APHA 23rd Edition 2017 -3500--B	mg/l	0.3	No relaxation	4.98
17.	Nitrate	IS 3025 (Pt.34):1988/RA 2003	mg/l	45	No relaxation	3.65
18.	Sodium	APHA- 23rd Edition 2017-3500 Na-B	mg/l	-	-	12
19.	Potassium	APHA- 23rd Edition 2017- 3500 K-B	mg/l	-	-	5

Reviewed by

ChinmayeeMohanty (Sr. Chemist)

CGWRTL

Authorized Signature

SaritaPanigrahi (QM)

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Email : cgwrtestinglab@gmail.com, cgwr.raipur@gmail.com Website : www.cgwr.in

TEST REPORT

TEST REPORT NO:CGWR/WLT/4901

Customer Name and Address-

M/S. D.B. POWER LTD.
NANDELI ROAD, VILL -BADADARHA,
DIST-JANJGIR CHAMPA (C.G.)

Date of Reporting : 14/07/2022
SRF No: CGWR/SRF/WTL/1652
Job Order No: CGWR/WTL/4901
Date of receipt sample: 12/07/2022
Start Date of Testing : 13/07/2022
End Date of Testing : 14/07/2022

Sample detail : HAND PUMP WATER	Sample ID: BASAN PALI-HAND PUMP N 21°55'48.6" E 83°10'50.6"	Sample Quantity: 1Ltr	Container : Plastic

Environment Condition -: Temp27^{0}C / Humidity-53%

Sl. No	PARAMETERS	TEST METHOD	UNIT	DRINKING WATER IS:10500-2012		TEST RESULT
				DESIRABLE	MAXIMUM	
A.	*Chemical Parameter*					
1.	pH	APHA 23rd Edition 2017- 4500-H+ A.	-	6.5 to 8.5	No relaxation	7.41
2.	Turbidity	APHA 23rd Edition 2017 -2130 B.	NTU	1	5	28
3.	Conductivity	APHA 23rd Edition 2017- 2510 A.	µs/cm	>1000	3200	530
4.	Total Dissolve Solids	APHA 23rd Edition 2017-2540 C.	mg/l	500	2000	280
5.	Total Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	200	600	188
6.	Calcium as Ca	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	75	200	64.12
7.	Calcium Hardness	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	-	-	159.99
8.	Magnesium as Mg	APHA 23rd Edition 2017- 2340-C	mg/l	30	100	6.81
9.	Magnesium Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	-	-	28.01
10.	Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	241.67
11.	Bi-Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	319.39
12.	Chloride	APHA 23rd Edition 2017- 4500- Cl- B.	mg/l	250	1000	19.66
13.	M- Alkalinity	APHA 23rd Edition 2017 -2320 B.	mg/l	200	600	261.8
14.	Fluoride as F	APHA 23rd Edition 2017- 4500-F D.	mg/l	1.0	1.5	0.62
15.	Sulphate as SO4	APHA 23rd Edition 2017- 4500 SO4 - E.	mg/l	200	400	10.33
16.	Iron	APHA 23rd Edition 2017 -3500--B	mg/l	0.3	No relaxation	2.4
17. .	Nitrate	IS 3025 (Pt.34):1988/RA 2003	mg/l	45	No relaxation	1.11
18.	Sodium	APHA- 23rd Edition 2017-3500 Na-B	mg/l	-	-	4
19.	Potassium	APHA- 23rd Edition 2017- 3500 K-B	mg/l	-	-	2

Reviewed by

ChinmayeeMohanty (Sr. Chemist)

Central Ground Water Recharge Testing Laboratory CGWRTL

Authorized Signature

SaritaPanigrahi (QM)

Statements:
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Email : cgwrtestinglab@gmail.com, cgwr.raipur@gmail.com Website : www.cgwr.in

TEST REPORT

TEST REPORT NO:CGWR/WLT/4899

Customer Name and Address-

M/S. D.B. POWER LTD.
NANDELI ROAD, VILL -BADADARHA,
DIST-JANJGIR CHAMPA (C.G.)

