COMPLIANCE REPORT

FOR

THE PERIOD APRIL'2020 – SEPTEMBER'2020

ENVIRONMENTAL CLEARANCE

EC Letter No. J-11011/112/2013-IA.II(I), date 29th March, 2016

Ardent steel limited

Vill: Phuljhar, Block: Banspal, Dist: Keonjhar, Odisha.

Ardent steel limited
CIN- U27310CT2007PLC007671

Ref. No. ASL / MoEF & CC / 2020-21

Date: 7th January, 2021

To
The Director
Ministry of Environment & Forest, Govt. of India
Eastern Regional Office,
A/3, Chandrasekharpur,
Bhubaneswar – 751 023

GOVT OF INDIA
MoEF & CC, Eastern R.O.
Bhubaneswar-751023
08 JAN 2021
K. Hembram
RECEIVED

Sub: Submission of half yearly Environmental Clearance Compliance Report for the Existing Iron Ore Pellet Plant (0.6 million TPA) of M/s. Ardent Steel Limited in village Phuljhar, Block – Bansapal, Dist. – Keonjhar, Odisha.

Ref: EC Letter No. J-11011/112/2013-IA.II(I), date 29th March, 2016

Dear Sir,

As per the conditions given in the Environmental Clearance accorded on 29th March, 2016 to our Existing Project (0.6 Million TPA Pellet Plant) in Phuljhar village of Keonjhar district, we are herewith submitting the Half Yearly Environmental Clearance Compliance Report for the period of April' 2020 – September' 2020.

Thanking you.

Yours Faithfully
For Ardent Steel Limited

Dr. Subhasish Das
(Director

Encl: As above.

Name of the Project: M/s. Ardent Steel Ltd.

Village: Phuljhar, Tehsil: Telkoi, Dist.: Keonjhar, Odisha

Clearance Letter/s No. & Date:

EC Letter No.J-11011/112/2013-IA.II(I), date 29th March, 2016

Period of Compliance: April, 2020 to September, 2020

A. SPECIFIC CONDITION:

Sl. No.	CONDITIONS	COMPLIANCE
i.	Periodical medical examination of the workers engaged in the project shall be carried and schedule of health examination of the workers should be drawn and followed accordingly.	We have appointed a qualified doctor on adhoc basis to do medical check-up of the workers working in our plant ones in every six month. During this six month period, there was health check up for 343 nos. of direct employee and 315 nos. of contractual workers. Few such examination reports are attached as **ANNEXURE – 1** for reference.
ii.	The project proponent shall ensure supply of safe drinking water to the nearby villages.	We are providing drinking water with the help of tankers within the radius of 3 km radius of the plant in the villages like Andharikhaman, Phuljhar (Barik Sahi, Majhi Sahi, Mahanta Sahi & Bhuiyan Sahi), etc. Apart from this, hand pumps have been set up in Kaliapal, Chhatna, Dhalidihi villages.
iii.	The project proponent shall install 24 X 7 air monitoring devices to monitor air emissions, as provided by the CPCB and submit report to Ministry and its Regional Office.	Installation of 24 X 7 air monitoring device to monitor air emission is completed. All hardware arrangement which includes a dedicated PC, Software for connecting to Forbes Marshall Cloud Server, cabling of Modem to transmit data to CPCB is ready. Due to the frequent network problem data transmission is not always successful.
iv.	Continuous stack monitoring facilities for all the stacks shall be provided and sufficient air pollution control devices viz. Electrostatic precipitator (ESP), bag house, bag filters etc. shall be provided	Air pollution control devices such as ESP, Bag house, Bag filters etc. has been installed in the plant to keep the stack emission level below the standard norms i.e. 50mg/Nm^3.

Sl. No.	CONDITIONS	COMPLIANCE
	to keep the emission levels below 50 mg/Nm^3 and installing energy efficient technology.	The monitoring has been conducted by Centre for Envotech and Management Consultancy Pvt. Ltd., Bhubaneswar which is recognized by the Ministry under EP Act, 1986. The stack monitoring data during the reporting six month period is attached as **Annexure – 2.**
v.	The National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R. No. 826(E) dated 16th November, 2009 shall be followed.	Agreed, we are following it. AAQ monitoring data during the reporting period of June 2020 to Sept. 2020 is enclosed as **ANNEXURE – 3**.
vi.	Gaseous emission levels including secondary fugitive emissions from all the sources shall be controlled within the latest permissible limits issued by the Ministry vide G.S.R. 414(E) dated 30th May, 2008 and regularly monitored. Guidelines/ Code of Practice issued by the CPCB shall be followed.	Agreed, we have taken steps to control fugitive emission. Fugitive emission monitoring data during the reporting period enclosed at **ANNEXURE – 4**. The monitoring during April & May was not possible due to Covid – 19 lockdown.
vii.	Vehicular pollution due to transportation of raw material and finished product shall be controlled. Proper arrangements shall also be made to control dust emission during loading and unloading of the raw material and finished product.	60 nos. of Water Sprinklers have been installed along the road as well as loading and unloading points to control the dust emission. Vehicles having valid PUC certificates are engaged in transporting raw materials /finished products. These materials are transported in covered condition. All roads inside the plant are concrete. A 10 KL capacity mobile water tanker has been engaged to sprinkle water on road. Truck mounted sweeper machine is engaged to clean dust.
viii.	'Zero' effluent discharge shall be strictly followed and no wastewater shall be discharged outside the premises.	Agreed, we are following 'Zero' effluent discharge concept. No wastewater is allowed to go outside the plant premises.
ix.	Regular monitoring of influent and effluent surface, sub-surface and ground water shall be ensured and treated wastewater shall meet the norms prescribed by the State Pollution Control Board or described under the E(P) Act whichever are more stringent.	Agreed, we are following it. Surface & Ground water sample monitoring data during the reporting period enclosed at **ANNEXURE – 5.** As per the monitoring reports submitted, the parameters are within the prescribed limits.

Sl. No.	CONDITIONS	COMPLIANCE
x.	Proper handling, storage, utilization and disposal of all the solid/hazardous waste shall be ensured and regular report regarding toxic metal content in the waste material and its composition, end use of solid/hazardous waste shall be submitted to the Ministry's Regional Office, SPCB and CPCB. The proponent shall submit a copy of the agreement with the authorized vender to the regional office as a part of compliance.	The hazardous wastes (HW) generated in plant are used oil and oil sludge. These wastes are collected and stored in HW storage area marked as per Hazardous and other waste Management and Trans-boundary Movement) Rule 2016. Coal ash which is a solid waste has been analyzed and found that it does not contain any hazardous waste. The HW waste authorization certificate issues by the SPCB, Odisha is attached as **Annexure – 6**. This certificate is valid upto 31.03.2022.
xi.	Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act and analysis shall be submitted to the regional office of the Ministry.	The Factories Act is strictly followed in our company. Adequate nos. of ear plugs, dust masks, etc, are provided to the workmen who are more exposed to the noisy & dusty atmosphere. All workers are examined for various health checkups viz., eye vision, respiratory system, cardiovascular system, abdomen tenderness, nervous system, locomotor system, skin condition, hernias, hydrocele, lung functioning test and X-ray test under Occupational health check up by a heath professional, who is appointed on adhoc basis to conduct health examination once in every six months basis.
xii.	A time bound action plan shall be submitted to reduce solid waste generated due to the project related activities, its proper utilization and disposal.	In the pellet production process in our plant, a negligible amount of solid waste is generated; this is kept separately and later utilized in repairing of roads within plant premises. The time bound action plan to reduce solid waste generation due to the project related activities, its proper utilization and disposal has been submitted vide letter no. ASL/MOEF/ 2017-18, dated 19.01.2018. Ref: **ANNEXURE – 7.**
xiii.	Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 1999 and subsequent amendment in	Negligible amount of coal ash is generated from coal gasifier which is used for levelling of low laying areas & repairing of

Sl. No.	CONDITIONS	COMPLIANCE
	2003 and 2009. All the fly ash shall be provided to cement and brick manufacturers for further utilization and Memorandum of Understanding shall be submitted to the Ministry's Regional at Chennai.	roads in the plant premises.
xiv.	A Risk and Disaster Management Plan shall be prepared and a copy submitted to the Ministry's Regional Office, SPCB and CPCB within 3 months of issue of environment clearance letter.	An updated plan has been submitted vide letter no. ASL MoEF/ 2019-20 dated 18.06.2019. This updated Risk and Disaster Management Plan has also been submitted at Directorate of Factories & Boilers, Odisha.
xv.	The project proponent shall provide for solar light system for all common area, street lights, villages, parking around project area and maintain the same regularly.	We are under process of establishing a 5 MW solar power plant in side of the plant premises. Further, we are also under process of procuring different capacity of solar lights to install for all common areas, street lights, villages, parking around the project area.
xvi.	The project proponent shall provide for LED lights in their offices and residential areas.	Yes, energy saving LED lights are provided in our offices and residential areas.
xvii.	Green belt shall be developed at least in 33% of the total project area with at least 10 meter wide green belt on all sides along the periphery of the project area and along road sides etc. by planting native and broad leaved species in consultation with local DFO, local community and as per the CPCB guidelines.	Out of total plant area of 36.781ha, around 12.13 ha (32.97% of total area) of land has been covered under green belt. During the present six month period 270 saplings are planted in the plant campus and 2700 saplings are distributed to villagers of Andharikhaman, Phuljhar, Chhatna, Dhaladihi, Kasia, etc to plant in their unused land. These saplings of Amla, Neem, Mahaneem, Guava, Bel, Mango, Jamun, Chhatina, Kendu, etc are procured form Forest Dept. nursery at Anjar, Belda, Telkoi & Chamra.
xviii.	At least 2.5% of the total cost of the project shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues, locals need and item-wise details along with time bound action plan shall be prepared and submitted to the Ministry's Regional	The project is in operation since 31/07/2010. The project cost at that time (2010) was Rs.133.96 crores which presently has increased to Rs.199.00 crores due to inflation. The stand alone pellet plants were waived off for conducting public hearing vide MoEF Notification No

Sl. No.	CONDITIONS	COMPLIANCE
	Office. Implementation of such program-shall be ensured by constituting a Committee comprising of the proponent, representatives of village Panchayat and District Administration. Action taken report in this regard shall be submitted to the Ministry's Regional Office.	SO 2572(E), dated 14th September 2015. However, the company has already spent about Rs.5,98,62,000 on Enterprise social commitment upto the year 2017, which is about 4.47% of project cost & is more than 2.5% as stipulated. In the year 2019-20 & this six month period Rs 3,25,881 has been spent on Enterprise social commitment which includes constriction of hospital building in Phuljhar, improvement in education facility in the village & maintenance of ambulance.
xix.	The proponent shall prepare a detailed CSR Plan for every year for the next 5 years for the existing-cum-expansion project, which includes village-wise, sector-wise, (Health, Education, Sanitation, Health, Skill Development and infrastructure requirements such as strengthening of village roads, avenue plantation, etc.) activities in consultation with the local communities and administration. The CSR Plan will include the amount of 2% retain annual profits as provided for in Clause 135 of the Companies Act, 2013 which provides for 2% of the average net profits of previous 3 years towards CSR activities for life of the project. A separate budget head shall be created and the annual capital and revenue expenditure on various activities of the Plan shall be submitted as part of the Compliance Report to RO. The details of the CSR Plan shall also be uploaded on the company website and shall also be provided in the Annual Report of the company.	Our Iron ore Pelletization Plant at Phuljhar was accorded Environmental clearance vide MoEF & CC Letter No. J-11011/112/2013 – IA II (I), Dated 29th March, 2016. As such the five year period under consideration for which CSR activities need to be planned include 2016-17, 2017-18, 2018-19, 2019-20 and 2020-21. The plant was not in operation during 2015-16. It incurred a loss of Rs. 4.78 crores in 2016-17. The details of CSR activities being uploaded on company's website along with six monthly compliance reports (ardentsteel.com). During the six month period of April to September 2020, Rs 50,74,690 is spend for CSR activities. These include expenses for reconstruction of school building in Phuljhar, electrification of Phuljhar village GP & donation to NGO for improvement of education.
xx.	The Company shall submit within three months their policy towards Corporate Environment Responsibility which shall inter-alia address (i) Standard operating process/procedure to being into focus	The company has submitted their policy towards Corporate Environment Responsibility (in the EAI /EMP Report) which address (i) Standard operating process/procedure to being into focus any

Sl. No.	CONDITIONS	COMPLIANCE
	any infringement/deviation /violation of environmental or forest norms/ conditions, (ii) Hierarchical system or Administrative order of the Company to deal with environmental clearance conditions and (iii) System of reporting of non-compliance/violation environmental norms to the Board of Directors of the Company and/or stakeholders or shareholders.	infringement/ deviation violation of environmental or forest norms/ conditions, (ii) Hierarchical system of Administrative order of the Company to deal with environmental clearance conditions and (iii) System of reporting of non Compliance /violation environmental norms to the Board of Directors of the Company and/or stakeholders or shareholders.
xxi.	Provision shall be made for the housing of construction labour 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.	The plant is in operation since 31/07/2010 with valid consent to Operate from SPCB, Odisha. Later EC was obtained in 2016, as per the notification of MoEF & CC. Thus, the construction activities were completed before obtaining the EC. So no housing for construction labor is needed. The condition is not applicable at present.

B. GENERAL CONDITIONS:

Sl. No.	CONDITIONS	COMPLIANCES
i.	The project authorities must strictly adhere to the stipulations made by the Odisha Pollution Control Board and the State Government.	Yes, we are following the stipulations of SPCB, Odisha strictly. We have obtained Consent to Operate (CTO) from State Pollution Control Board, Odisha vide letter no. 3010/IND-I-CON-6363; dated 25.03.2019; which is valid till 31.03.2024. Ref. **Annexure- 9.**
ii.	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forest and Climate Change (MoEFCC).	Agreed, our future expansion will only be carried out after prior approval of MoEF & CC.
iii.	At least four ambient air quality monitoring stations should be established in the downward direction as well as where maximum ground level concentration of PM10, PM2.5, SO2 and NOx are anticipated in consultation with the SPCB. Data on	Ambient Air Quality at four locations and Stack emission are monitored regularly by a MoEF /NABL accredited laboratory. The monitoring report during this six month period is attached as **Annexure – 2**.

Sl. No.	CONDITIONS	COMPLIANCES
	ambient air quality and stack emission shall be regularly submitted to this Ministry including its Regional Office at Bhubaneswar and SPCB /CPCB once in six months.	
iv.	Industrial wastewater shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May, 1993 and 31st December, 1993 or as amended from time to time. The treated wastewater shall be utilized for plantation purpose.	Very negligible amount of wastewater is generated from plant which is collected in a concrete sump of 50 m^3 (4 X 5 X 2.5 m) capacity and three concrete sumps of capacity 96 m^3 (4 x 8 x 3 m) each. The water is being recycled to the grinding process only. Total rain water and sprinkling water is being collected through drains to a pond of capacity 55000 m^3 (100 x 100 x 5.5 m) which is recycled to thickener of grinding area. The water seepage near the storage yard is being collected through garland drains and routed to a concrete pit of capacity 92.5 m^3 (5 x 5 x 3.7 m). All the treated water from the settling ponds have been recycled in the process and no water is being discharged outside of the plant premises. The wastewater being generated from the process being treated in settling ponds by gravitational settling and the treated water being recycled in the process only. So effluent treatment plant is not required for this process.
v.	The overall noise levels in and around the plant area shall be kept well within the standards (85 dBA) by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1989 viz. 75 dBA (daytime) and 70 dBA (nighttime)	The noise monitoring result in this six month period is attached as **Annexure-8**. Noise control measures are provided at noise generating sites to keep the noise level under approved level. It has been observed that Noise level is within the prescribed limit. The monitoring reports are submitted to Regional Office of MoEF & CC, Bhubaneswar along with six monthly compliance reports on regular basis.
vi.	Occupational health surveillance of the workers shall be done on a regular basis and	Yes, it is being done on regular basis. The periodical medical examination of

Sl. No.	CONDITIONS	COMPLIANCES
	records maintained as per Factories Act.	the workers has been carried out by an qualified doctor and the records were maintained.
vii.	The company shall develop rain water harvesting structures to harvest the rain water for utilization in the lean season besides recharging the ground water table.	We do not utilize any surface water till date. However, Rain Water Harvesting and Ground Water Recharge Plan for our plant has been prepared. Ref: **Annexure – 10**. The rain water from the plant surface, raw material (coal, Iron Ore, etc.) storage yard being collected in a settling pond and utilizing for sprinkling & gardening purpose.
viii.	The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the EIA/EMP report. Further, the company must undertake socio-economic development activities in the surrounding villages like community development programmes, educational programmes, drinking water supply and health care etc.	Yes, it is being carried out as per the need of the local villagers.
ix.	Requisite funds shall be earmarked towards capital cost and recurring cost/annum for environment pollution control measures to implement the conditions stipulated by the Ministry of Environment, Forest and Climate Change (MoEFCC) as well as the State Government. An implementation schedule for implementing all the conditions stipulated herein shall be submitted to the Regional Office of the Ministry at Bhubaneswar. The funds so provided shall not be diverted for any other purpose.	The project was operating before obtaining the EC. As such pollution control systems for air, water and noise control has been in place. Total expenditure on account of pollution control measures in the financial year 201-20 is about Rs 8.5 lakhs.
x.	A copy of clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parishad/ Municipal Corporation, Urban Local Body and the local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the web site of the company by the proponent.	Yes, copy of environmental clearance letter given to Phuljhar Panchayat and a receipt from Gram Panchayat on this subject has also been obtained. A copy of the EC letter is also available in the website.

Sl. No.	CONDITIONS	COMPLIANCES
xi.	The project proponent shall upload the status of compliance of the stipulated environment clearance 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 the MoEFCC at Bhubaneswar. The respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; PM_{10}, SO_2, NO_x (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the projects shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	Yes, the compliance report, monitoring report, CSR Activities report are being uploaded on company's website (ardentsteel.com) regularly. We have installed a display board at the main gate. Along with the temperature, it is also displaying the environmental monitoring values.
xii.	The project proponent shall also submit six monthly reports on the status of the compliance of the stipulated environmental conditions including results of monitored data (both in hard copies as well as by e-mail) to the Regional Office of MoEFCC, the respective Zonal Office of CPCB and the SPCB. The Regional Office of this Ministry at Bhubaneswar /CPCB /SPCB shall monitor the stipulated conditions.	The six monthly EC compliance report is being submitted regularly.
xiii.	The environmental statement for each financial year ending 31st March in Form-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 conditions and shall also be sent to the respective Regional Office of the MoEFCC at Bhubaneswar by e-mail.	The environmental statement for each financial year is submitted regularly to SPCB, Odisha.
xiv.	The Project Proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB and may also be seen at Website of the Ministry of Environment,	Yes, it has already been intimated to public and also submitted a copy to the State Pollution Control Board, Odisha.

Sl. No.	CONDITIONS	COMPLIANCES
	Forest and Climate Change (MoEFCC) at http:/envfor.nic.in. This shall be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same should be forwarded to the Regional office at Bhubaneswar.	The newspaper advertisements copies were published on 06.04.2016 in "The Pioneer" (English) and on 05.04.2016 in "Pratidin" (Odia daily).
xv.	Project authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of commencing the land development work.	The project has been completed before obtaining the EC. Financial Closure : 21 .10.2008 Financial approval : 21.10.2008 Purchase of 1st land : 31.05.2008 Proof for the above already submitted earlier.

* * *

ANNEXURE

Annexure 1	Health check-up report of few staff
Annexure 2	Stack Monitoring Result
Annexure 3	Ambient Air Quality Monitoring Result
Annexure 4	Fugitive Emission Monitoring Result
Annexure 5	Surface & Ground Water quality monitoring result
Annexure 6	Hazardous Waste Authorisation from SPCB, Odisha
Annexure 7	Time bound action plan to reduce solid waste generated
Annexure 8	Noise Level Monitoring Result
Annexure 9	Valid Consent to Operate from SPCB, Odisha
Annexure 10	Rain Water Harvesting & Artificial Recharge of Ground Water

ANNEXURE 1

[FORM No. 31-A]

Health Record

(Pre-employment / Periodical)

[Prescribed under rule 62 –I]

1 Name of the factory : ASL

2 Name of the Employee : Akashya kumar mohanta

3 Employee Distinguishing Number : 068

4 Age of the employee : 46 years.

5 Identification mark : A black mole is present at the base of the Nose.

6 Nature of the job : Workman, mechanical

7 Date of Employment : 2008

8 Length of service in years : 12 yrs.

9 General Survey :

Health : Good / Fair / Poor

Height : Cms. 164 cms

Weight : Kg. 59 kg

10 Blood group : A +ve

11 Eye Vision

Normal / Abnormal

Use of glass : ~~Yes~~ / No

12 Hearing : Normal / ~~Abnormal~~

13 Respiratory system and chest Measurement

Inspiration 36"

Expiration 35"

Respiration rate / min. 20 / min

Remarks, if any Nil

14 Cardiovascular system

Pulse rate 84 / min

B.P. 140/90 mm Hg

Heart Sound S1 S2 Normal heared

Remarks, if any Nil

15 Abdomen Tenderness : ~~Yes~~ / No

16 Nervous System

History of Fits : ~~Yes~~ / No

Epilepsy : ~~Yes~~ / No

Remarks on Mental Health Sound

17 Locomotor System : Normal / ~~Abnormal~~

18 Skin Condition : Normal / ~~Abnormal~~

Remarks on any skin disease noticed : Nil

19 Hearnias : ~~Present~~/ Absent

20 Hydrocele : ~~Present~~/ Absent

21 Present complain if any : Nil

22 Summary of Findings :

Heart Disease: Nil

Hypertension: Mild hypertension

Diabetes : Nil

T.B. : Nil

Epilepsy: Nil

Poisoning: Nil

Others : Nil

Occupational Disease, if any : Not found.

23 Recommendation, if any for any further investigation

Adv. Restriction of salt.
Morning Walk

Akshay Kumar Mohanta

Signature of the employee

Signature of Medical officer

[FORM No. 31-A]

Health Record

(Pre-employment / Periodical)

[Prescribed under rule 62 –I]

1 Name of the factory : ASL

2 Name of the Employee : Sudarsanani Mohanta

3 Employee Distinguishing Number : 679

4 Age of the employee : 39 year.

5 Identification mark : A blackmole is present over the Right side of the face.

6 Nature of the job : chemist QC

7 Date of Employment : 1.10.2016

8 Length of service in years : 4 year.

9 General Survey :

Health : Good / Fair / Poor

Height : Cms. 158 cms

Weight : Kg. 68 kg

10 Blood group : A +VE

11 Eye Vision

Normal / ~~Abnormal~~

Use of glass : ~~Yes~~ / No

12 Hearing : Normal / ~~Abnormal~~

13 Respiratory system and chest Measurement

Inspiration 38"

Expiration 36"

Respiration rate / min. 18 / min

Remarks, if any Nil

14 Cardiovascular system

Pulse rate 72 / min

B.P. 120 / 80 mm Hg

Heart Sound S1 S2 Normal heared.

Remarks, if any Nil

15 Abdomen Tenderness : ~~Yes~~ / No

16 Nervous System

History of Fits : ~~Yes~~ / No

Epilepsy : ~~Yes~~ / No

Remarks on Mental Health Sound

17 Locomotor System : Normal / ~~Abnormal~~

18 Skin Condition : Normal / Abnormal

Remarks on any skin disease noticed : Skin is healthy.

19 Hearnias : ~~Present~~/ Absent

20 Hydrocele : ~~Present~~/ Absent

21 Present complain if any : Nil

22 Summary of Findings :

Heart Disease: Nil

Hypertension: Nil

Diabetes : Nil

T.B. : Nil

Epilepsy: Nil

Poisoning: Nil

Others : Nil

Occupational Disease, if any : Nil

23 Recommendation, if any for any further investigation

he beans a good health.

Indrani Mahato

Signature of the employee

23040 21/8/20.

Signature of Medical officer

[FORM No. 31-A]

Health Record

(Pre-employment / Periodical)

[Prescribed under rule 62 –I]

1 Name of the factory : ASL

2 Name of the Employee : Anadi Setty

3 Employee Distinguishing Number : 75

4 Age of the employee : 53 years.

5 Identification mark : A raised rounded blackmole at present over the left side abdomen.

6 Nature of the job : Workmen. Stone.

7 Date of Employment : 2008

8 Length of service in years : 12 years.

9 General Survey :

Health : Good / ~~Fair / Poor~~

Height : Cms. 166 cms

Weight : Kg. 69 Kg

10 Blood group : B+ve

11 Eye Vision

Normal / ~~Abnormal~~

Use of glass : ~~Yes~~ / No

12 Hearing : Normal / ~~Abnormal~~

13 Respiratory system and chest Measurement

Inspiration 37"

Expiration 35"

Respiration rate / min. 18/min

Remarks, if any Nil

14 Cardiovascular system

Pulse rate 73/min

B.P. 120/80 mm Hg

Heart Sound S1 S2 Normal heard.

Remarks, if any Nil

15 Abdomen Tenderness : ~~Yes~~ / No

16 Nervous System

History of Fits : ~~Yes~~ / No

Epilepsy : ~~Yes~~ / No

Remarks on Mental Health Sound

17 Locomotor System : Normal / ~~Abnormal~~

18 Skin Condition : Normal / ~~Abnormal~~

Remarks on any skin disease noticed : Nil

19 Hearnias : ~~Present~~/ Absent

20 Hydrocele : ~~Present~~/ Absent

21 Present complain if any : Nil

22 Summary of Findings :

Heart Disease: Nil

Hypertension: Nil

Diabetes : Nil

T.B. : Nil

Epilepsy: Nil

Poisoning: Nil

Others : Nil

Occupational Disease, if any : Not found

23 Recommendation, if any for any further investigation Not required.

Anasli Sethy.

Signature of the employee

Signature of Medical officer

20/8/20

Dr. SUSHIL KUMAR BEHERA RMO - 23040

[FORM No. 31-A]

Health Record

(Pre-employment / Periodical)

[Prescribed under rule 62 –I]

1 Name of the factory : ASL

2 Name of the Employee : Lambodhan Borah

3 Employee Distinguishing Number : 27.

4 Age of the employee : 42 years.

5 Identification mark : A black moles present over the neck on its right side.

6 Nature of the job : Workshop Workman mechanical.

7 Date of Employment : 2008

8 Length of service in years : 12 years.

9 General Survey :

Health : Good / ~~Fair / Poor~~

Height : Cms. 172 cms

Weight : Kg. 68 kg

10 Blood group : A +ve

11 Eye Vision

Normal / ~~Abnormal~~

Use of glass : ~~Yes~~ / No

12 Hearing : Normal / ~~Abnormal~~

13 Respiratory system and chest Measurement

Inspiration 37"

Expiration 35"

Respiration rate / min. 18/min

Remarks, if any Nil

14 Cardiovascular system

Pulse rate 72/min

B.P. 90/60 mm Hg

Heart Sound S1 S2 Normal heared.

Remarks, if any Nil

15 Abdomen Tenderness : ~~Yes~~ / No

16 Nervous System

History of Fits : ~~Yes~~ / No

Epilepsy : ~~Yes~~ / No

Remarks on Mental Health Sound

17 Locomotor System : Normal / ~~Abnormal~~

18 Skin Condition : Normal / ~~Abnormal~~

Remarks on any skin disease noticed : Nil

19 Hearnias : ~~Present~~/ Absent

20 Hydrocele : ~~Present~~/ Absent

21 Present complain if any : Nil

22 Summary of Findings :

Heart Disease: Nil

Hypertension: ~~Hy~~ Hypotensive

Diabetes : Nil

T.B. : Nil

Epilepsy: Nil

Poisoning: Nil

Others : Nil

Occupational Disease, if any : Nil Not bound.

23 Recommendation, if any for any further investigation Not required.
Adv- to take Proteinous food.
to drink plenty of water.

Signature of the employee

Signature of Medical officer

Dr. SUSHREE SUPRIYA BEHERA
RMO - 29040

CENTRE FOR ENVOTECH AND MANAGEMENT CONSULTANCY PVT. LTD.

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Accredited by NABET, QCI for EIA Studies as 'A' Category Consultant Organization. Empanelled with PCCF(Wildlife) &CWLW,Odisha
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MoEF&CC, Govt. of India, Recognised Environment Laboratory under Environment (Protection) Act, 1986.

Reference No	:	**CEMC/ASL/ Jun -ST-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Stack Monitoring**
Date of Monitoring	:	**11.06.2020**
Sample Collected by	:	**Mr.B Samantaray**
Stack Height	:	**30m**

STACK EMISSION REPORT

Sl. No.	Location of Sampling	Flue Gas Temp. in K	Concentration of Particulate Matter (PM) in mg/Nm^3
			Result
01	ESP	396	48.2

Authorized Signatory

Seal of Laboratory

Notes:

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Reference No	:	**CEMC/ASL/ Jul -ST-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Stack Monitoring**
Date of Monitoring	:	**13.07.2020**
Sample Collected by	:	**Mr.B Samantaray**
Stack Height	:	**30m**

STACK EMISSION REPORT

Sl. No.	Location of Sampling	Flue Gas Temp. in K	Concentration of Particulate Matter (PM) in mg/Nm^3
			Result
01	ESP	390	46.8

Authorized Signatory **Seal of Laboratory**

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Reference No	:	**CEMC/ASL/ Aug -ST-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Stack Monitoring**
Date of Monitoring	:	**11.08.2020**
Sample Collected by	:	**Mr.B Samantaray**
Stack Height	:	**30m**

STACK EMISSION REPORT

Sl. No.	Location of Sampling	Flue Gas Temp. in K	Concentration of Particulate Matter (PM) in mg/Nm^3
			Result
01	ESP	378	47.0

Authorized Signatory **Seal of Laboratory**

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Reference No	:	**CEMC/ASL/ Sept -ST-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Stack Monitoring**
Date of Monitoring	:	**14.09.2020**
Sample Collected by	:	**Mr.B Samantaray**
Stack Height	:	**30m**

STACK EMISSION REPORT

Sl. No.	Location of Sampling	Flue Gas Temp. in K	Concentration of Particulate Matter (PM) in mg/Nm^3
			Result
01	ESP	368	48.2

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Reference No	:	**CEMC/ASL/ Jun -A-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Ambient Air**
Date of Monitoring	:	**11.06.2020**
Date of Receiving	:	**12.06.2020**
Date of Analysis	:	**12.06.2020**
Sample Collected by	:	**Mr.B Samantaray**

AMBIENT AIR QUALITY TEST REPORT (24 HOURLY AVERAGE)

Sl. No.	LOCATION	MONITORING REPORT					
		PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)
1	At the boundary near the water harvesting pond (East Direction)	71.8	38.8	11.6	17.2	0.5	<20
2	At the Boundary near ESP (South Direction)	67.8	36.5	11.7	16.1	0.5	<20
3	At the Boundary near Coal Fines Stock yard (North Direction)	71.3	37.8	12.4	17.1	0.5	<20
4	Near Ball mill,Iron ore fines stock yard	72.8	38.9	11.9	14.8	0.4	<20
NAAQ Standard		**100 ($\mu g/m^3$)**	**60 ($\mu g/m^3$)**	**80 ($\mu g/m^3$)**	**80 ($\mu g/m^3$)**	**4.0 (mg/m^3)**	**400 ($\mu g/m^3$)**

Authorized Signatory

Seal of Laboratory

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Reference No	:	**CEMC/ASL/ Jul -A-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Ambient Air**
Date of Monitoring	:	**13.07.2020**
Date of Receiving	:	**14.07.2020**
Date of Analysis	:	**14.07.2020**
Sample Collected by	:	**Mr.B Samantaray**

AMBIENT AIR QUALITY TEST REPORT (24 HOURLY AVERAGE)

Sl. No.	LOCATION	MONITORING REPORT					
		PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)
1	At the boundary near the water harvesting pond (East Direction)	70.2	37.6	11.2	17.0	0.5	<20
2	At the Boundary near ESP (South Direction)	66.0	35.2	11.5	15.8	0.5	<20
3	At the Boundary near Coal Fines Stock yard (North Direction)	70.2	36.7	12.2	16.9	0.5	<20
4	Near Ball mill,Iron ore fines stock yard	70.4	36.4	10.6	14.2	0.5	<20
NAAQ Standard		**100 ($\mu g/m^3$)**	**60 ($\mu g/m^3$)**	**80 ($\mu g/m^3$)**	**80 ($\mu g/m^3$)**	**4.0 (mg/m^3)**	**400 ($\mu g/m^3$)**

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Seal of Laboratory

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Reference No	:	**CEMC/ASL/ Aug -A-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Ambient Air**
Date of Monitoring	:	**11.08.2020**
Date of Receiving	:	**12.08.2020**
Date of Analysis	:	**12.08.2020**
Sample Collected by	:	**Mr.B Samantaray**

AMBIENT AIR QUALITY TEST REPORT (24 HOURLY AVERAGE)

Sl. No.	LOCATION	MONITORING REPORT					
		PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)
1	At the boundary near the water harvesting pond (East Direction)	68.6	36.2	11.0	16.8	0.5	<20
2	At the Boundary near ESP (South Direction)	64.8	34.0	11.2	15.6	0.5	<20
3	At the Boundary near Coal Fines Stock yard (North Direction)	68.8	35.4	12.0	16.4	0.4	<20
4	Near Ball mill,Iron ore fines stock yard	69.2	35.6	10.2	14.0	0.5	<20
NAAQ Standard		**100 ($\mu g/m^3$)**	**60 ($\mu g/m^3$)**	**80 ($\mu g/m^3$)**	**80 ($\mu g/m^3$)**	**4.0 (mg/m^3)**	**400 ($\mu g/m^3$)**

Authorized Signatory

Seal of Laboratory

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Reference No	:	**CEMC/ASL/ Sept -A-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Ambient Air**
Date of Monitoring	:	**14.09.2020**
Date of Receiving	:	**15.09.2020**
Date of Analysis	:	**15.09.2020**
Sample Collected by	:	**Mr.B Samantaray**

AMBIENT AIR QUALITY TEST REPORT (24 HOURLY AVERAGE)

Sl. No.	LOCATION	MONITORING REPORT					
		PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)	NH_3 ($\mu g/m^3$)
1	At the boundary near the water harvesting pond (East Direction)	66.8	35.0	10.8	16.4	0.5	<20
2	At the Boundary near ESP (South Direction)	62.4	33.5	11.1	15.2	0.5	<20
3	At the Boundary near Coal Fines Stock yard (North Direction)	66.2	34.4	11.7	16.2	0.4	<20
4	Near Ball mill,Iron ore fines stock yard	67.6	33.8	10.0	13.6	0.5	<20
NAAQ Standard		**100 ($\mu g/m^3$)**	**60 ($\mu g/m^3$)**	**80 ($\mu g/m^3$)**	**80 ($\mu g/m^3$)**	**4.0 (mg/m^3)**	**400 ($\mu g/m^3$)**

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Reference No	:	**CEMC/ASL/ Jun -F-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Fugitive Air**
Date of Monitoring	:	**11.06.2020**
Date of Receiving	:	**12.06.2020**
Date of Analysis	:	**12.06.2020**
Sample Collected by	:	**Mr.B Samantaray**

FUGITIVE EMISSION TEST REPORT

Sl. No.	LOCATION	RESULT	
		RSPM ($\mu g/m^3$)	SPM ($\mu g/m^3$)
1	Proportioning System (Ash & Coke Fines Bunker)	328	1120
2	Raw Material Transfer point of Mixture (Mixture Building)	310	998
3	Ball Mill (Cool Grinding)	320	1082
4	Ball Mill (Flux & Coke Grinding)	315	1098
5	Finished Product Transfer points and plant de-dusting system	301	1092
6	Travelling Grate & Rotary Kiln	330	1002
MoEF Standard for SPM		**--**	**2000***

** The standard is applicable at 10 m distance from the source*

Authorized Signatory **Seal of Laboratory**

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Reference No	:	**CEMC/ASL/ Jul -F-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Fugitive Air**
Date of Monitoring	:	**13.07.2020**
Date of Receiving	:	**14.07.2020**
Date of Analysis	:	**14.07.2020**
Sample Collected by	:	**Mr.B Samantaray**

FUGITIVE EMISSION TEST REPORT

Sl. No.	LOCATION	RESULT	
		RSPM ($\mu g/m^3$)	SPM ($\mu g/m^3$)
1	Proportioning System (Ash & Coke Fines Bunker)	318	1010
2	Raw Material Transfer point of Mixture (Mixture Building)	296	990
3	Ball Mill (Cool Grinding)	300	1065
4	Ball Mill (Flux & Coke Grinding)	305	1088
5	Finished Product Transfer points and plant de-dusting system	280	1032
6	Travelling Grate & Rotary Kiln	310	985
MoEF Standard for SPM		**--**	**2000***

** The standard is applicable at 10 m distance from the source*

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Reference No	:	**CEMC/ASL/ Aug -F-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Fugitive Air**
Date of Monitoring	:	**11.08.2020**
Date of Receiving	:	**12.08.2020**
Date of Analysis	:	**12.08.2020**
Sample Collected by	:	**Mr.B Samantaray**

FUGITIVE EMISSION TEST REPORT

Sl. No.	LOCATION	RESULT	
		RSPM ($\mu g/m^3$)	SPM ($\mu g/m^3$)
1	Proportioning System (Ash & Coke Fines Bunker)	307	998
2	Raw Material Transfer point of Mixture (Mixture Building)	292	980
3	Ball Mill (Cool Grinding)	290	1050
4	Ball Mill (Flux & Coke Grinding)	300	1000
5	Finished Product Transfer points and plant de-dusting system	275	1028
6	Travelling Grate & Rotary Kiln	300	970
MoEF Standard for SPM		**--**	**2000***

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Reference No	:	**CEMC/ASL/ Sept -F-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Fugitive Air**
Date of Monitoring	:	**14.09.2020**
Date of Receiving	:	**15.09.2020**
Date of Analysis	:	**15.09.2020**
Sample Collected by	:	**Mr.B Samantaray**

FUGITIVE EMISSION TEST REPORT

Sl. No.	LOCATION	RESULT	
		RSPM ($\mu g/m^3$)	SPM ($\mu g/m^3$)
1	Proportioning System (Ash & Coke Fines Bunker)	300	990
2	Raw Material Transfer point of Mixture (Mixture Building)	282	965
3	Ball Mill (Cool Grinding)	284	1038
4	Ball Mill (Flux & Coke Grinding)	290	988
5	Finished Product Transfer points and plant de-dusting system	270	1016
6	Travelling Grate & Rotary Kiln	292	968
MoEF Standard for SPM		**--**	**2000***

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Reference No	:	**CEMC/ASL/Jun -SW-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Surface Water**
Date of Monitoring	:	**11.06.2020**
Date of Receiving	:	**12.06.2020**
Date of Analysis	:	**12.06.2020**
Sample Collected by	:	**Mr.B Samantaray**
Sample Location	:	**Reservoir**

SURFACE WATER TEST REPORT

Sl. No	Parameter	Unit	GSR 422E Standards	Result
1	Colour	Hazen	--	5
2	Odour	-	--	U/O
3	pH Value @ 25°C	-	5.5-9.0	7.26
4	Total Dissolved Solid	mg/l	2100	322.6
5	Iron as Fe	mg/l	3.0	0.32
6	Sulphate as SO_4	mg/l	1000	16.4
7	Nitrate as NO_3^--N	mg/l	50	14.5
8	Boron as B	mg/l	2.0	0.16
9	BOD for 3 days @ 27^0C	mg/l	30	2.6
10	COD	mg/l	250	22.8

N.B: U/O- Un-objectionable

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Reference No	:	**CEMC/ASL/Jul -SW-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Surface Water**
Date of Monitoring	:	**13.07.2020**
Date of Receiving	:	**14.07.2020**
Date of Analysis	:	**14.07.2020**
Sample Collected by	:	**Mr.B Samantaray**
Sample Location	:	**Reservoir**

SURFACE WATER TEST REPORT

Sl. No	Parameter	Unit	GSR 422E Standards	Result
1	Colour	Hazen	--	5
2	Odour	-	--	U/O
3	pH Value @ 25°C	-	5.5-9.0	7.35
4	Total Dissolved Solid	mg/l	2100	318.4
5	Iron as Fe	mg/l	3.0	0.45
6	Sulphate as SO_4	mg/l	1000	17.4
7	Nitrate as NO_3^--N	mg/l	50	15.2
8	Boron as B	mg/l	2.0	0.22
9	BOD for 3 days @ 27^0C	mg/l	30	2.4
10	COD	mg/l	250	22.0

N.B: U/O- Un-objectionable

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Reference No	:	**CEMC/ASL/Aug -SW-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Surface Water**
Date of Monitoring	:	**11.08.2020**
Date of Receiving	:	**12.08.2020**
Date of Analysis	:	**12.08.2020**
Sample Collected by	:	**Mr.B Samantaray**
Sample Location	:	**Reservoir**

SURFACE WATER TEST REPORT

Sl. No	Parameter	Unit	GSR 422E Standards	Result
1	Colour	Hazen	--	5
2	Odour	-	--	U/O
3	pH Value @ 25°C	-	5.5-9.0	7.11
4	Total Dissolved Solid	mg/l	2100	302.6
5	Iron as Fe	mg/l	3.0	0.72
6	Sulphate as SO_4	mg/l	1000	17.0
7	Nitrate as NO_3^--N	mg/l	50	16.2
8	Boron as B	mg/l	2.0	0.30
9	BOD for 3 days @ 27^0C	mg/l	30	2.8
10	COD	mg/l	250	24.0

N.B: U/O- Un-objectionable

Authorized Signatory **Seal of Laboratory**

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Reference No	:	**CEMC/ASL/Sept -SW-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Surface Water**
Date of Monitoring	:	**14.09.2020**
Date of Receiving	:	**15.09.2020**
Date of Analysis	:	**15.09.2020**
Sample Collected by	:	**Mr.B Samantaray**
Sample Location	:	**Reservoir**

SURFACE WATER TEST REPORT

Sl. No	Parameter	Unit	GSR 422E Standards	Result
1	Colour	Hazen	--	5
2	Odour	-	--	U/O
3	pH Value @ 25°C	-	5.5-9.0	7.08
4	Total Dissolved Solid	mg/l	2100	315.8
5	Iron as Fe	mg/l	3.0	0.68
6	Sulphate as SO_4	mg/l	1000	16.8
7	Nitrate as NO_3^--N	mg/l	50	15.8
8	Boron as B	mg/l	2.0	0.14
9	BOD for 3 days @ 27^0C	mg/l	30	2.6
10	COD	mg/l	250	22.0

N.B: U/O- Un-objectionable

Authorized Signatory **Seal of Laboratory**

Notes:

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CENTRE FOR ENVOTECH AND MANAGEMENT CONSULTANCY PVT. LTD.