Date of Reporting : 14/07/2022
SRF No: CGWR/SRF/WTL/1652
Job Order No: CGWR/WTL/4899
Date of receipt sample: 12/07/2022
Start Date of Testing : 13/07/2022
End Date of Testing : 14/07/2022

Sample detail :BORE WELL WATER	Sample ID: RESERVOIR(BORE WELL) N 21°54'54.4"E 83°11'36.0"	Sample Quantity: 1Ltr	Container : Plastic

Environment Condition -: Temp27^{0}C / Humidity-53%

Sl. No	PARAMETERS	TEST METHOD	UNIT	DRINKING WATER IS:10500-2012		TEST RESULT
				DESIRABLE	MAXIMUM	
A.	*Chemical Parameter*					
1.	pH	APHA 23rd Edition 2017- 4500-H+ A.	-	6.5 to 8.5	No relaxation	8.01
2.	Turbidity	APHA 23rd Edition 2017 -2130 B.	NTU	1	5	<1
3.	Conductivity	APHA 23rd Edition 2017- 2510 A.	µs/cm	>1000	3200	310
4.	Total Dissolve Solids	APHA 23rd Edition 2017-2540 C.	mg/l	500	2000	170
5.	Total Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	200	600	60
6.	Calcium as Ca	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	75	200	20.04
7.	Calcium Hardness	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	-	-	49.99
8.	Magnesium as Mg	APHA 23rd Edition 2017- 2340-C	mg/l	30	100	2.43
9.	Magnesium Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	-	-	10.01
10.	Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	64.94
11.	Bi-Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	96.62
12.	Chloride	APHA 23rd Edition 2017- 4500- Cl- B.	mg/l	250	1000	23.8
13.	M- Alkalinity	APHA 23rd Edition 2017 -2320 B.	mg/l	200	600	79.2
14.	Fluoride as F	APHA 23rd Edition 2017- 4500-F D.	mg/l	1.0	1.5	1.47
15.	Sulphate as SO4	APHA 23rd Edition 2017- 4500 SO4 - E.	mg/l	200	400	28.87
16.	Iron	APHA 23rd Edition 2017 -3500--B	mg/l	0.3	No relaxation	0.85
17. .	Nitrate	IS 3025 (Pt.34):1988/RA 2003	mg/l	45	No relaxation	1.11
18.	Sodium	APHA- 23rd Edition 2017-3500 Na-B	mg/l	-	-	4
19.	Potassium	APHA- 23rd Edition 2017- 3500 K-B	mg/l	-	-	1

Reviewed by

ChinmayeeMohanty (Sr. Chemist)

Centre For Ground Water Recharge Testing Laboratory CGWRTL

Authorized Signature

SaritaPanigrahi (QM)

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Email : cgwrtestinglab@gmail.com, cgwr.raipur@gmail.com Website : www.cgwr.in

TEST REPORT

TEST REPORT NO:CGWR/WLT/4895

Customer Name and Address-

M/S. D.B. POWER LTD.
NANDELI ROAD, VILL -BADADARHA,
DIST-JANJGIR CHAMPA (C.G.)

Date of Reporting : 14/07/2022
SRF No: CGWR/SRF/WTL/1652
Job Order No: CGWR/WTL/4895
Date of receipt sample: 12/07/2022
Start Date of Testing : 13/07/2022
End Date of Testing : 14/07/2022

Sample detail :BORE WELL WATER	Sample ID: TAYANG (BORE WELL) N 21°55'31.1" E 83°13'09.4"	Sample Quantity: 1Ltr	Container : Plastic

Environment Condition -: Temp27°C / Humidity-53%

Sl. No	PARAMETERS	TEST METHOD	UNIT	DRINKING WATER IS:10500-2012		TEST RESULT
				DESIRABLE	MAXIMUM	
A.	*Chemical Parameter*					
1.	pH	APHA 23rd Edition 2017- 4500-H+ A.	-	6.5 to 8.5	No relaxation	7.28
2.	Turbidity	APHA 23rd Edition 2017 -2130 B.	NTU	1	5	<1
3.	Conductivity	APHA 23rd Edition 2017- 2510 A.	µs/cm	>1000	3200	1100
4.	Total Dissolve Solids	APHA 23rd Edition 2017-2540 C.	mg/l	500	2000	600
5.	Total Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	200	600	416
6.	Calcium as Ca	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	75	200	145.89
7.	Calcium Hardness	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	-	-	363.99
8.	Magnesium as Mg	APHA 23rd Edition 2017- 2340-C	mg/l	30	100	12.63
9.	Magnesium Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	-	-	52.00
10.	Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	194.83
11.	Bi-Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	289.87
12.	Chloride	APHA 23rd Edition 2017- 4500- Cl- B.	mg/l	250	1000	169.76
13.	M- Alkalinity	APHA 23rd Edition 2017 -2320 B.	mg/l	200	600	237.6
14.	Fluoride as F	APHA 23rd Edition 2017- 4500-F D.	mg/l	1.0	1.5	1.21
15.	Sulphate as SO4	APHA 23rd Edition 2017- 4500 SO4 - E.	mg/l	200	400	55.24
16.	Iron	APHA 23rd Edition 2017 -3500--B	mg/l	0.3	No relaxation	0.15
17. .	Nitrate	IS 3025 (Pt.34):1988/RA 2003	mg/l	45	No relaxation	2.36
18.	Sodium	APHA- 23rd Edition 2017-3500 Na-B	mg/l	-	-	29
19.	Potassium	APHA- 23rd Edition 2017- 3500 K-B	mg/l	-	-	11