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Accredited by NABET, QCI for EIA Studies as 'A' Category Consultant Organization. Empanelled with PCCF(Wildlife) &CWLW,Odisha
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MoEF&CC, Govt. of India, Recognised Environment Laboratory under Environment (Protection) Act, 1986.

Reference No	:	**CEMC/ASL/Jun -GW-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Ground Water**
Date of Monitoring	:	**11.06.2020**
Date of Receiving	:	**12.06.2020**
Date of Analysis	:	**12.06.2020**
Sample Collected by	:	**Mr.B Samantaray**
Sample Location	:	**Canteen(RO Water)**

GROUND WATER TEST REPORT

Sl. No	Parameter	Unit	Desired Limit of drinking water (BIS:10500:2012)	Permissible Limit of drinking water (BIS:10500:2012)	Result
1	Colour	Hazen	5	15	<5
2	Odour	-	Agreeable	Agreeable	AL
3	Taste	-	Agreeable	-	AL
4	Turbidity	NTU	1	5	<1
5	pH Value @ 25°C	-	6.5-8.5	No Relaxation	6.52
6	Total Dissolved Solid	mg/l	500	2000	82
7	Alkalinity as $CaCO_3$	mg/l	200	600	38
8	Total Hardness as $CaCO_3$	mg/l	200	600	32
9	Iron as Fe	mg/l	0.3	No Relaxation	0.09
10	Nitrate as NO_3^--N	mg/l	45	No Relaxation	0.32
11	Sulphate as SO_4	mg/l	200	400	1.42
12	Fluoride as F	mg/l	1.0	1.5	<0.05
13	Calcium as Ca	mg/l	75	200	9.22
14	Chloride as Cl^-	mg/l	250	1000	2.9

N.B: AL – Agreeable

Authorized Signatory **Seal of Laboratory**

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MoEF&CC, Govt. of India, Recognised Environment Laboratory under Environment (Protection) Act, 1986.

Reference No	:	**CEMC/ASL/Jul -GW-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Ground Water**
Date of Monitoring	:	**13.07.2020**
Date of Receiving	:	**14.07.2020**
Date of Analysis	:	**14.07.2020**
Sample Collected by	:	**Mr.B Samantaray**
Sample Location	:	**Canteen(RO Water)**

GROUND WATER TEST REPORT

Sl. No	Parameter	Unit	Desired Limit of drinking water (BIS:10500:2012)	Permissible Limit of drinking water (BIS:10500:2012)	Result
1	Colour	Hazen	5	15	<5
2	Odour	-	Agreeable	Agreeable	AL
3	Taste	-	Agreeable	-	AL
4	Turbidity	NTU	1	5	<1
5	pH Value @ 25°C	-	6.5-8.5	No Relaxation	6.50
6	Total Dissolved Solid	mg/l	500	2000	78
7	Alkalinity as $CaCO_3$	mg/l	200	600	30
8	Total Hardness as $CaCO_3$	mg/l	200	600	36
9	Iron as Fe	mg/l	0.3	No Relaxation	0.08
10	Nitrate as NO_3^--N	mg/l	45	No Relaxation	0.42
11	Sulphate as SO_4	mg/l	200	400	1.22
12	Fluoride as F	mg/l	1.0	1.5	<0.05
13	Calcium as Ca	mg/l	75	200	10.2
14	Chloride as Cl^-	mg/l	250	1000	3.9

N.B: AL – Agreeable

Authorized Signatory

Seal of Laboratory

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Reference No	:	**CEMC/ASL/Aug -GW-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Ground Water**
Date of Monitoring	:	**11.08.2020**
Date of Receiving	:	**12.08.2020**
Date of Analysis	:	**12.08.2020**
Sample Collected by	:	**Mr.B Samantaray**
Sample Location	:	**Canteen(RO Water)**

GROUND WATER TEST REPORT

Sl. No	Parameter	Unit	Desired Limit of drinking water (BIS:10500:2012)	Permissible Limit of drinking water (BIS:10500:2012)	Result
1	Colour	Hazen	5	15	<5
2	Odour	-	Agreeable	Agreeable	AL
3	Taste	-	Agreeable	-	AL
4	Turbidity	NTU	1	5	<1
5	pH Value @ 25°C	-	6.5-8.5	No Relaxation	6.53
6	Total Dissolved Solid	mg/l	500	2000	70
7	Alkalinity as $CaCO_3$	mg/l	200	600	32
8	Total Hardness as $CaCO_3$	mg/l	200	600	30
9	Iron as Fe	mg/l	0.3	No Relaxation	0.07
10	Nitrate as NO_3^--N	mg/l	45	No Relaxation	0.52
11	Sulphate as SO_4	mg/l	200	400	1.12
12	Fluoride as F	mg/l	1.0	1.5	<0.05
13	Calcium as Ca	mg/l	75	200	9.8
14	Chloride as Cl^-	mg/l	250	1000	3.6

N.B: AL – Agreeable

Authorized Signatory

Seal of Laboratory

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MoEF&CC, Govt. of India, Recognised Environment Laboratory under Environment (Protection) Act, 1986.

Reference No	:	**CEMC/ASL/Sept -GW-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Ground Water**
Date of Monitoring	:	**14.09.2020**
Date of Receiving	:	**15.09.2020**
Date of Analysis	:	**15.09.2020**
Sample Collected by	:	**Mr.B Samantaray**
Sample Location	:	**Canteen(RO Water)**

GROUND WATER TEST REPORT

Sl. No	Parameter	Unit	Desired Limit of drinking water (BIS:10500:2012)	Permissible Limit of drinking water (BIS:10500:2012)	Result
1	Colour	Hazen	5	15	<5
2	Odour	-	Agreeable	Agreeable	AL
3	Taste	-	Agreeable	-	AL
4	Turbidity	NTU	1	5	<1
5	pH Value @ 25°C	-	6.5-8.5	No Relaxation	6.56
6	Total Dissolved Solid	mg/l	500	2000	60
7	Alkalinity as $CaCO_3$	mg/l	200	600	28
8	Total Hardness as $CaCO_3$	mg/l	200	600	26
9	Iron as Fe	mg/l	0.3	No Relaxation	0.05
10	Nitrate as NO_3^--N	mg/l	45	No Relaxation	0.46
11	Sulphate as SO_4	mg/l	200	400	1.22
12	Fluoride as F	mg/l	1.0	1.5	<0.05
13	Calcium as Ca	mg/l	75	200	8.4
14	Chloride as Cl^-	mg/l	250	1000	3.2

N.B: AL – Agreeable

Authorized Signatory

Seal of Laboratory

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ANNEXURE 6

Tel : 2564033/2563924
EPABX : 2561909/2562847
E-mail: hwmd@ospcboard.org / paribesh1@ospcboard.org
Website: www.ospcboard.org

STATE POLLUTION CONTROL BOARD, ODISHA

[DEPARTMENT OF FOREST & ENVIRONMENT, GOVERNMENT OF ODISHA]
Paribesh Bhawan, A/118, Nilakantha Nagar, Unit – VIII
Bhubaneswar – 751012, INDIA

BY SPEED POST

FORM 2
[See rule 6(2)]

FORM FOR GRANT OR RENEWAL OF AUTHORISATION BY STATE POLLUTION CONTROL BOARD, ODISHA TO THE OCCUPIERS, RECYCLERS, REPROCESSORS, REUSERS, USER AND OPERATORS OF DISPOSAL FACILITIES

1. Number of authorization: **IND-IV-HW-951/** 371 and date of issue: 09-01-2019

2. Reference of application (No. and date): **1625774, dtd. 17-04-2017 / 12-04-2018.**

3. **M/s Ardent Steel Limited** is hereby granted an authorization based on the enclosed signed inspection report for generation, storage, transport, reuse, recycling, recovery, preprocessing, co-processing, utilization, treatment, disposal or any other use of hazardous or other wastes or both on the premises situated **At/Po - Phuljhar, Via - Suakati, Dist - Keonjhar, Odisha.**

Details of Authorization

Sl. No.	Category of Hazardous Waste as per the Schedules I, II and III of these Rules	Waste Description	Quantity	Mode of Disposal
1.	Schedules - I Stream - 5.1	Used /Spent Oil	0.75 KL/A	Storage in containers over concrete floor under well ventilated covered shed followed by sale to actual users having valid authorisation from SPCB, Odisha
2.	Schedules - I Stream - 5.2	Oily sludge & Waste Containing Oil	0.35/A	Storage in impervious pits / containers under well ventilated covered shed followed disposal in the Authorized HW incinerator/ Common Hazardous Waste Treatment Storage Disposal Facility (CHWTSDF), Jajpur
3.	Schedules - I Stream - 35.2	Spent Resin	0.8 T/A	Storage in impervious pits / containers under covered shed followed by final disposal in Authorized HW incinerator / CHWTSDF, Jajpur

(1) The authorization shall be valid up to **31-03-2022**.

(2) The authorization is subject to the following general and specific conditions.

A. General Conditions of authorisation:

1. The authorized person shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made there under.
2. The authorization or its renewal shall be produced for inspection at the request of an officer authorized by the State Pollution Control Board.
3. The person authorized shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorisation.
4. Any unauthorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall constitute a breach of his authorisation.
5. The person authorized shall implement Emergency Response Procedure (ERP) for which this authorisation is being granted considering all site specific possible scenarios such as spillages, leakages, fire, etc. and their possible impacts and also carry out mock drill in this regard at regular interval of time.
6. The person authorized shall comply with the provisions outlined in the Central Pollution Control Board guidelines on "Implementing Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Waste and Penalty". Any accident in this respect shall be intimated to the Board immediately.
7. It is the duty of the authorized person to take prior permission of the State Pollution Control Board to close down the facility.
8. The hazardous and other waste which gets generated during recycling or reuse or recovery or pre-processing or utilization of imported hazardous or other wastes shall be treated and disposed of as per specific conditions of authorisation.
9. An application for the renewal of an authorisation shall be made as laid down under these Rules.
10. Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board from time to time.
11. Annual return shall be filed by 30th day of June of every year for the preceding period from April to March.

B. Specific Conditions:

1. Authorization granted herewith does not relieve you in complying with other provision laid down under Water (PCP) Act, 1974, Air (PCP) Act, 1981 and Environment (Protection) Act, 1986, and the Rules made there under.
2. This authorization is subject to statutory and other clearances from Govt. of Odisha and / or Govt. of India as and when applicable.
3. In case the quantity of generation of hazardous Waste exceeds the Authorized quantity, the industry / mine shall apply for amendment of Authorization order.
4. The industry / mine shall strictly comply to the provisions of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and amendments made thereafter.
5. Annual returns in Form - 4 (See Rules- 6 (5), 13 (8), 16 (6) & 20 (2)) shall be submitted to the Board for the financial year by 30th June of every year. It shall contain the detail quantities of generation, storage and disposal of different type of hazardous wastes such as recyclable, incinerable, land disposable.
6. Steps shall be taken for reduction and prevention of the hazardous waste generated or for recycling or reuse.
7. Environmental Information with ... Air, Water, Hazardous Waste and Hazardous

8. The transport of the hazardous and other waste shall be in accordance with the provisions of the Rule, 2016 and the rules made by the Central Government under the Motor Vehicles Act, 1988 and the guidelines issued by the Central Pollution Control Board from time to time in this regard.

9. The occupier shall provide the transporter with the relevant information in **Form 9**, regarding the hazardous nature of the wastes and measures to be taken in case of an emergency and shall label the hazardous and other wastes containers as per **Form 8**.

10. In case of transportation of hazardous waste and other wastes for recycling or utilization including co-processing to outside the state, the sender shall intimate both the State Pollution Control Boards before handing over the waste to the transporter.

11. Manifest system (Movement document) shall be strictly followed as per Rule-19 and to be submitted to this office as per the Rule. The industry / mine shall check the authenticity of the way bill of the transport vehicle to ensure supply of hazardous waste to the authorized destination.

12. The hazardous waste shall be sold if required only to Actual User having valid authorization from the State Pollution Control Board, Odisha and concerned SPC Board. Details of such wastes shall be entered in the passbook issued by respective SPCB.

13. All the hazardous waste shall be stored in impervious pits / containers / floors under cover shed with adequate capacity having spill containment facility. The spilled hazardous waste shall be re-collected and stored in impervious pits / containers / floors under cover shed prior to sale / disposal.

14. The schedule of hazardous waste and the quantity as specified shall only be disposed off as per the stipulation prescribed in this authorisation.

15. This authorization does not permit you to either receive and process or generate hazardous waste in case validity of Consent to Operate of your industry / mine ceases. However you can carry out handling, storage, treatment, transport and disposal of hazardous waste and other wastes generated previously during such period to avoid accumulation of hazardous waste.

16. The industry / mine shall store the accumulated hazardous waste for a period not exceeding 90 days and shall dispose as per the stipulation prescribed in this authorisation order. In case of any violation, authorization granted shall be suspended / cancelled.

17. The industry / mine shall apply for renewal of authorization in Form-1, 120 days before expiry of this authorization order enclosing Annual Return in Form-4, Manifest copies in Form -10 and compliance to the conditions stipulated in this order along with adequate processing fees.

18. In case of transportation of hazardous and other waste, the responsibility of safe transport shall be either of the sender or the receiver whosoever arranges the transport and has the necessary authorisation for transport from the concerned State Pollution Control Board. This responsibility should be clearly indicated in the manifest.

Member Secretary

To

The Director
M/s Ardent Steel Limited
At/Po- Phuljhar, Via- Sualkati,
Dist- Keonjhar, Odisha

Memo No. 372 **Dt.** 09-01-2019

Copy to the

1. Collector & District Magistrate, **Keonjhar.**
2. Director, Factories & Boilers, Odisha, **Bhubaneswar.**
3. Regional Officer, State Pollution Control Board, Odisha, **Keonjhar.**
4. Guard file.

Chief Environmental Engineer

TIME BOUND ACTION PLAN TO REDUCE SOLID WASTE DUE TO PROJECT RELATED ACTIVITIES, ITS PROPER UTILIZATION AND DISPOSAL

M/s Ardent Steel Ltd. established a 0.6 MTPA Iron Ore Pelletisation Plant in Village / P.O. Phuljhar, Block Banspal, Tehsil Telkoi, in Keonjhar District, Odisha. The operations of the plant were started on 31/07/2010.Originally the project was established with consent to establish letter from State Pollution Control Board, Odisha which was issued to M/s Ardent Steel Ltd vide reference letter ref no: 25076/ Ind-II-NOC-5070, on 17.11.2008The consent to operate letter was issued to the company vide letter Ref No:Ind-I-CON-6363 and dated 24. 04.2012. The company availed Environmental Clearance from MoEF &CC vide letter Ref No. J-11011/112/2013 – IA II (I) Dated 29th March, 2016. As per the consent condition no. xii the company needs to submit time bound action plan to reduce solid waste generated due to the project related activities, its proper utilization and disposal. Accordingly, the following points are mentioned.

1. **Project Configuration:**

Sl. No	Plant/FRacility	Plant capacity	Product	Configuration	Total Plant Capacity
1	Iron Ore Pellet Plant	0.6 MTPA	Pellets	One Kiln of 0.6MTPA	0.6 MTPA
2	Coal Gasifier	25800 NM3/hr	Producer gas	(3 W+1 S)	25800 NM3/hr

2. The commercial production is continuing since 31/07/2010.The solid waste generated during the construction phase of the company like top soil has been utilized in filling up the low lying areas .As such construction wastes are not piled up anywhere in the plant.
3. The pellet plant operates with Grate Kiln Technology for the pellet manufacture. The solid waste generated including the following:
   i) Iron Ore fines
   ii) Broken Green Pellets
   iii) Coal ash from producer gas plant.
4. **Solid Waste Generation and Utilization:**

Sl. No.	Process Unit	Solid Waste	Quantity Ton/Annum	Mode of Utilization and disposal
1	Pellet Plant	Dust from APC devices	13,798	Fully recycled in the pellet plant
		Broken green pellets	Not quantified	Fully recycled in the pellet plant
2	Coal gasifier	Coal ash from producer gas plant	4147	Used for filling low lying areas. The ash which is not utilize is dumped in waste dump area

The plant having been in operation since 2010, the process plant operation is very stable and all efforts are being made to reduce/recycle the wastes being generated. Therefore, no time bound action plant is submitted.

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MoEF&CC, Govt. of India, Recognised Environment Laboratory under Environment (Protection) Act, 1986.

Reference No	:	**CEMC/ASL/Jun-N-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Noise Monitoring Report**
Date of Monitoring	:	**11.06.2020**
Sample Collected by	:	**Mr.B Samantaray**

NOISE LEVEL STUDY REPORT

Sl. No.	Location	Noise Level In Day Time dB(A)	Noise Level In Night Time dB(A)
01	Ball Mill (Cool Grinding)	74.2	65.4
02	Raw Material Transfer point of Mixture (Mixture Building)	71.2	68.6

NATIONAL STANDARD NOISE LEVEL

Area Code	Category of Area/Zone	Permissible Limit in dB (A)	
		Day Time	Night Time
A	**Industrial Area**	**75**	**70**
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Authorized Signatory

Seal of Laboratory

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Reference No	:	**CEMC/ASL/Jul-N-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Noise Monitoring Report**
Date of Monitoring	:	**13.07.2020**
Sample Collected by	:	**Mr.B Samantaray**

NOISE LEVEL STUDY REPORT

Sl. No.	Location	Noise Level In Day Time dB(A)	Noise Level In Night Time dB(A)
01	Ball Mill (Cool Grinding)	73.2	64.6
02	Raw Material Transfer point of Mixture (Mixture Building)	70.0	66.8

NATIONAL STANDARD NOISE LEVEL

Area Code	Category of Area/Zone	Permissible Limit in dB (A)	
		Day Time	Night Time
A	**Industrial Area**	**75**	**70**
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Authorized Signatory

Seal of Laboratory

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Reference No	:	**CEMC/ASL/Aug -N-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Noise Monitoring Report**
Date of Monitoring	:	**11.08.2020**
Sample Collected by	:	**Mr.B Samantaray**

NOISE LEVEL STUDY REPORT

Sl. No.	Location	Noise Level In Day Time dB(A)	Noise Level In Night Time dB(A)
01	Ball Mill (Cool Grinding)	71.8	63.2
02	Raw Material Transfer point of Mixture (Mixture Building)	68.8	65.2

NATIONAL STANDARD NOISE LEVEL

Area Code	Category of Area/Zone	Permissible Limit in dB (A)	
		Day Time	Night Time
A	**Industrial Area**	**75**	**70**
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Authorized Signatory

Centre for Envotech & Management Consultancy Pvt. Ltd. ★ Environmental Laboratory

Seal of Laboratory

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Reference No	:	**CEMC/ASL/Sept -N-06/20**
Name of Company	:	**Ardent Steel Ltd.**
Sample Description	:	**Noise Monitoring Report**
Date of Monitoring	:	**14.09.2020**
Sample Collected by	:	**Mr.B Samantaray**

NOISE LEVEL STUDY REPORT

Sl. No.	Location	Noise Level In Day Time dB(A)	Noise Level In Night Time dB(A)
01	Ball Mill (Cool Grinding)	70.2	62.4
02	Raw Material Transfer point of Mixture (Mixture Building)	67.0	63.8

NATIONAL STANDARD NOISE LEVEL

Area Code	Category of Area/Zone	Permissible Limit in dB (A)	
		Day Time	Night Time
A	**Industrial Area**	**75**	**70**
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Authorized Signatory

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ANNEXURE 9

CONSENT ORDER

BY REGD. POST WITH AD

STATE POLLUTION CONTROL BOARD, ODISHA

[DEPARTMENT OF FOREST & ENVIRONMENT, GOVERNMENT OF ODISHA]
Paribesh Bhawan, A/118, Nilakantha Nagar, Unit-VIII, Bhubaneswar-751012
Phone-2561909, Fax: 2562822, 2560955

CONSENT ORDER

No. 3010 / IND-I-CON-6363 Dt. 25.03.2019 /

CONSENT ORDER NO. 2716

Sub : Consent for discharge of sewage and trade effluent under Section 25/26 of Water (PCP) Act, 1974 and emission under Section 21 of Air (PCP) Act, 1981 for operation of the plant.

Ref : Your online application **ID No.2420862, Dtd.25-02-2019**

Consent to operate is hereby granted under section 25/26 of Water (Prevention & Control of Pollution) Act, 1974 and under section 21 of Air (Prevention & Control of Pollution) Act, 1981 and rules framed thereunder to

Name of the Industry **M/s Ardent Steel Limited**

Name of the Occupier & Designation **Dr. Subhasish Das, Director**

Address: **Phuljhar, Suakati, Dist – Keonjhar- 758018**

Details of Products Manufactured

Sl. No.	Product	Quantity
1.	*Iron Ore Pellet*	*50,000 Metric Tonnes /Month*
2.	*Producer Gas*	*25,800Nm^3/Hr*
3.	*Flux grinding unit*	*5 Metric Tonnes/Hour*

This consent order is valid for the period from **01.04.2019 to 31.03.2024**

This consent order is valid for the specified outlets, discharge quantity and quality of effluents (ii) quantity of emission and its quality, specified chimney / stack (iii) quantity of solid waste and its disposal as specified below.

This consent is granted subject to the General and Special Conditions stipulated below:

A. Discharge permitted through the following outlet subject to the standard

Outlet No.	Description of outlet	Point of discharge	Quantity of discharge KLD or KL/hr	Pre-scribed Standard					
				pH	BOD (mg/l)	COD (mg/l)	TSS (mg/l)	Fecal Coliform (MPN/100ml)	O & G (mg/l)
01.	*Process effluent through settling tanks*	*Recycled back to process (900 KLD)*	NIL	-	-	-	-	-	-
02.	*Outlet of STP (15 KLD) for domestic wastewater of plant premises*	*To be used for gardening*	15 KLD	6.5-9.0	30	-	100	1000	-

B. Emission permitted through the following stack subject to the prescribed standard

Chimney Stack No.	Description of Stack	Stack height (m)	Quantity of emission (m^3/hr)	Prescribed Standard				
				PM	SO_2	NO_x	-	-
1	Bag filter at proportioning system (Iron ore fines and coke bunker)	30	8,000	100	-	-	-	-
2	Bag filter at raw material transfer point of mixer (Mixture building)	30	4,000	100	-	-	-	-
3	Multi cyclone and ESP at travelling grate and rotary kiln	52	-	100	-	-	-	-
4	Bag filter at Flux grinding unit	26	6,500	100	-	-	-	-

C. Disposal of solid waste permitted in the following manner

Sl. No.	Type of Solid waste	Quantity generated (TPD)	Quantity to be reused on site (TPD)	Quantity to be reused off site (TPD)	Quantity disposed off (TPD)	Description of disposal site.
1.	*Cinder from Gas Producer Plant*	-	-	-	-	*Used for low land filling inside plant premises*

D. GENERAL CONDITIONS FOR ALL UNITS

1. The consent is given by the Board in consideration of the particulars given in the application. Any change or alternation or deviation made in actual practice from the particulars furnished in the application will also be the ground liable for review/variation/revocation of the consent order under section 27 of the Act of Water (Prevention & Control of Pollution) Act, 1974 and section 21 of Air (Prevention & Control of Pollution) Act, 1981 and to make such variations as deemed fit for the purpose of the Acts.

2. The industry would immediately submit revised application for consent to operate to this Board in the event of any change in the quantity and quality of raw material / and products / manufacturing process or quantity /quality of the effluent rate of emission / air pollution control equipment / system etc.

3. The applicant shall not change or alter either the quality or quantity or the rate of discharge or temperature or the route of discharge without the previous written permission of the Board.

4. The application shall comply with and carry out the directives/orders issued by the Board in this consent order and at all subsequent times without any negligence on his part. In case of non-compliance of any order/directives issued at any time and/or violation of the terms and conditions of this consent order, the applicant shall be liable for legal action as per the provisions of the Law/Act.

5. The applicant shall make an application for grant of fresh consent at least 90 days before the date of expiry of this consent order.

6. The issuance of this consent does not convey any property right in either real or personal property or any exclusive privileges nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Central, State laws or regulation.

7. This consent does not authorize or approve the construction of any physical structure or facilities or the undertaking of any work in any natural water course.

8. The applicant shall display this consent granted to him in a prominent place for perusal of the public and inspecting officers of this Board.

9. An inspection book shall be opened and made available to Board's Officers during the visit to the factory.

10. The applicant shall furnish to the visiting officer of the Board any information regarding the construction, installation or operation of the plant or of effluent treatment system / air pollution control system / stack monitoring system any other particulars as may be pertinent to preventing and controlling pollution of Water / Air.

11. Meters must be affixed at the entrance of the water supply connection so that such meters are easily accessible for inspection and maintenance and for other purposes of the Act provided that the place where it is affixed shall in no case be at a point before which water has been taped by the consumer for utilization for any purposes whatsoever.

12. Separate meters with necessary pipe-line for assessing the quantity of water used for each of the purposes mentioned below:

    a) Industrial cooling, spraying in mine pits or boiler feed,

    b) Domestic purpose

    c) Process

13. The applicant shall display suitable caution board at the place where the effluent is entering into any water-body or any other place to be indicated by the Board, indicating therein that the area into which the effluents are being discharged is not fit for the domestic use/bathing.

14. Storm water shall not be allowed to mix with the trade and/or domestic effluent on the upstream of the terminal manholes where the flow measuring devices will be installed.

15. The applicant shall maintain good house-keeping both within the factory and the premises. All pipes, valves, sewers and drains shall be leak-proof. Floor washing shall be admitted into the effluent collection system only and shall not be allowed to find their way in storm drains or open areas.

16. The applicant shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems install or used by him to achieve with the term(s) and conditions of the consent.

17. Care should be taken to keep the anaerobic lagoons, if any, biologically active and not utilized as mere stagnation ponds. The anaerobic lagoons should be fed with the required nutrients for effective digestion. Lagoons should be constructed with sides and bottom made impervious.

18. The utilization of treated effluent on factory's own land, if any, should be completed and there should be no possibility of the effluent gaining access into any drainage channel or other water courses either directly or by overflow.

19. The effluent disposal on land, if any, should be done without creating any nuisance to the surroundings or inundation of the lands at any time.

20. If at any time the disposal of treated effluent on land becomes incomplete or unsatisfactory or create any problem or becomes a matter of dispute, the industry must adopt alternate satisfactory treatment and disposal measures.

21. The sludge from treatment units shall be dried in sludge drying beds and the drained liquid shall be taken to equalization tank.

22. The effluent treatment units and disposal measures shall become operative at the time of commencement of production.

23. The applicant shall provide port holes for sampling the emissions and access platform for carrying out stack sampling and provide electrical outlet points and other arrangements for chimneys/stacks and other sources of emissions so as to collect samples of emission by the Board or the applicant at any time in accordance with the provision of the Act or Rules made therein.

24. The applicant shall provide all facilities and render required assistance to the Board staff for collection of samples / stack monitoring / inspection.

25. The applicant shall not change or alter either the quality or quantity or rate of emission or install, replace or alter the air pollution control equipment or change the raw material or manufacturing process resulting in any change in quality and/or quantity of emissions, without the previous written permission of the Board.

26. No control equipments or chimney shall be altered or replaced or as the case may be erected or re-erected except with the previous approval of the Board.

27. The liquid effluent arising out of the operation of the air pollution control equipment shall be treated in the manner and to ion of standards prescribed by the Board in accordance with the provisions of Water (Prevention and Control of Pollution) Act, 1974 (as amended).

28. The stack monitoring system employed by the applicant shall be opened for inspection to this Board at any time.

29. There shall not be any fugitive or episodal discharge from the premises.

30. In case of such episodal discharge/emissions the industry shall take immediate action to bring down the emission within the limits prescribed by the Board in conditions/stop the operation of the plant. Report of such accidental discharge /emission shall be brought to the notice of the Board within 24 hours of occurrence.

31. The applicant shall keep the premises of the industrial plant and air pollution control equipments clean and make all hoods, pipes, valves, stacks/chimneys leak proof. The air pollution control equipments, location, inspection chambers, sampling port holes shall be made easily accessible at all times.

32. Any upset condition in any of the plant/plants of the factory which is likely to result in increased effluent discharge/emission of air pollutants and / or result in violation of the standards mentioned above shall be reported to the Headquarters and Regional Office of the Board by fax / speed post within 24 hours of its occurrence.

33. The industry has to ensure that minimum three varieties of trees are planted at the density of not less than 1000 trees per acre. The trees may be planted along boundaries of the industries or industrial premises. This plantation is stipulated over and above the bulk plantation of trees in that area.

34. The solid waste such as sweeping, wastage packages, empty containers residues, sludge including that from air pollution control equipments collected within the premises of the industrial plants shall be disposed off scientifically to the satisfaction of the Board, so as no to cause fugitive emission, dust problems through leaching etc., of any kind.

35. All solid wastes arising in the premises shall be properly classified and disposed off to the satisfaction of the Board by :

i) Land fill in case of inert material, care being taken to ensure that the material does not give rise to leachate which may percolate into ground water or carried away with storm run-off.
ii) Controlled incineration, wherever possible in case of combustible organic material.
iii) Composting, in case of bio-degradable material.

36. Any toxic material shall be detoxicated if possible, otherwise be sealed in steel drums and buried in protected areas after obtaining approval of this Board in writing. The detoxication or sealing and burying shall be carried out in the presence of Board's authorized persons only. Letter of authorization shall be obtained for handling and disposal of hazardous wastes.

37. If due to any technological improvement or otherwise this Board is of opinion that all or any of the conditions referred to above requires variation (including the change of any control equipment either in whole or in part) this Board shall after giving the applicant an opportunity of being heard, vary all or any of such condition and thereupon the applicant shall be bound to comply with the conditions so varied.

38. The applicant, his/heirs/legal representatives or assignees shall have no claim whatsoever to the condition or renewal of this consent after the expiry period of this consent.

39. The Board reserves the right to review, impose additional conditions or condition, revoke change or alter the terms and conditions of this consent.

40 Notwithstanding anything contained in this conditional letter of consent, the Board hereby reserves to it the right and power under section 27(2) of the Water (Prevention & Control of Pollution) Act, 1974 to review any and/or all the conditions imposed herein above and to make such variations as deemed fit for the purpose of the Act by the Board.

41. The conditions imposed as above shall continue to be in force until revoked under section 27(2) of the Water (Prevention & Control of Pollution) Act, 1974 and section 21 A of Air (Prevention & Control of Pollution) Act, 1981.

42. In case the consent fee is revised upward during this period, the industry shall pay the differential fees to the Board (for the remaining years) to keep the consent order in force. If they fail to pay the amount within the period stipulated by the Board the consent order will be revoked without prior notice.

43. The industry shall comply to all the conditions stipulated under Charter on Corporate Responsibility for Environmental Protection (CREP) guidelines in a time bound manner as envisaged there in. (if applicable)

44. The industry shall comply to the conditions stipulated in CTE order issued by Odisha State Pollution Control Board and conditions stipulated in Environmental Clearances issued by MoEF, Govt. of India.

45. The industry shall abide by E(P) Act, 1986 and Rules framed there-under.

46. The Board reserves the right to revoke/refuse consent to operate at any time during period for which consent is granted in case any violation is observed and to modify/ stipulate additional conditions as deemed appropriate.

GENERAL CONDITIONS FOR UNITS WITH INVESTMENT OF MORE THAN Rs.50 CRORES, AND 17 CATEGORIES OF HIGHLY POLLUTING INDUSTRIES (RED A)

1. The applicant shall analyse the effluent / emissions and Ambient Air Quality every month through approved laboratory for the parameters indicated in TABLE- 'B', 'C' & Part -'B' as mentioned in this order and shall furnish the report thereof to the Board on monthly basis.
2. The following information shall be forwarded to the Member Secretary on or before 10th of every month.
   a) Performance / progress of the treatment plant.
   b) Monthly statement of daily discharge of domestic and/or trade effluent.
3. Non-compliance with effluent limitations
   a) If for any reason the applicant does not comply with or is unable to comply with any effluent limitations specified in this consent, the applicant shall immediately notify the consent issuing authority by telephone and provide the consent issuing authority with the following information in writing within 5 days of such notification.
      i) Causes of non-compliance
      ii) A description of the non-compliance discharge including its impact on the receiving waters.
      iii) Anticipated time of continuance of non-compliance if expected to continue or if such condition has been corrected the duration or period of non-compliance.
      iv) Steps taken by the applicant to reduce and eliminate the non-complying discharge and
      v) Steps to be taken by the applicant too prevent the condition of non-compliance.
   b) The applicant shall take all reasonable steps to minimize any adverse impact to natural waters resulting from non-compliance with any effluent limitation specified in this consent including such accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying discharge.
   c) Nothing in this consent shall be construed to relieve the applicant from civil or criminal penalties for non-compliance whether or not such non-compliance is due to factors beyond his control, such as break-down, electric failure, accident or natural disaster.
4. Proper housekeeping shall be maintained inside the factory premises including process areas by a dedicated team.
5. The industry must constitute a team of responsible and technically qualified personnel who will ensure continuous operation of all pollution control devices round the clock (including night hours) and should be in a position to explain the status of operation of the pollution control measures to the inspecting officers of the Board at any point of time. The name of these persons with their contact telephone numbers shall be intimated to the concerned Regional Officer and Head Office of the Board and in case of any change in the team it shall be intimated to the Board immediately.
6. The industry shall engage dedicated qualified manpower to ensure continuous and effective operation of online stack / Ambient Air Quality / Effluent monitoring stations for maintenance of database, real time data transfer to SPCB server, data analysis and co-ordination with concerned personnel of process units for taking corrective measures in case of non-compliances and to respond to the instructions of SPCB in this matter.

E. SPECIAL CONDITIONS (AIR POLLUTION CONTROL):

1. Adequate dust suppression arrangements shall be provided at raw material handling, product handling, coal handling system and other potential dust generating points to control fugitive emission.
2. The unit shall operate all the air pollution control devices effectively all the time so as to meet the prescribed standard for particulate matter emission as mentioned in Section-B of the consent order.
3. The cinder generated from the Gas Producer Plant shall be dumped in an area earmarked for the same. Sprinkling arrangement shall be provided at the disposal site so that the ash does not become air borne during dry season.
4. The industry shall take expedious steps to make entire internal roads black topped / concreted by June, 2019 and permanent high pressure water spraying system shall be installed for regular spraying of water on roads and work zone to minimize fugitive emission.
5. The height of the stack connected to DG set shall conform to the following
   $H = h+0.2\sqrt{KVA}$
   Where, h= Height of the building where it is installed in meter
   KVA = Capacity of DG set
   H = Height of the stack in meter above ground level.

F. SPECIAL CONDITIONS (WATER POLLUTION CONTROL):

1. Cooling tower blow down water shall be taken to storage pond and shall be used in green pellet making / dust suppression.
2. Wastewater generated during regeneration of DM plant shall be neutralized and reused for dust suppression.
3. The wastewater generated in slurry form from rotary dryer, indorating furnaces transfer points, pellet screens circuit etc. shall be treated in two nos. of thickeners and supernatant water shall be reused. Thickener underflow shall be taken to vacuum disc filter from where filter cake shall be separated and filtrate shall be collected in sump for reuse.
4. The unit shall provide garland drain around raw material and product stock yard. Run off generated from this area shall be passed through adequate settling arrangement so that the final discharge meets the prescribed general standard for discharge notified under E(P) Act, 1986.
5. The industry shall install separate Sewage Treatment Plant (STP) of adequate capacity for treatment of domestic wastewater generated from the colony.
6. There shall not be any discharge of phenolic wastewater from the catch pit. The wastewater generated from the sealing of producer gas plant shall be recycled back to the process after separation of tar.

7. The tar so generated shall be stored off in a concrete pit under a cover shed.
8. The unit shall develop a thick green belt around the factory premises.

G. SPECIAL CONDITIONS (OTHERS):

1. The unit shall obtain authorization from the Board under the Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016.
2. In case the consent fee is revised upward during this period, the industry shall pay the differential fees to the Board (for the remaining years) to keep the consent order in force. If they fail to pay the amount within the period stipulated by the Board the consent order will be revoked without prior notice.
3. The Board reserves the right to revoke / refuse consent to operate / to modify or stipulate additional conditions as deemed appropriate at any time during period for which consent is granted.
4. Rain water harvesting shall be followed by utilizing the rain water collected from the roof of the administrative buildings for recharging of ground water within the premises as per the concept and practices prescribed by CPCB.

The occupier must comply with the conditions stipulated in section A,B,C,D,E,F & G to keep this consent order valid.