Reviewed by

ChinmayeeMohanty (Sr. Chemist)

Centre For Ground Water Recharge Testing Laboratory CGWRTL

Authorized Signature

SaritaPanigrahi (QM)

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Email : cgwrtestinglab@gmail.com, cgwr.raipur@gmail.com Website : www.cgwr.in

TEST REPORT

TEST REPORT NO:CGWR/WLT/4898

Customer Name and Address-

M/S. D.B. POWER LTD.
NANDELI ROAD, VILL -BADADARHA,
DIST-JANJGIR CHAMPA (C.G.)

Date of Reporting : 14/07/2022
SRF No: CGWR/SRF/WTL/1652
Job Order No: CGWR/WTL/4898
Date of receipt sample: 12/07/2022
Start Date of Testing : 13/07/2022
End Date of Testing : 14/07/2022

Sample detail :BORE WELL WATER	Sample ID: TUDRI (BORE WELL) N 21°53'33.3" E 83°11'30.1"	Sample Quantity: 1Ltr	Container : Plastic

Environment Condition -: Temp27°C / Humidity-53%

Sl. No	PARAMETERS	TEST METHOD	UNIT	DRINKING WATER IS:10500-2012		TEST RESULT
				DESIRABLE	MAXIMUM	
A.	*Chemical Parameter*					
1.	pH	APHA 23rd Edition 2017- 4500-H+ A.	-	6.5 to 8.5	No relaxation	7.58
2.	Turbidity	APHA 23rd Edition 2017 -2130 B.	NTU	1	5	8
3.	Conductivity	APHA 23rd Edition 2017- 2510 A.	µs/cm	>1000	3200	380
4.	Total Dissolve Solids	APHA 23rd Edition 2017-2540 C.	mg/l	500	2000	210
5.	Total Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	200	600	76
6.	Calcium as Ca	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	75	200	22.44
7.	Calcium Hardness	APHA 23rd Edition 2017- 3500-Ca-B	mg/l	-	-	55.99
8.	Magnesium as Mg	APHA 23rd Edition 2017- 2340-C	mg/l	30	100	4.86
9.	Magnesium Hardness	APHA 23rd Edition 2017- 2340-C	mg/l	-	-	20.01
10.	Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	104.63
11.	Bi-Carbonate	APHA 23rd Edition 2017 -2320 B.	mg/l	-	-	155.67
12.	Chloride	APHA 23rd Edition 2017- 4500- Cl- B.	mg/l	250	1000	23.8
13.	M- Alkalinity	APHA 23rd Edition 2017 -2320 B.	mg/l	200	600	127.6
14.	Fluoride as F	APHA 23rd Edition 2017- 4500-F D.	mg/l	1.0	1.5	1.55
15.	Sulphate as SO4	APHA 23rd Edition 2017- 4500 SO4 - E.	mg/l	200	400	12.43
16.	Iron	APHA 23rd Edition 2017 -3500--B	mg/l	0.3	No relaxation	0.1
17. .	Nitrate	IS 3025 (Pt.34):1988/RA 2003	mg/l	45	No relaxation	1.22
18.	Sodium	APHA- 23rd Edition 2017-3500 Na-B	mg/l	-	-	6
19.	Potassium	APHA- 23rd Edition 2017- 3500 K-B	mg/l	-	-	2

Reviewed by

ChinmayeeMohanty (Sr. Chemist)

CGWRTL

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