To

The Director,
M/s Ardent Steel Ltd.,
At/PO-Phuljhar, Via-Suakati,
Dist-Keonjhar

25/3/19

CHIEF ENV. SCIENTIST
STATE POLLUTION CONTROL BOARD, ODISHA

Memo No._____/Dt._____/

Copy forwarded to :

i. Regional Officer, State Pollution Control Board, **Keonjhar**
ii. District Collector, **Keonjhar**
iii. DDM, Mines, **Joda, Keonjhar**
iv. Central Laboratory, SPC Board, Bhubaneswar
v. Cess Section (Head Office)
vi. H.S.M. Cell, (Head Office)

CHIEF ENV. SCIENTIST
STATE POLLUTION CONTROL BOARD, ODISHA

GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENT POLLUTANTS

Annexure-I

GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART – A : EFFLUENTS

Sl. No.	Parameters	Standards			
		Inland surface	Public sewers	Land for irrigation	Marine Costal Areas
		(a)	(b)	(c)	(d)
1.	Colour & odour	Colourless/ Odourless as far as practible	--	See 6 of Annex-1	See 6 of Annex-1
2.	Suspended Solids (mg/l)	100	600	200	a. For process wastewater – 100 b. For cooling water effluent 10% above total suspended matter of influent.
3.	Particular size of SS	Shall pass 850	--	--	--
5.	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
6.	Temperature	Shall not exceed 5^0C above the receiving water temperature	--	--	Shall not exceed 5^0C above the receiving water temperature
7.	Oil & Grease mg/l max.	10	20	10	20
8.	Total residual chlorine	1.0	--	--	1.0
9.	Ammonical nitrogen (as N) mg/l max.	50	50	--	50
10.	Total Kajeldahl nitrogen (as NH_3) mg/l max.	100	--	--	100
11.	Free ammonia (as NH_3) mg/l max.	5.0	--	--	5.0
12.	Biochemical Oxygen Demand (5 days at (20^0C) mg/l max.	30	350	100	100
13.	Chemical Oxygen Demand, mg/l max.	250	--	--	250
14.	Arsenic (as As) mg/l max.	0.2	0.2	0.2	0.2
15.	Mercury (as Hg) mg/l max.	0.01	0.01	--	0.001
16.	Lead (as pb) mg/l max.	01.	1.0	--	2.0

Sl. No.	Parameters	Standards			
		Inland surface	Public sewers	Land for irrigation	Marine Costal Areas
		(a)	(b)	(c)	(d)
17.	Cardmium (as Cd) mg/l max.	2.0	1.0	--	2.0
18.	Hexavalent Chromium (as Cr + 6) mg/l max.	0.1	2.0	--	1.0
19.	Total Chromium (as Cr) mg/l max.	2.0	2.0	--	2.0
20.	Copper (as Cu) mg/l max.	3.0	3.0	--	3.0
21.	Zinc (as Zn) mg/l max.	5.0	15	--	15
22.	Selenium (as Sc) mg/l max.	0.05	0.05	--	0.05
23.	Nickel (as Nil) mg/l max.	3.0	3.0	--	5.0
24.	Cyanide (as CN) mg/l max.	0.2	2.0	0.2	0.02
25.	Fluoride (as F) mg/l max.	2.0	15	--	15
26.	Dissolved Phosphates (as P) mg/l max.	5.0	--	--	--
27.	Sulphide (as S) mg/l max.	2.0	--	--	5.0
28.	Phennolic compounds as (C_6H_5OH) mg/l max.	1.0	5.0	--	5.0
29.	Radioactive materials a. Alpha emitter micro curle/ml. b. Beta emitter micro curle/ml.	10^7 10^6	10^7 10^6	10^8 10^7	10^7 10^6
30.	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
31	Manganese (as Mn)	2 mg/l	2 mg/l	--	2 mg/l
32.	Iron (Fe)	3 mg/l	3 mg/l	--	3 mg/l
33.	Vanadium (as V)	0.2 mg/l	0.2 mg/l	--	0.2 mg/l
34.	Nitrate Nitrogen	10 mg/l	--	--	20 mg/l

CONSENT ORDER

Annexure-II

NATIONAL AMBIENT AIR QUALITY STANDARDS

Sl. No.	Pollutants	Time Weighed Average	Concentrate of Ambient Air		
			Industrial Residential, Rural and other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1.	Sulphur Dioxide (SO_2), $\mu g/m^3$	Annual *	50	20	-Improved west and Gaeke
		24 Hours **	80	80	- Ultraviolet fluorescence
2.	Nitrogen Dioxide (NO_2), $\mu g/m^3$	Annual *	40	30	- Modified Jacob & Hochheiser (Na-Arsenite)
		24 Hours **	80	80	- Chemiluminescence
3.	Particulate Matter (size less than 10µm) or $PM_{10}\mu g/m^3$	Annual *	60	60	-Gravimetric - TOEM
		24 Hours **	100	100	- Beta Attenuation
4.	Particulate Matter (size less than 2.5µm) or $PM_{2.5}$ $\mu g/m^3$	Annual *	40	40	-Gravimetric - TOEM
		24 Hours **	60	60	- Beta Attenuation
5.	Ozone (O_3) $\mu g/m^3$	8 Hours **	100	100	- UV Photometric - Chemiluminescence
		1 Hours **	180	180	- Chemical Method
6.	Lead (Pb) $\mu g/m^3$	Annual *	0.50	0.50	-AAS/ICP method after sampling on EMP 2000 or equivalent filter paper. - ED-XRF using Teflon filter
		24 Hours **	1.0	1.0	
7.	Carbon Monoxide (CO) mg/m^3	8 Hours **	02	02	- Non Dispersive Infra Red (NDIR)
		1 Hours **	04	04	Spectroscopy
8.	Ammonia (NH_3) $\mu g/m^3$	Annual*	100	100	-Chemiluminescence - Indophenol Blue Method
		24 Hours**	400	400	
9.	Benzene (C_6H_6) $\mu g/m^3$	Annul *	05	05	-Gas Chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10.	Benzo (a) Pyrene (BaP)-Particulate phase only, ng/m^3	Annual*	01	01	-Solvent extraction followed by HPLC/GC analysis
11.	Arsenic (As), ng/m^3	Annual*	06	06	-AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12.	Nickel (Ni), ng/m^3	Annual*	20	20	-AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

ANNEXURE - 10

REPORT

ON

GROUND WATER CONDITION AND PROPOSAL ON RAIN WATER HARVESTING & ARTIFICIAL RECHARGE

FOR

M/S ARDENT STEEL LIMITED

At: Village Phuljhar, Block: Bansapal, District: Keonjhar, Odisha.

JUNE 2018

Centre For Envotech and Management Consultancy Pvt. Ltd.

AN ISO: 9001: 2008 and BS OSHAS 18001: 2007 certified company,
Empanelled with OCCL, Govt. Of Odisha, OSPCB as Category "A" Consultant Organization,

Accredited by NABET, Quality Council of India for EIA studies
As Category "A" Consultant Organization.

Regd. Off: N5/305, IRC Village, Bhubaneswar, Odisha Tele: 0674 - 2360344,
E-mail: cemc_consultancy@yahoo.co.in, cemc122@gmail.com
Website: www.cemc.in

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CHAPTER – 1
INTRODUCTION

1.1 BACKGROUND

Water is amongst the basic necessities without which one cannot imagine of any human habitation. This is probably the root cause, why the development of past human civilizations has been associated with areas nearby water sources. In this 21st century, water can be attributed to be the root cause of most of the crises and conflicts. However, the problem of water does not only point towards the quantity of water available but also to the quality of water available and its conjunctive use.

The National Water Resources Council adopted the new National Water Policy (NWP) in its 5th meeting held on 01 April 2002. The policy provides the national perspective for the planning and management of water resources with a view to ensuring their optimal, economical and equitable use. It recognizes that "water is a scarce and precious national resource to be planned, developed, conserved and managed as such, and on an integrated and environmentally sound basis, keeping in view the socio-economic aspects and needs of the States". The focus of National Water Policy can be outlined as follows:

- The development and management of water resources has to be planned for hydrological units. "All individual development projects and proposals should be formulated and considered within the framework of such an overall plan …"
- River basin organisations should be established and "prepare comprehensive plans taking into account not only the needs of irrigation but also harmonising various other water uses … The scope and powers of the river basin organisations shall be decided by the basin states themselves."
- Planning, design, development and management of water resources schemes should involve "not only the various government agencies but also the users and other stakeholders. … Water Users' Associations and the local bodies such as municipalities and gram panchayats should particularly be involved in the operation, maintenance and management of water infrastructure." Wherever feasible, "private sector participation should be encouraged in planning, development and management of water resources projects for diverse uses."

With the growth of economy and subsequent upgradation of the very pattern of life, there is a corresponding increase in demand for water from different sectors. In a progressive society it is natural that demands of water remain on the rise. In this context the issues are varied and complex in our country, because in India there are remarkable variation in the availability of water on account of the regional rainfall and geography. Along with, the increasing population and urbanization are having telling effect on the availability and quality of water.

Ground water has emerged as an important source to meet the water requirements of various sectors including the major consumers of water like irrigation, domestic and industries. The sustainable development of ground water resource requires precise quantitative assessment based on reasonably valid scientific principles.

Water conservation can be defined as any beneficial reduction in water loss, use or waste as well as the preservation of water quality, a reduction in water use accomplished by implementation of water conservation or water efficiency measures; or, improved water management practices that reduce or enhance the beneficial use of water. A water conservation measure is an action, behavioral change, device, technology, or improved design or process implemented to reduce water loss, waste, or use. *Water efficiency* is a tool of water conservation. That results in more efficient water use and thus reduces water demand. The value and cost-effectiveness of a water efficiency measure must be evaluated in relation to its effects on the use and cost of other natural resources (e.g. energy or chemicals). The goals of water conservation efforts include as follows:

- Sustainability: To ensure availability for future generations, the withdrawal of fresh water from an ecosystem should not exceed its natural replacement rate.
- Energy conservation: Water pumping, delivery, and wastewater treatment facilities consume a significant amount of energy. In some regions of the world over 15% of total electricity consumption is devoted to water management.
- Habitat conservation: Minimizing human water use helps to preserve fresh water habitats for local wildlife and migrating waterfowl, as well as reducing the need to build new dams and other water diversion infrastructure.

1.2 OBJECTIVE OF STUDY

The major objectives of the study can be outlined as follows:

- To assess the hydrogeological setup of the project area.
- To assess the catchment characteristics, hydrometeorology and water harvesting potential of the project area.
- To study the nature of subsurface formation with help of geophysical survey and hydrogelogical investigation for designing suitable rain water harvesting structures.
- To study, identify and suggest suitable location and design of rain water harvesting and artificial recharge structures for the project area.

CHAPTER - 2

RAIN WATER HARVESTING AND ARTIFICIAL RECHARGE

2.1 RAIN WATER HARVESTING

With the ever-increasing population and rising demands, the pressure on the existing water resources has grown many folds. Rain water harvesting is the age old concept, which holds immense potential in the current times in controlling runoff and resultant water logging issues besides assuring an alternative source of water and supplement to existing natural resources in a wide variety of circumstances. It is the technique of collection and storage of rain water at surface or in sub-surface aquifers, before it is lost as surface run-off. The augmented resource can be harvested in the time of need.

There are two sources for rain water harvesting. They are Surface Runoff and Roof Top Rain water. The basic purpose of rain water harvesting are-

- To overcome the inadequacy of waters to meet our demands.
- To arrest decline in ground water levels.
- To enhance availability of ground water at specific place and time and utilize rain water for sustainable development.
- To increase infiltration of rain water in the subsoil, which has decreased drastically in urban areas due to paving of open area.
- To improve ground water quality by dilution.
- To increase agriculture production.
- To improve ecology of the area by increase in vegetation cover, etc.

2.2 CONCEPT OF ARTIFICIAL RECHARGE

The term artificial recharge has different connotations for various practitioners. Artificial recharge to ground water is defined as the recharge that occurs when the natural pattern of recharge is deliberately modified to increase recharge (ASCE 2001). The process of recharge itself is not artificial. The same physical laws govern recharge, whether it occurs under natural or artificial conditions. What is artificial is the availability of water supply at a

particular location and a particular time. In the broadest sense one can define artificial recharge as "any procedure, which introduces water in a previous stratum".

The term artificial recharge refers to transfer of surface water to the aquifer by human interference. The natural process of recharging the aquifers is accelerated through percolation of stored or flowing surface water, which otherwise does not percolate into the aquifers. Artificial recharge is also defined as the process by which ground water is augmented at a rate exceeding that under natural condition of replenishment. Therefore, any man-made facility that adds water to an aquifer may be considered as artificial recharge (CGWB, 1994)

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.

2.3 NEED FOR ARTIFICIAL RECHARGE

Natural replenishment of ground water reservoir is a slow process and is often unable to keep pace with the excessive and continued exploitation of ground water resources in various parts of the country. This has resulted in declining ground water levels and depletion of ground water resources in such areas. Artificial recharge efforts are basically aimed at augmentation of the natural movement of surface water into ground water reservoir through suitable civil construction techniques. Such techniques interrelate and integrate the source water to ground water reservoir and are dependent on the hydrogeological situation of the area concerned.

Occurrence of rainfall in India is mostly limited to about three months in a year. The natural recharge to ground water reservoir is restricted to this period only in a major part of the country. Artificial recharge techniques aim at extending the recharge period in the post-monsoon season for about three or more months, resulting in enhanced sustainability of ground water sources during the lean season. In arid regions of the country, rainfall varies between 150 and 600 mm/ year with less than 10 rainy days. A major part of the precipitation is received in 3 to 5 major storms lasting only a few hours. The rates of potential evapotranspiration (PET) are exceptionally high in these areas, often ranging from

300 to 1300 mm. In such cases, the average annual PET is much higher than the rainfall and the annual water resource planning has to be done by conserving the rainfall, by storing the available water either in surface or in sub-surface reservoirs. In areas where climatic conditions are not favorable for creating surface storage, artificial recharge techniques have to be adopted for diverting most of the surface storage to the ground water reservoirs within the shortest possible time.

In hilly areas, even though the rainfall is comparatively high, scarcity of water is often felt in the post-monsoon season, as most of the water available is lost as surface runoff. Springs, the major source of water in such terrains, are also depleted during the post monsoon period. In such areas, rainwater harnessing and small surface storages at strategic locations in the recharge areas of the springs can provide sustainable yields to the springs as well as enhance the recharge during and after rainy season. The basic advantages are-

- Cost of recharge to sub-surface reservoir is lower than surface reservoirs.
- The aquifer serves as distribution system also.
- No land is wasted for storage purpose and no population displacement is involved.
- Ground water is not directly exposed to evaporation and pollution.
- Storing water underground is environment friendly.
- It increases the productivity of aquifer.
- It reduces flood hazards.
- Effects rise in ground water levels.
- Mitigates the effects of drought.
- Reduces soil erosion.

2.4 FACTORS INFLUENCING PLANNING OF ARTIFICIAL RECHARGE SCHEME

Proper planning is essential for the successful outcome of any artificial recharge scheme. Planning of artificial recharge schemes involves the formulation of a suitable plan, under a given set of natural conditions, to augment the natural ground water recharge. The existing natural factors which influence the planning of artificial recharge scheme include:

- Depth to water level
- Subsurface storage capacity of the formation
- Source water available

- Topography
- Soil characteristics
- Landuse/land cover
- Hydrogeology

The scope for artificial recharge in an area is basically governed by the thickness of unsaturated material available above the water table in the unconfined aquifer. Depth to water level, therefore, provides the reference level to calculate the volume of unsaturated material available for recharge. Depth to water level recorded during post monsoon period is used for the purpose as areas where the natural recharge is not enough to compensate the ground water withdrawal, can be easily identified using the water level data. A realistic assessment and quantification of the source water help design the storage capacity of the structure. Otherwise, there is a possibility of arriving at an improper design of the recharge structure.

The topographic set-up of an area controls the retention period of surface and ground water within a topographic unit. The gradients are very steep (more than 1:10) in the runoff zones, with very little possibility of infiltration.

Soil and land use conditions are of vital importance if artificial recharge through surface spreading methods is contemplated in an area. Various factors such as the depth of soil profile, its texture, mineral composition and organic content control the infiltration capacity of soils. Areas having a thin soil cover are easily drained and permit more infiltration when compared to areas with thick soil cover in the valley zones. Soils having coarser texture due to higher sand-silt fractions have markedly higher infiltration capacity as compared to clay-rich soils, which are poorly permeable. Soils containing minerals, which swell on wetting like montmorillonite etc. and with higher organic matter, are good retainers of moisture necessary for crop growth but impede deeper percolation.

The land use and extent of vegetation also controls the infiltration capacity of soils. Barren valley slopes are poor retainers of water as compared to grass lands and forested tracts, which not only hold water on the surface longer, but also facilitate seepage during the rainy seasons through the root systems. Similarly, ploughed fields facilitate more infiltration as compared to barren fields.

Hydrogeological conditions of the area are also among important factors in planning

artificial recharge schemes. The recharged water moves below the soil zone in moisture fronts through the zone of aeration. The unsaturated flow is governed by the permeability of zone of aeration, which in turn varies with moisture content of the front. Usually, in case of consolidated and semi consolidated rock formations, the subsoil zone passes into weathered strata, which, in turn, passes into unweathered rock. The hydrogeologic properties of the weathered strata are generally much better as compared to the parent rock due to higher porosity and permeability imparted by weathering. The nature of soil, subsoil, weathered mantle, presence of hard pans or impermeable layers govern the process of recharge into the unconfined aquifer. The saturation and movement of ground water within unconfined and all deeper semiconfined and confined aquifers is governed by storativity and hydraulic conductivity of the aquifer material. Aquifers best suited for artificial recharge are those, which absorb large quantities of water and release them whenever required.

2.5 INVESTIGATIONS NEEDED FOR PLANNING OF ARTIFICIAL RECHARGE SCHEME

Various inputs are necessary for proper and scientific planning of artificial recharge schemes in any terrain. Scientific investigations leading to a better understanding of the characteristics of sub-surface formations are to be taken up for realistic determination of these inputs. The various field based investigation techniques adopted for an effective planning includes:

Remote Sensing Studies:

Remote sensing, with its advantages of spatial, spectral and temporal availability of data has now become a very useful tool in assessing, monitoring and conserving ground water resources. Satellite data provides quick and useful baseline information on various parameters controlling the occurrence and movement of ground water such as geology, structural features, geomorphology, soils, land use, land cover, lineaments etc. All these parameters used to be studied earlier independently due to non-availability of data and lack of integrating tools and modeling techniques

Hydrological & Hydrometeorological Studies:

Rainfall and evaporation are two of the most important parameters, which are required for proper planning of artificial recharge schemes. Detailed information pertaining to the amount, duration and intensity of rainfall in a given area is a necessary pre-requisite

for planning recharge schemes. Long-term average rainfall is an important parameter for assessing the storage capacity of various artificial recharge structures. On the other hand, daily and hourly rainfall data is essential for planning water conservation schemes such as farm ponds, contour trenches, roof top rainwater harvesting schemes and also for designing filters for runoff recharge schemes. Evaporation data is useful for assessing the potential losses from the free surfaces of ponds and other surface water storage structures. Data related to daily/seasonal/monthly evaporation losses is helpful for identification of most effective recharge. The hydrological studies also include estimation of runoff.

Geophysical Studies:

Geophysical studies can provide useful information pertaining to the characteristics of sub-surface lithological formations, which influence the type of recharge mechanism suitable for a particular area. These studies are normally taken up to complement the data collected through hydrogeological investigations. The main purpose of applying geophysical methods for the selection of appropriate sites for artificial recharge studies is to assess the unknown sub-surface hydrogeological conditions economically, adequately and unambiguously. They are usually employed to narrow down the target zone and to pinpoint the probable sites for artificial recharge structures. The application of geophysical techniques is also useful for bringing out a comparative picture of the sub-surface litho-environment and to correlate them with the hydrogeological setting.

Hydrogeological Studies:

A detailed understanding of the hydrogeology of the area is of prime importance in ensuring successful implementation of any artificial recharge scheme. A desirable first step toward achieving this objective is to synthesize all available data on various hydrogeological parameters from different agencies. Regional geological maps indicate the location of different geological strata, their geological age sequence, boundaries/contacts of individual formations and structural expressions like strike, dip, faults, folds, fractures, intrusive bodies etc. These maps also indicate the correlation of topography and drainage to geological contacts. Maps providing information on regional hydrogeological units, their ground water potential and general pattern of ground water flow and chemical quality of ground water in different aquifers are also necessary. Satellite imagery provide useful data on geomorphic units and lineaments, which govern the occurrence and movement of ground water, especially in hard rock terrain. A detailed hydrogeological study, aimed at supplementing the

regional picture of hydrogeological set up available from previous studies, is imperative to have precise information about the promising hydrogeological units for recharge and to decide on the location and type of structures to be constructed. The purpose of detailed hydrogeological mapping is to prepare the following maps, which facilitate an understanding of the ground water regime and its suitability to artificial recharge schemes.

2.6 METHODS OF ARTIFICIAL RECHARGE

As it has been discussed earlier, the selection of a suitable technique for artificial recharge of ground water depends on various factors, which include:

- Quantum of non-committed surface run-off available.
- Rainfall pattern
- Land use and vegetation
- Topography and terrain profile
- Soil type and soil depth
- Thickness of weathered / granular zones
- Hydrological and hydrogeological characteristics
- Environmental and ecological impacts of artificial recharge scheme proposed

The various Artificial Recharge Structures used for Rain Water Harvesting are-

- Recharge Pit
- Recharge Trench
- Recharge Well
- Gully Plug
- Contour Bund
- Gabion Structure
- Percolation tank/Recharge Pond
- Check Dam/ Cement Plug/ Nala Bund
- Recharge shaft
- Ground Water Dams/Subsurface Dyke

CHAPTER - 3
PROJECT PROFILE & ITS ENVIRONMENT

3.1 COMPANY BACKGROUND

Ardent Steel Limited is an associate company of the reputed Hira Group of Raipur. Hira Group of companies is pioneer in the field of Sponge Iron, Steel and Power having a successful track record and a name to be reckoned in the Iron and Steel Industry. Hira group of industries of Raipur are having interests in various segments of the core sector of the economy, viz Ferro-alloys, sponge iron, steel billets, wire rods, steel wires, power generation, coal beneficiation and mining (iron ore and coal). The group is one of the leading manufacturers of silico based Ferro-alloys in India. The group turnover is over Rs. 1000 crores. Hira Group is having 75% stake in Ardent Steel Ltd.

3.2 PROJECT DESCRIPTION

Having their existing manufacturing base at Raipur, Chhatishgarh, these group have presently set up a Green-field Iron Ore Pelletisation Plant of 0.6 MTPA capacity at Vill. Phuljhar, Tehsil; Telkoi, Dist.: Keonjhar, Odisha, by using High-grade Iron ore fines. The plant is located at Village Phuljhar, Tehsil; Telkoi, District Keonjhar, in the State of Odisha. Pelletisation offers the following advantages:

- Utilisation of iron ore fines
- Production of a more value added product
- Pellets have high tumbling index and lower abrasion index
- Pellets have higher porosity
- Charging of pellets increases productivity.

Expansion Plans of Ardent Steel Limited

In view of expanding market and consistent market demand on iron and steel products in domestic as well as international market. It proposes now to set up an Iron ore beneficiation plant with a capacity of 3.0 million tons along with expansion of present unit from 0.6 MTPA to 1.8 MTPA so as to effectively utilize the ore fines generated at the mines.

The planning of acquiring additional land of about 325 acre is going on for the above up-coming project. The total project configuration is presented in Table 1.1 as given below:

Table 3.1 Project Configurations

Unit	Product	Existing	Proposed	Total
Pelletisation Plant	Pellet	0.6 MTPA	1.2 MTPA	1.80 MTPA
Beneficiation Plant		- -	3.0 Million Ton	3.0 Million Ton

Market Prospects

Steel has played a vital role in the development of a country's economy. Production of steel is an important index of measuring the country economic and industrial development. The demand for steel is correlated with development of country's Infrastructure like Roads, Railways, Ports, housing drinking water, growth of manufacturing and automobile industries , Indian construction sector is consuming about 10 million tonnes of steel annually with steel cement consumption ratio of 0.32:1 against international standard ratio of I:I. This sector is likely to increase the steel consumption for increasing quality construction and durability. Our per capita consumption of steel is only 29 Kg per annum against the international standard of 150Kg.

Steel Industries in India have made progressive growth since 2003 with growth of qualitative and quantitative crude steel production. India has targeted 120 Million tonnes of steel production by 2020 against the present production capacity of 44 million tonnes. Indian population is expected to grow to about 1400 million by 2020 and with an average per capita steel consumption of about 150Kg; the total demand will be around 210 million tonnes per annum. This shall lead to a short fall in production by about 90 million tonnes.

The present steel production in India is growing at a rate of 7.3 % with about 50 % of the total capacity in the secondary steel sector of DRI-Scrap-Electric Furnace route. Manufacture of secondary steel in India particularly in Odisha and Jharkhand is competitive with lower operating cost due to availability of Iron ore and non-coking coal. India is the largest manufacturer of DRI.

Global Scenario

The pellet plant capacity increased from a mere 7 MTPA in 1955 to about 290 MTPA in the year 2000. The capacity increased to about 345 MTPA in 2006. The growth of pelletization globally is at a rate of 13.5 % annually. USA is the leading producer of pellets followed by Brazil and China. At present the total installed capacity of pellet plants in India is about 18 MTPA which corresponds to a share of about 5 % of World Pellet Capacity. India is placed in the 7th position globally. Plants installed in India are mostly of higher capacity and are based on straight grate induration process which is more suitable for hematite ore available in India. The notable pellet producers are Kudremukh Iron Ore Company, Jindal South West, Essar Steel. Visakhapatanam Steel Plant in joint venture with NMDC is proposing to set up a 2 MTPA pellet plant. Similarly NMDC is planning 2 MTPA Pellet Plant at Bachelli, Chhatisgarh, and Donimalai, Karnataka. Ministry of Steel is examining the feasibility of setting up a pellet plant at Goa. Similarly Tamil Nadu Industrial Development Corporation is examining the feasibility for beneficiation and pelletization at Kanjamali and Tiruvannamalai Deposits. Janki Corporations Ltd and Tungabhadra Minerals are setting up pellet plants at Bellary of capacity 0.6 MTPA and 1.2 MTPA respectively. India Exports iron ore pellets to countries like Brazil, Canada, Mexico & Australia.

3.3 DETAILS OF COMPANY

1	Name of the Company	ARDENT STEEL LIMITED
2	Constitution	Limited Company
3	Date of Incorporation	30 April, 2007
4	Promoters / Directors	1) Sri Sanjay Gupta 2) Sri Dinesh Kumar Gandhi 3) Sri Bhrigu Nath Ojha 4) Sri Sanjay Bothra 5) Sri Hari Om Haritash
5	Nature of Industry	Iron Ore Pelletisation
6	Product	PELLET
7	Installed capacity	0.6 MTPA
8	Address of the Company	
	Regd. Office	F-9, Hira Arcad, Near Bus Stand, Pandri, Raipur, Chhattisgarh – 492004

	Factory	At – Phuljhar , Via – Suakati P.O.-Phuljhar, P.S. - Nayakote Dist. –Keonjhar
	City Office (Address for Correspondence)	At – Plot No.208, New Colony, Mining Road, Jamuhata , Dist : Keonjhar Pin : 751 018, Odisha Tel : 06766-250173 Fax : 06766-258473 Email: asl@ardentsteel.com

3.4 WATER BALANCE SYSTEM

Grinding of Iron Ore is wet process and green pellets are heat harden in the Grate-Kiln-cooler. Both the processes require a considerable quantity of circulating and cooling water for control of processes as well as for dissipation of heat. To minimize the consumption of water, it has been planned to recirculate the water by treating the waste water generated. In order to further economize on fresh water demand, closed circuit water re-circulation systems have been planned to effect extensive recycling and reuse of return water from plant processes. The water will be re-circulated in closed circuits. Evaporative cooling towers will be provided for cooling water recirculation. Process water losses will be compensated by adding make-up water of respective qualities.

Table 3.2 Break-up of water requirement

Activity	Present Requirement (M^3/day)	Total Requirement (M^3/day)	No. of Operational days in a year	Annual Requirement (M^3/year)
Industrial Activity	492	492	345	169740
Residential & Domestic	5	5	345	1725
Green Belt Development/ Environment maintenance	3	3	180	540
Total	500	500		172005

3.5 LOCATION AND EXTENT OF THE STUDY AREA

The area under present study has been taken as buffer area of 10km. radius keeping iron Ore Pelletization plant of M/s. Ardent Steel Limited at the center. The study area falls under the Survey of India Topo sheets No. 73 G/5, G/6, G/09 and G/10. It lies within 21^0 38' 48.78" to 21^0 49' 36.21" North Latitudes and 85^0 20' 19.96" to 85^0 31' 56.87" East Longitudes. The total study area is 314 sq. km. The study area falls in Banspal, Keonjhar Sadar, Joda and Jhumpura blocks of Keonjhar district. The major reserved forests in the area are Nayagarh, Gandhamardan and Raigurha. The main rivers in the area are Baitarai River, Malda nadi, Bamni nadi, Kadal nala and Jagadhara nadi which all flow from south to north. The area can be approached from Raisuan on NH-215 which passes in east of the area joining Keonjhar and Rourkela. A well net work of PWD road and village road exist in the study area. The nearest railway station is Nayagarh. The study area is shown in the Fig. 3.1.

3.6 PHYSIOGRAPHY

The project site is situated in a hilly terrain and has been elevated upto a maximum height of 540 m above mean sea level (MSL). The area is characterized by hilly as well as flat ground having elevation from 802 m to 500 m above M.S.L. The hills & hill ranges are Satpuri, Rai, Boita, Nandijhara, Matkam, Nekeraghara, Handibhanga, Udaipini, Jankapani, Dhaurduma, Sangaithali and Sanda Paharah. The Relief map within 10km radius of the project site is given in Fig. 3.2.

3.7 GEOMORPHOLOGY

Information on landforms is an important input for identification of potential zones of ground water occurrence. Identification of various geomorphic units is primarily based on remote sensing techniques with the input of actual ground truth. Various factors like degree of ruggedness, nature of dissection, amount of elevation/depth, drainage density, texture and pattern, vegetation and land use pattern, reflectivity in terms of brightness grey value/colour, slope characters, relative relief, alignment of ridges/ valleys, crest configuration, origin, extent of denudation, etc. have been taken into consideration in classifying the geomorphic units. Major geomorphic units of the area have been discussed below. The Fig.3.3 depicts the geomorphic units in the study area.

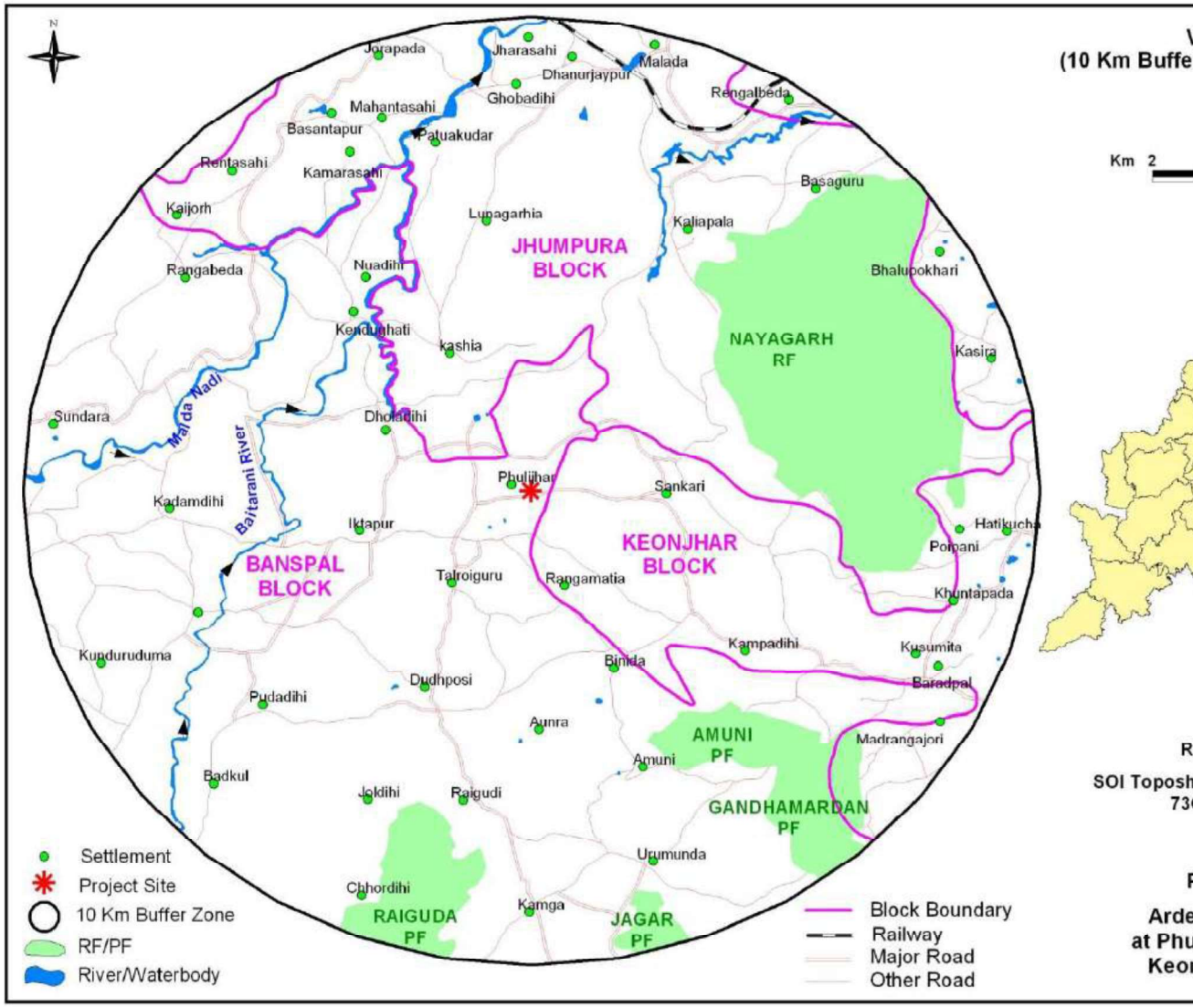
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Fig. 3.1

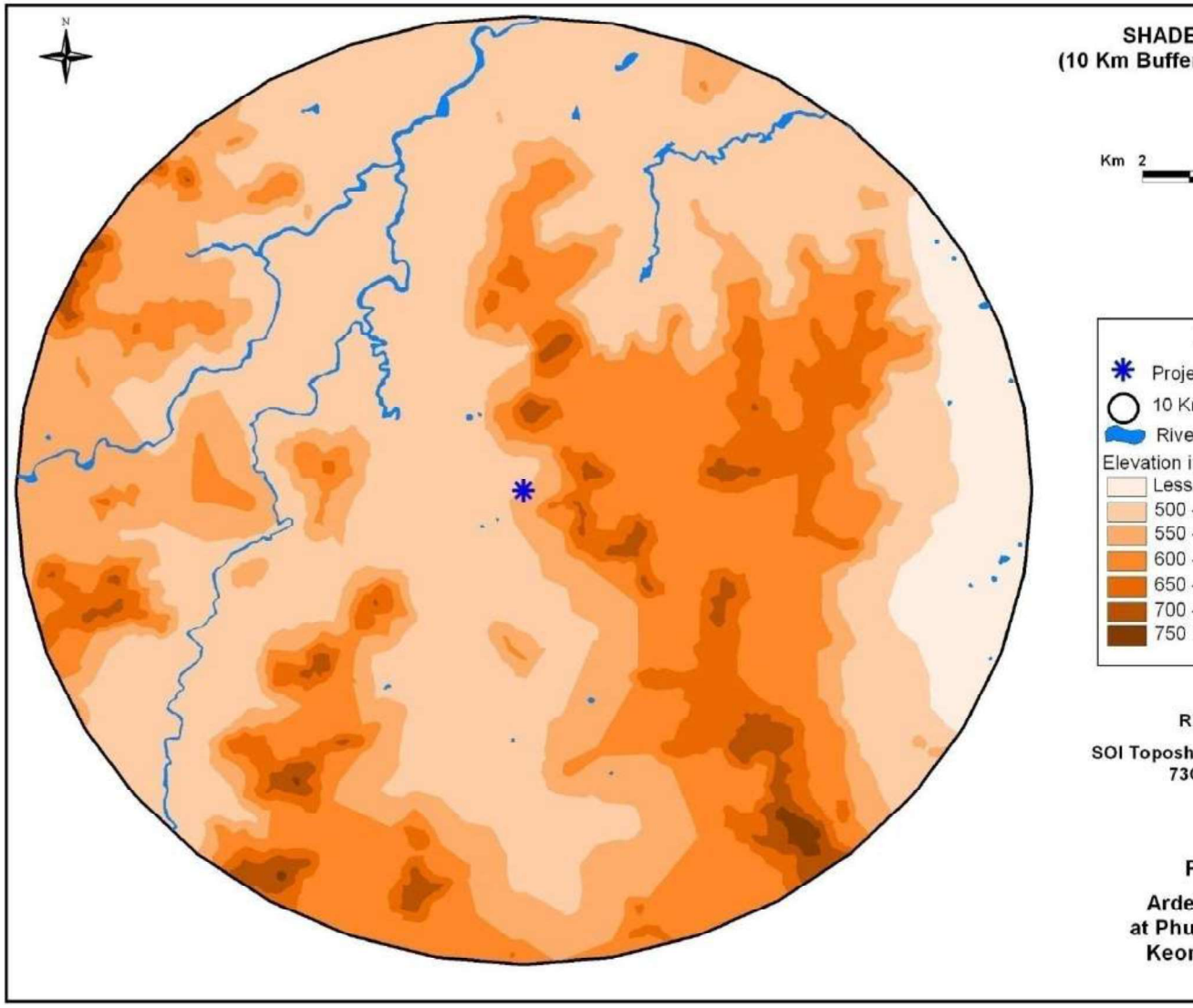
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Fig. 3.2

Structural Hills

This hydrogeomorphic unit in the area comprises of Banded Hematite Jasper/ banded hematite quartzites of Iron Ore Supergroup and occupy a major part in the central part of the buffer zone area. These are structurally controlled hills and traversed by numerous joints and fractures facilitating ground water infiltration. Structural hills are the linear or arcuate hills exhibiting definite trend lines and BHQ/BHJ formations. These hills are structurally controlled with complex folding, faulting, criss-crossed by numerous joints/fractures which facilitate some infiltration and mostly act as run off zones. These are found almost throughout the study areas. The structural trend of the hills ranges in the southwest to northeastern direction with slight deviation towards the western part. The slope of the hills ranges from 12 degree to1 4 degree. In this unit groundwater prospects is very poor.

Residual Hills

These hills are formed due to differential erosion and weathering, so that a more resistant formation stand as mountain/hill. This unit in the area mainly comprises of BHQ/BHJ and occurs in the south-western part of the project site.

Intermontane Valley

Broad depression between mountains normally filled with colluvial deposits and sometimes controlled by fractures. Ground water potential in these areas is good to moderate and depends on thickness of the detritus fill. The yield range in this unit varies from 50-100 lpm.

Valley Fill

Unconsolidated sedimentary deposit which fills or partly fills a valley. These are narrow fluvial valleys with unconsolidated sediments deposited by streams/rivers. These are very good sites for ground water exploitation. Potential depends on the thickness of the fill. The yield potential in these areas varies from 120-170 lpm.

Inselberg

This hydromorphic unit occurs in isolated hillocks in several parts of the buffer zone. These are developed due to active weathering and erosion in humid tropical climatic condition. Inselbergs acts as runoff zones, thus ground water potential is very poor. This is a minor unit.

Pediments

This unit is developed as a result of continuous processes of pedimentation. The altitudinal variation is relatively high for rolling plain and is about 5 -10 m. In this horizon are exists irregular dissected portions with a number of gully are present. This formed due to intensive weathering under semi arid climatic conditions, representing final stage of the cyclic erosion. Pediplains are found in isolated patches dispersed throughout the study area. Devoid of any structural control these are characterized by isolated mounds of small hills with weathered residuum of up to 10 meters and poor to good ground water potential.

3.8 DRAINAGE

Baitarani, Bamni, Malda, Jagadhara and Kadal rivers are the major perennial streams in the study area. All these major streams flow in south-north direction. Besides these streams there are numerous seasonal nalas which join in these rivers. The drainage in the area is controlled by the topography of the area. The natural drainage pattern of the project area and its adjacency has been given in Fig.3.4.

3.9 LANDUSE/LANDCOVER

Landuse and landcover pattern is important in planning rainwater harvesting in an area. The landuse pattern for the study area has been given in Fig.3.5. & Land use/ cover area statistics has been given in Table No.3.9. However the landuse use pattern of the project area has been presented in Fig. 3.6. This reveals that the rooftop area of major structures is 14211 sq. m. The area of existing rain water harvesting reservoir is 10400 sq. m. Other open area, road area and open stack yards represent around 90 % of the total project area.

Table 3.3: Land use/ Land cover Area Statistics

Land use Type	**Area (in Sq. Km.)**
Settlement	3.03
Agricultural Land	131.798
Open Forest	94.648
Dense Forest	36.978
Scrub Forest	22.986
Land with/without Scrub	18.321
Waste Land	2.414
River/ Water body	4.105
Total	**314.28**

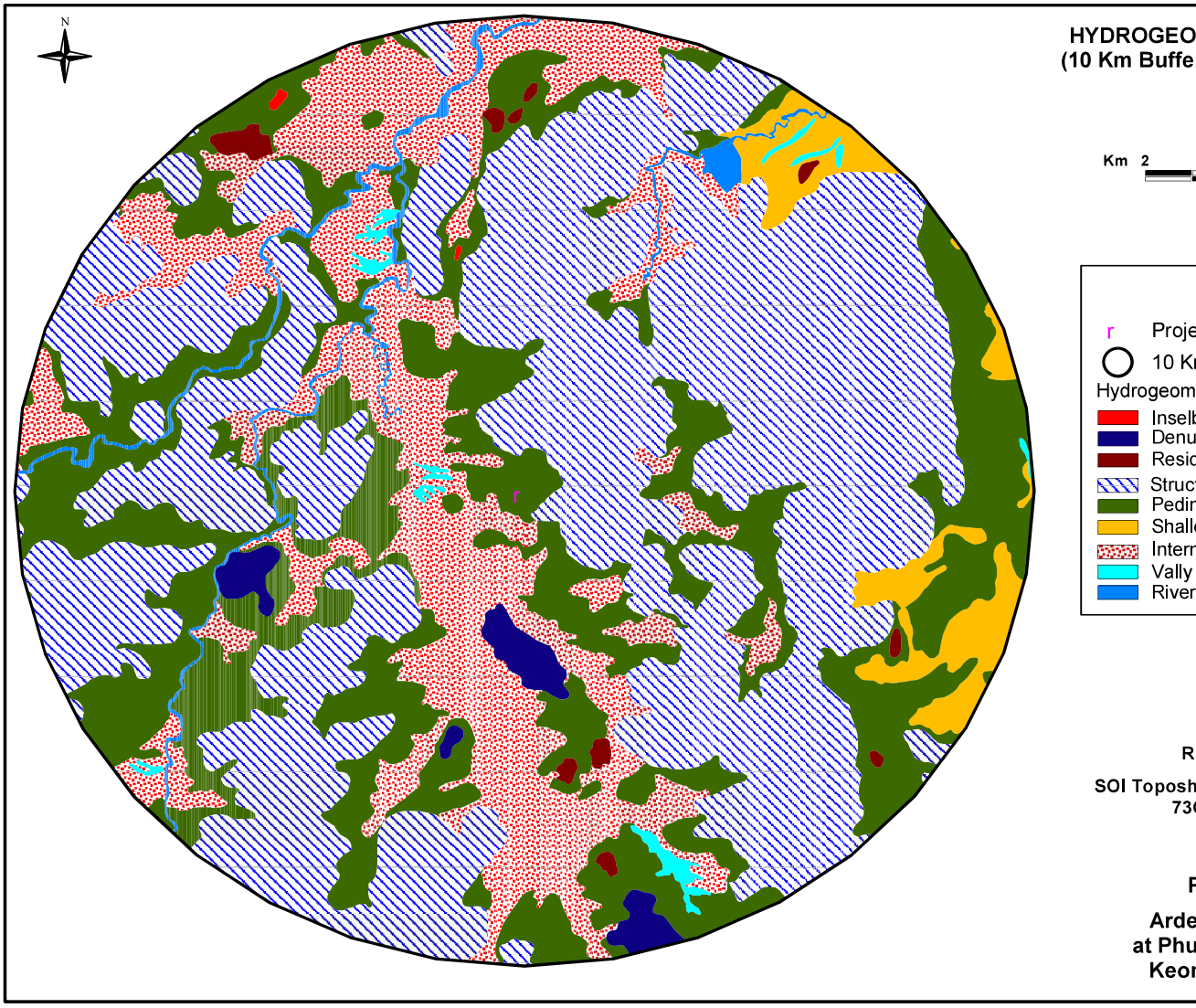
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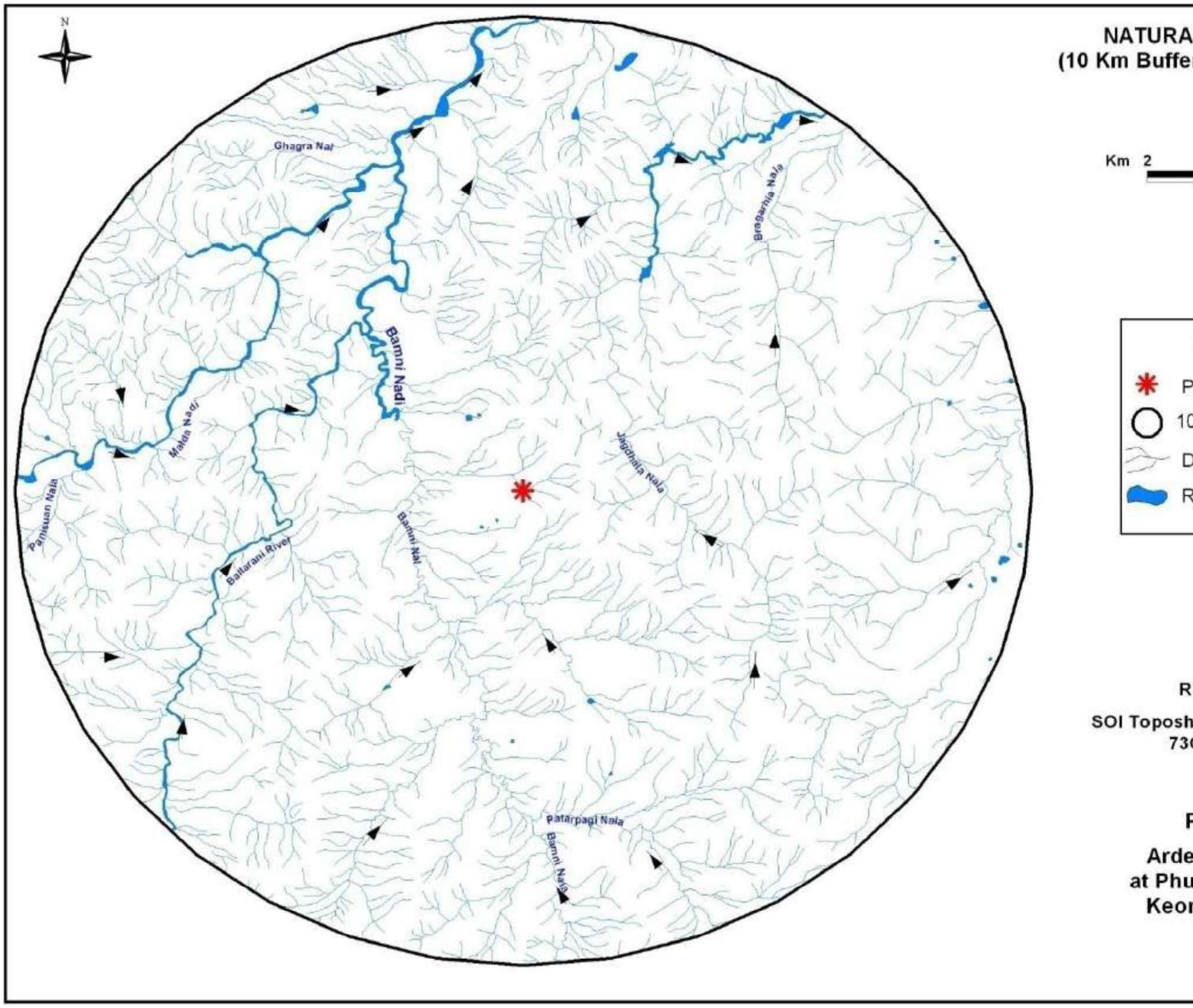
Fig. 3.3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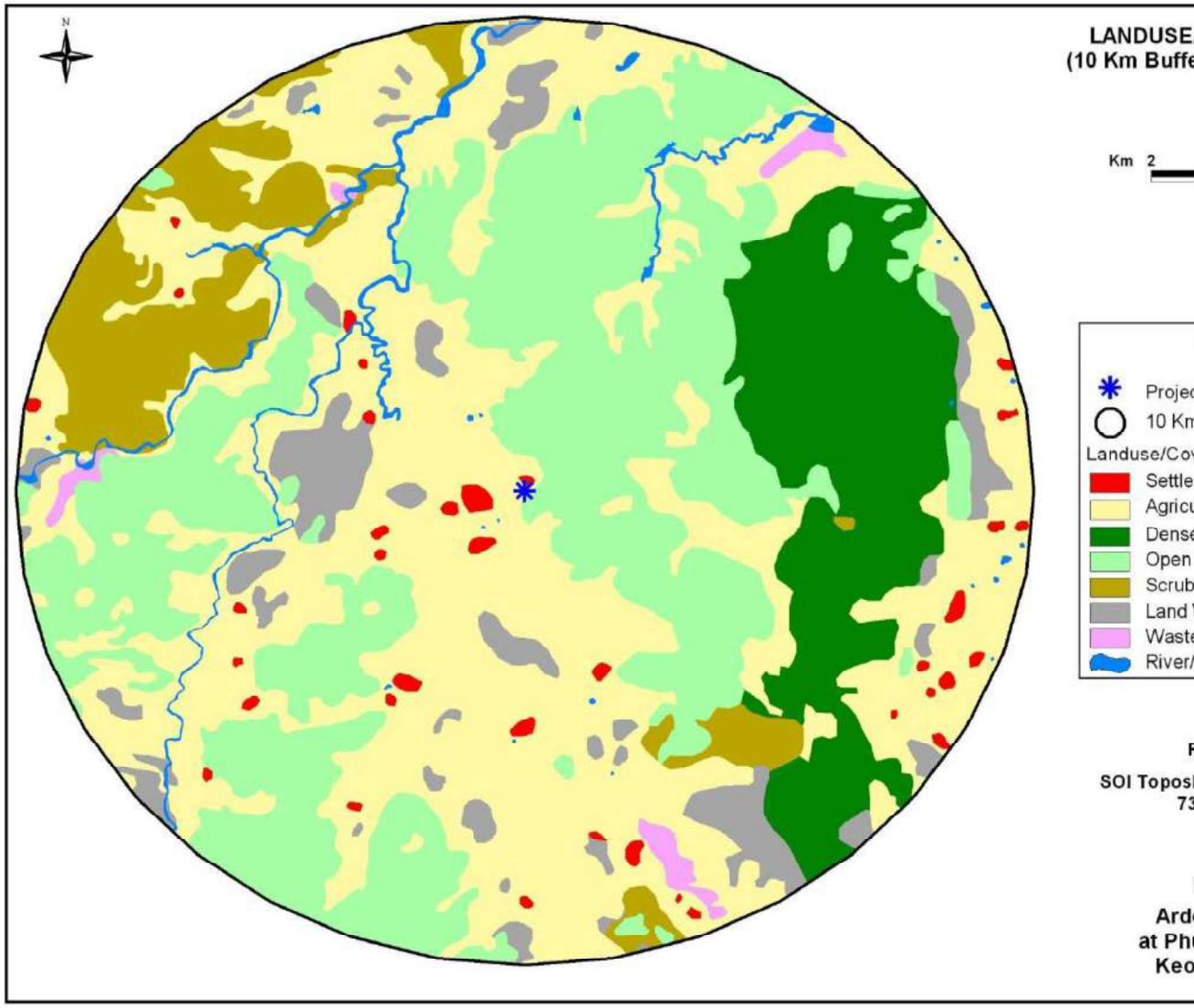
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Fig. 3.5

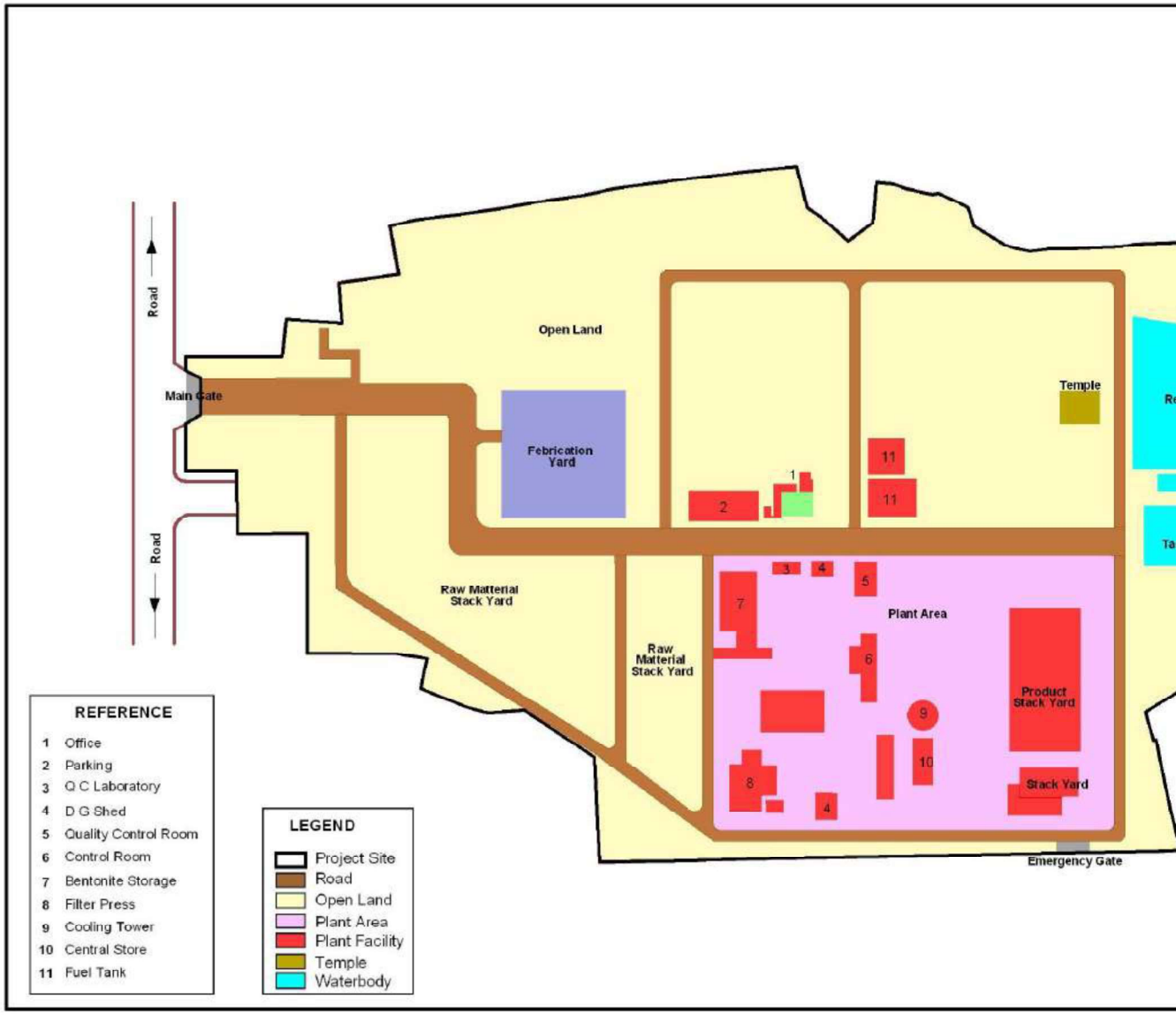

Fig. 3.6: landuse use pattern of the project area

3.10 PEDOLOGY

There are two major soil types in the buffer zone - Alfisols and Ultisols.

Alfisols

These soils include Red sandy and Red gravelly soil .These soils are deficient in nitrogen and P_2O_3. Both total and available K_2O are fairly adequate and pH varies from 6.5 to 7.3. The reddish colour is due to oxidation of original ferruginous materials. These soils occur in area in patches in the east, east-central, north-west and south-western part of the study area.

Ultisols

It consists of mainly lateritic soils which covers most of the study area. These types of soils are characterized by vesicles and compactness. These are composed of mainly hydrated oxides of aluminum and iron.

3.11 CLIMATE

The area is characterized by extreme climate with very hot (42^0 C) summer and very cold winter (4^0 C). It experiences tropical and humid climate which shows three distinct seasons viz. summer, rainy and winter. The summer is very hot and dry starting from March and continues till end of May or early June. The rainy season lasts from early June to end of September. October and November are the post monsoon months followed by a cold winter which lasts till end of February.

CHAPTER – 4
GEOLOGY AND HYDROGEOLOGY

4.1 GEOLOGY

The area is underlain by rocks belonging to the Iron Ore Group (IOG), Singhbhum Granite, Older Metamorphics and alluvium ranging in age from Archaean to Holocene. The regional stratigraphic succession has been established and is as follows:

Group/Formation	Lithology	Age
Alluvium	Sand, silt, clay	Holocene
Lower Bonai Group (Iron Ore Group)	Basalt, tuff, meta gabbro Granite Shale, tuff and manganese BHQ, BHJ, ferruginous shale and quartzite Gritty sandstone, orthoquartzite, conglomarate	Archean to Palaeo-Proterozoic
Gorumahisani Group (Iron Ore Group)	Hornblende schist, chlorite schist, amphibolite and meta gabbro Quartzite, quartz sericite schist, cherty quartzite, fushsite quartzite & black chert Quartzite, chert BHQ, BMQ, BCQ, BJQ Ferruginous shale, carbonaceous shale, phyllites and mica schist Pebbly quartzite, gritty quartzite and quartzite	Archean
Singhbhum Granite	Granite	
Older Metamorphic Group	Pellitic schist, quartzite, amphibolite	

Pebbly quartzite, gritty quartzite and quartzite ; Ferruginous shale, carbonaceous shale, phyllites and mica schist; BHQ, BMQ, BCQ, BJQ; Quartzite, chert; Quartzite, quartz sericite schist, cherty quartzite, fushsite quartzite & black chert; Hornblende schist, chlorite schist, amphibolite and meta gabbro are the rock types in Gorumahisani Group. Similarly Gritty

sandstone, orthoquartzite, conglomarate; BHQ, BHJ, ferruginous shale and quartzite; Shale, tuff and manganese; Granite; Basalt, tuff, meta gabbro are the rock types in Lower Bonai Group. The major lithounits observed in the buffer zone have been presented in Fig. 4.1. The lithounits are as follows:

Quartzite

This litho unit occurs in northwestern and southeast part of the buffer zone. These are resistant in nature and mostly occur as ridges. The ground water occurs within the fractures. The yield ranges from 3 to 5 lps.

Granite

Granite is the major rock type occurring in Bonaigarh and Sundergarh areas. The texture varies from coarse grained to fine grained aplitic types. These rocks are well foliated and joined and generally have a thick weathered zone. The weathered and fractured granites from the most productive aquifer in the terrain.

Banded Haematite Jasper

Banded Hematite Jasper/quartzite of Iron ore super group covers major part of the project area. BHJ is the parent rock of iron ore bodies. BHJ consist of alternate layers of dark, bluish grey hematite and red coloured jasper or chert. The thickness of iron and silica bands varies from less than 0.5 cm to more than 1 mt. Different structures like banding, penecontemporaneous and post depositional structures are found in these rocks. They are very resistant than the surrounding rocks, hence from hill ranges in the area.

4.2 HYDROGEOLOGICAL SETUP

Hydrogeology of the study area is mainly controlled by geomorphological and geological set up and also by climatic conditions. Since major part of the study area are underlain by the hard rocks of diverse lithological composition and structure, the water bearing and transmitting properties of the formations vary widely. The area has undergone several phases of intense tectonic deformations, which has been responsible for the development of deep seated intersecting fracture system. Hydrogeological surveys in the study area brings out the bearing of lithology and tectonic deformation on the occurrence and distribution of groundwater reservoirs and their water bearing and water yielding properties in different lithological units.

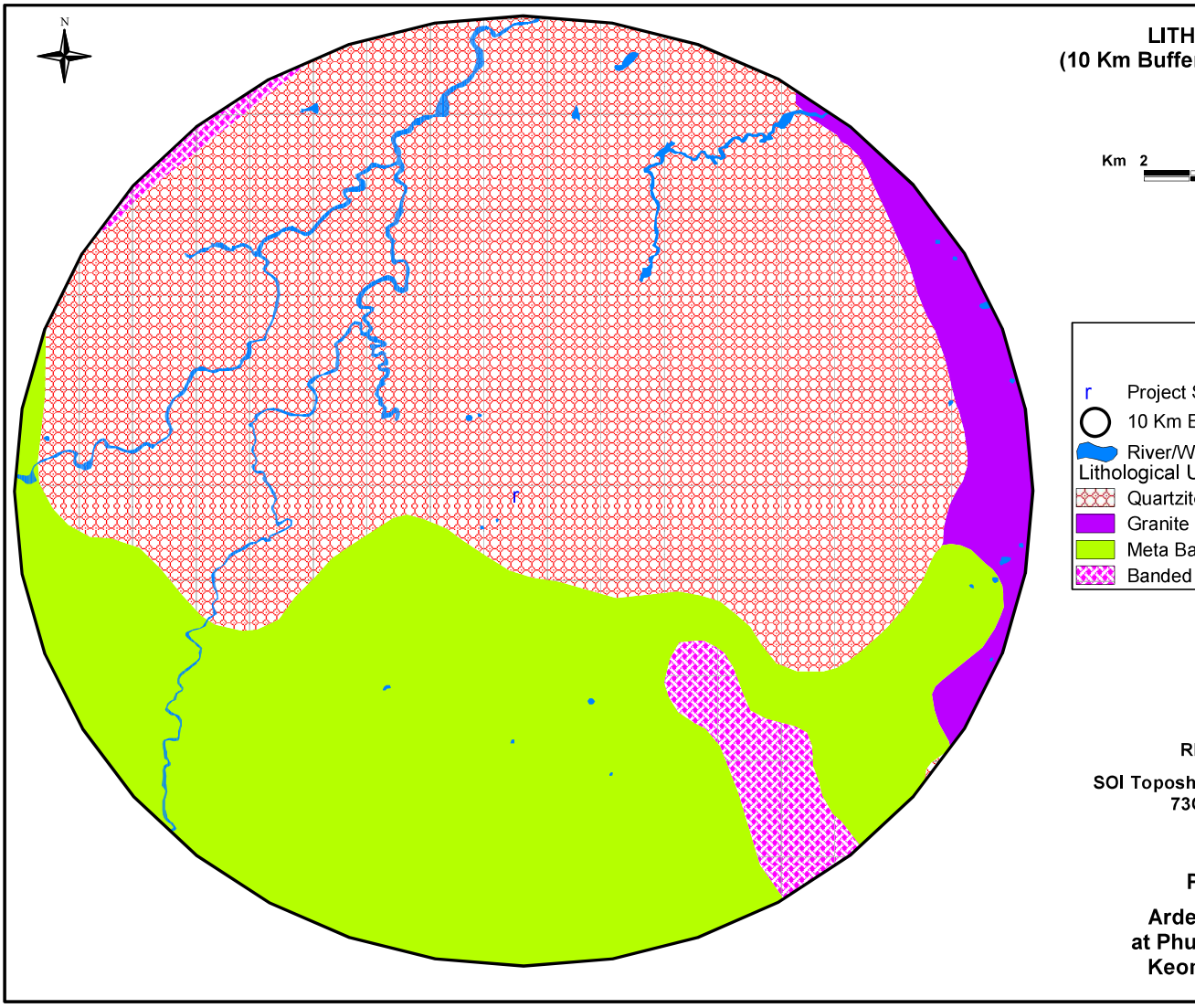
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Fig. 4.1

The Consolidated Formation (hard rocks) forms the main hydrogeological unit occurring in the study area. It includes Older Metamorphic, Gorumahisani Group (iron ore group); Lower Bonai Group (iron ore group). These rocks lack primary porosity and are rendered porous and permeable by weathering and fracturing. The water yielding capability of these rocks depends entirely on the intensity of fracturing and weathering. In plateau areas lateritic capping is developed on the weathered residuum. In theses area dug wells and dug cum bore wells are suitable ground water structures.

Thin weathered zone on hilly and hill slope areas acts as temporary water bearing zone just after monsoon season and in post-monsoon season, ground water from this saturated zone is drained out as base flow and water level starts depleting very fast. The wells in this area may go dry in January/February months. Fracture zones form the deeper aquifer systems and ground water occurs under semi-confined to confined conditions. Generally 2 to 3 potential fracture zones are encountered within the depth range of 100 m. Areas occupied by other hard rock formations are having water bearing fracture zones but are less promising as compared to granitic rocks. Granite suites of rocks are having more promising aquifers (may yield more than 3 liters per second with moderate drawdown). However, the successes of bore wells are site specific (under suitable topography and hydrogeologcal conditions).

Laterites and Alluvium of Sub-recent to Recent age constitutes the unconsolidated formations. Laterite which occurs as patches as capping over the hard rock formations are usually porous in nature and form very good shallow aquifers, developed through open wells. Alluvium occurs as small patches along the courses of the Baitarani River and their tributaries. Alluvium forms good shallow aquifers to be developed through dug wells and shallow tube wells. The coarse grained sands with pebbles form the main repository of ground water.

4.3 GROUND WATER REGIME/DEPTH TO WATER LEVEL

Depth to water level is an important parameter of hydrogeological investigation which is mainly influenced by topography, rainfall, lithology, drainage characteristics, depth and nature of weathering and soil conditions of the area. The occurrence and movement of ground water and seasonal water table fluctuation are studied through monitoring wells established in the study area.

The depth to water level data and map shows that the pre-monsoon (April –2011) depth to water level in the study area ranges between 3.8 to 12.3 m bgl. Maximum depth to water level of 12.3m bgl is observed at Phuljhar. The data shows that depth to water level during post monsoon (November–2011) varies from 0.79 to 5.6mbgl in the wells monitored. Maximum depth to water level of 5.6 m bgl is observed at Phuljhar. The perusal of data reveals that water level fluctuation between pre to post-monsoon period is of the order at 3.01 to 8.2m. The maximum and minimum rises in water level have been observed at Kusimita and Rengalbera.

CHAPTER – 5

RAIN WATER HARVESTING & GROUND WATER RECHARGE PLAN FOR THE PROJECT

5.1 CATCHMENT CHARACTERISTICS

The proposed project comes under the Baitarani Sub-basin of Brahmani Basin (as per CGWB sources) (Fig. 5.1). The Baitarani originates from the Gonasika hills of Keonjhar at an elevation of 900 m. After flowing North-Easterly direction in its upper reaches, for a distance it runs as the boundary between Odisha and Jharkhand and turns in South-Easterly direction to join the river Brahmani and flows in to Bay of Bengal as Dhamra. At Akhuapada, the river throws off the first branch Budha and about 10 Km. downstream Genguti takes off. Budha, after flowing for about 25 Km., falls into Kharsuan, a branch of Brahmani river. The total length of the river is 365 Km. and Akhuapada (the delta head) it drains an area of 10360 Sq. Km. Its major tributaries are Deo and Salandi on the left bank and Kanjhari, Musal and Kusei on the right bank. The average annual runoff of the Baitarani at Akhuapada is about 5450 M. cum. The peak discharge recorded is 11893 cumecs. The important towns in the sub-basin are Joda, Champua, Karanjia, Keonjhar, Anandpur and Jaipur. The basin is rich in mineral wealth. Iron ore, copper, chromite, asbestos, manganese, atomic minerals, china clay and soap stone are available in Cuttack, Keionjhar, Mayurbhanj districts of Orissa and in the Singhbhum district of Bihar.

5.2 RAINFALL CHARACTERISTICS

Rainfall and runoff available constitute the major sources of water for artificial recharge of ground water. Rainfall is the primary source of recharge into the ground water reservoir. Rainfall in India is typically monsoonal in nature. 'Monsoon' literally means seasonal wind. It is basically a part of the trade wind system. The southeast trade winds and northeast trade winds converge at the Inter-Tropical Convergence Zone (ITCZ). Due to uneven distribution of land and water masses, it is crooked in shape and keeps shifting seasonally. During its northwards movement, it draws the southeast trades along with it. After crossing the equator, the winds change direction by 90 degrees (due to Coriolis force),


40 0 40 80 Kilometers
Brahmani Sub -Basin
Subernarekha Sub -Basin
Middle Mahanadi Sub -Basin
Upper Mahanadi Sub -Basin
Lower Mahanadi Sub -Basin
Rushikulya Sub -Basin
Nagavali Sub -Basin
Baitarani Sub -Basin
Chaibasa
Jamshedpur
Raurkela
Champua
Bonai
Kendujhar
Bilaspur
Raigarh
Jharsuguda
Raipur
Samal
Angul
Dhenkanal
Cuttack
Bolangir
Phulbani
Nayagarh
Bhubaneswar
Paradeep
Bhawanipatna
Chilika Catchment
Chhatrapur
Gopalpur
MAHANADI BASIN
BRAHMANI BASIN
VAMASADHARA BASIN
Project Site
Improtant Locations
Rivers/Streams
Basin/Sub basin Boundary
District Boundary
Brahmani Basin
Mahanadi Basin
Vamsadhara Basin
INDEX TO DRAINAG
AND LOCATION OF PR

Fig. 5.1

taking a southwesterly direction. Hence, these seasonal winds are named Southwest monsoon. It lasts for four months, from June to September. While traversing the vast stretches of water, (Bay of Bengal and Arabian Sea), these winds pick up lot of moisture. On an average, annually, about 1120 mm of rainfall is received in the country. Bulk of this rainfall occurs during Southwest monsoon.

Length of rainfall data records to be considered is an important factor in the analysis of rainfall. If the frequency distribution of mean annual rainfall becomes stable after a certain period, the addition of further years of observations does not add significantly to the accuracy. The length or period of record needed to achieve stability varies between seasons and regions. As per IMD experience it is observed that rainfall data of 30 years is adequate under Indian conditions. This period encompasses dry as well as wet cycles and is called the normal period. Averages of normal periods are termed normals. These normals need updating to account for changes in environment and land use.

The long-term average annual rainfall of the State is 1482 mm. In the state, 78% of annual rainfall is received from June to September and the balance 22% is available in eight months. As the project site is located in Baitarani Sub-Basin, the nearest gauging station in Baitarani Sub-basin is Kendujhargarh. So the rainfall data of Kendujhargarh station has been taken for analysis. The available rainfall normal of Kendujhargarh is based on 60 years data (as per IMD, Govt. of India). The data has been presented in Table 5.1.

Table 5.1: Average Rainfall and No of Rainy Days at Kendujhargarh as per IMD

Month	No of Rainy Days	Rainfall in mm	% of Annual Total
January	1.4	21.1	1.47
February	2.4	39.0	2.71
March	1.9	23.1	1.61
April	3.1	47.4	3.30
May	5.9	95.8	6.66
June	10.5	198.0	13.77
July	16.8	356.7	24.81
August	15.7	306.2	21.30
September	12.7	221.6	15.41
October	5.7	95.8	6.66

November	1.5	29.2	2.03
December	0.4	4.0	0.28
Annual Total	78.0	1437.7	100.00
Monsoon Total	55.7	1082.5	75.29

Thus the annual average rainfall at Kendujhargarh is 1437.7 mm and the average monsoon rainfall is 1082.5 mm. The peak daily rainfall at Kendujhargarh is 273.1 mm (3rd July 1945). However, the rainfall data of recent years for Bansapal block has been given in Table 5.2 as well as Fig. 5.2 & 5.3.

Table No.5.2: Monthly Rainfall (mm) in Banspal Block

Year/ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	1	0	0	15	9	93	226	317.1	135.8	74	0	0	870.9
2005	3	2	0	0	24	196	357.9	251.5	187.3	4	0	0	1025.7
2006	0	0	0	32.4	180	268.7	324.9	398.1	228	17	34	0	1482.8
2007	1	150	0	46.2	30	132	520	452	446	3	33	0	1813.2
2008	18	0	2	2	19	615	256	241	333	32	0	0	1518
2009	0	0	0	0	59	62	313.5	104.1	139	33	18	0	728.6
2010	0	0	0	0	23	86	301.5	121	171	40	0	0	742.5
2011	0	15	0	61	40	189	136	275	564	4	0	0	1284
Av.	**2.88**	**20.88**	**0.25**	**19.58**	**47.96**	**205.21**	**304.48**	**269.98**	**275.51**	**25.88**	**10.63**	**0.00**	**1183.21**

Fig.5.2: Monthly Rainfall in Banspal Block, Keonjhar District

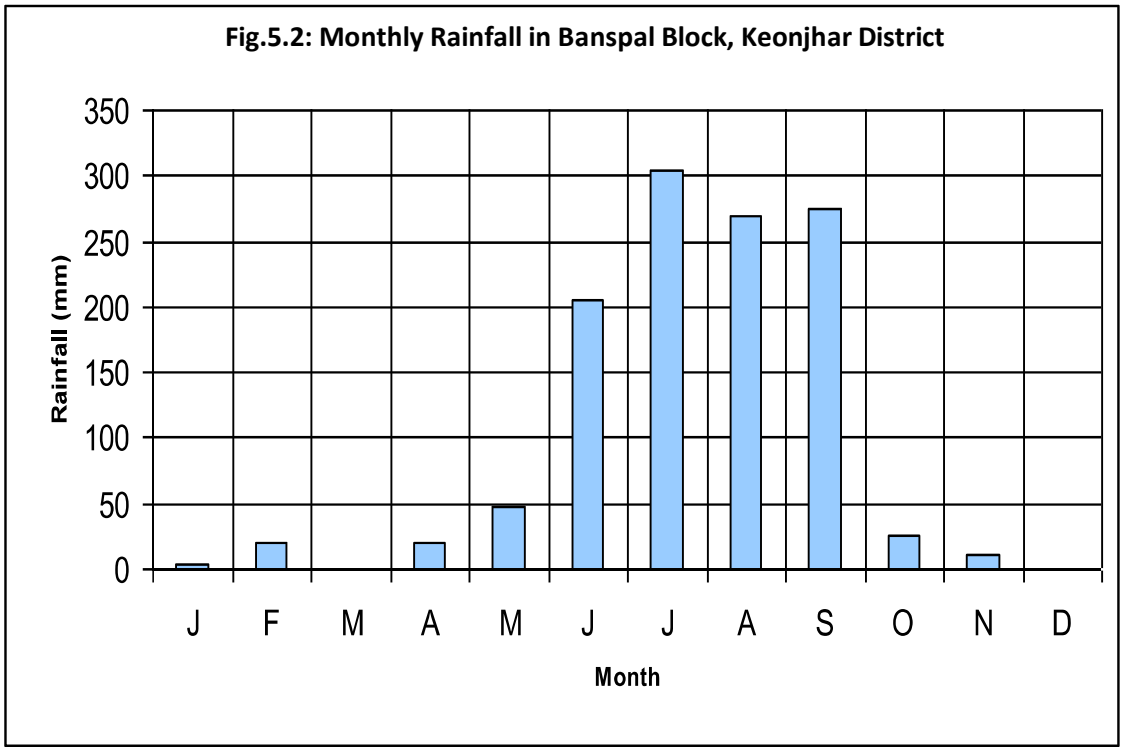
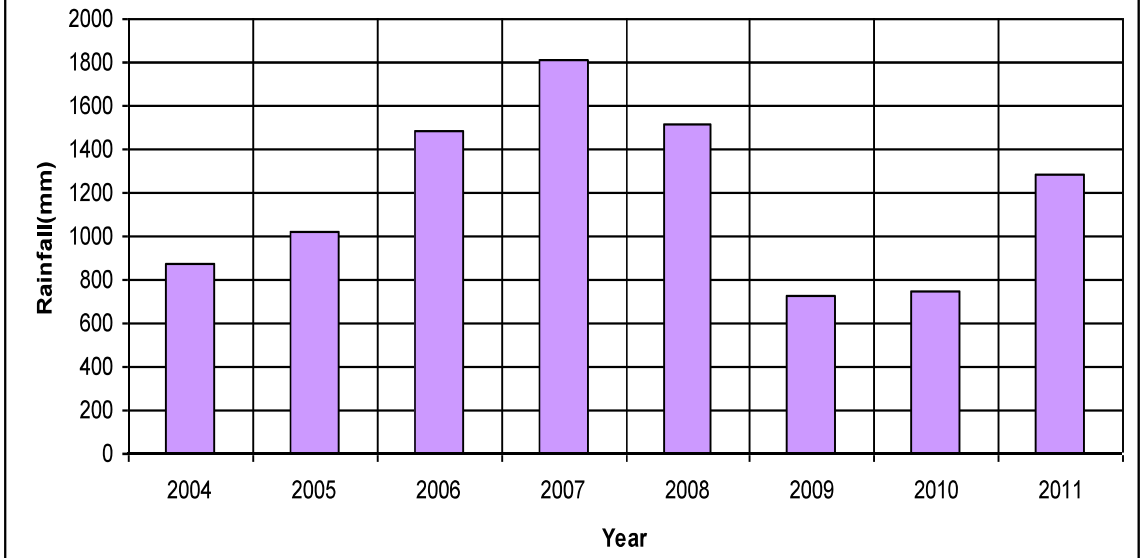


Fig.5.3: Annual Rainfall in Banspal Block, Keonjhar District



5.3 RAIN WATER HARVESTING POTENTIAL

Precise estimation of runoff is the basic and foremost input requirement for the design of recharge structures of optimum capacity. Unrealistic runoff estimates of catchments yield often leads to the construction of oversized or undersized structures,

which, in any case, must be avoided. Runoff is defined as the portion of the precipitation that makes its way towards rivers or oceans as surface or subsurface flow. After the occurrence of infiltration and other loses from the precipitation (rainfall), the excess rainfall flows out through the small natural channels on the land surface to the main drainage channels. Such types of flow are called *surface flows.* A part of the infiltrated rainwater moves parallel to the land surface as subsurface flow, and reappears on the surface at certain other points. Such flows are called *interflows*. Another part of the *infiltrated* water percolates downwards to ground water and moves laterally to emerge in depression and rivers and joins the surface flow. This type of flow is called the *subsurface flow* or *ground water flow*.

In order to harvest the rain water within the plant premises it is recommended to harvest roof top rain water from major buildings as well as surface runoff. For this purpose quantity of rain water that could be generated is calculated using the below given formula.

Runoff = Rainfall X Catchment Area X Runoff Coefficient

Existing Major Roof top area = 14,211 sq. m

Road, Open Stack yard and other open area = 2,41,600 sq.mt.

Coefficient of Run off for Rooftop = 0.85

Coefficient of Run off for Open area = 0.60

(Ref. – Manual on Norms and Standards for Environment Clearance by MoEF, GOI).

Average Annual Rainfall = 1.438 m

So, the quantity of average annual run-off from roof top is

1.438 X 14,211 X 0.85 = 17,370 m^3

And, the quantity of average annual run-off from open area/road is

1.438 X 241,600 X 0.6 = 2,08,453 m^3

Hence, quantity of average annual run-off for project area

= 17,370 m^3 + 2,08,453 m^3 = 2,25,823 m^3

So the total rain water that is generated and can be harvested within the bounded area of the project is 2,25,823 m^3.

5.4 EXISTING/IMPLEMENTED STRUCTURES

In respect to the existing guidelines of Central Ground Water Board as well as advice of the CGWA vide NOC obtained during 2008, the Plant has planned, developed and commissioned rain water harvesting and ground water recharge structures within the plant premises. The purpose of the structure is to harvest and store the surface run off generated inside the plant premises and surface runoff generated from the hills in the north of the plant. The harvested water is being used in the plant process. The existing structures are a combination of:

- Check dam
- Associated Rain Water Harvesting Reservoir
- Storm water drainage network connecting the reservoir

The Check Dam is a Concrete Dam constructed inside the plant area across a seasonal nala carrying the flow from the foot hills and from the plant premises. The dimension of the check dam is:

Length : 8.5m

Height : 5.5m

Width : 1.0m

The Check Dam is located at 540 m amsl and is surrounded by high land on the east, north and north-east. Maximum elevation of these lands is 724 m amsl.

The pondage area of the check dam has been further excavated to increase the volume of harvested rain water. Thus a rain water harvesting reservoir has been developed with dimension as follows:

Width = 95 m.

Length = 95 m.

Depth = 5 m.

Volume = 45,125 m^3

The catchment of the check dam feeds the reservoir. Moreover, the surface runoff from more than 70% of the plant areas is channelized to this reservoir. The plant has developed a well net work of storm water drainage system to drain out the rain water to this reservoir. Rainfall from all roof area, stack yard area, road and open area is being channelized to the reservoir through this drainage network. The holding capacity (volume) of the reservoir is 45125 m^3. The reservoir gets excess water than its capacity. The excess water overflows the

check dam through spill ways. The harvested water is being used in the plant process, dust suppression and green belt development, which in turn reduce dependency on ground water.

Fig. 5.4: Photograph showing the Implemented Rain Water Harvesting Reservoir

Fig. 5.5: Existing Rain Water Harvesting Reservoir with Check Dam

Fig. 5.6: Implemented Check Dam

Fig. 5.7: Part of Implemented Drainage Network Connecting Reservoir

5.5 PROPOSED STRUCTURES

However, based upon the estimation of water harvesting potential, few more structures have been proposed to add with the existing structures for effective management of water resources as well as ground water recharging. Detailed study was carried out in the plant premises of the Ardent Steel. Hydrogeological survey was carried out surrounding the area of the plant. Depth to water level was measured both during pre and Post-monsoon period. It was observed that the underlying aquifer is being fully recharged through nature process during monsoon. The aquifer has the potential to accept recharging by artificial means.

In this regard, it is noteworthy that, the plant establishment comprises of huge sheds having mostly sloping roof. In fact the total roof top area is 14211 sq. m. This roof top area generates good amount of rain water amounting to be 17,370 m^3 (in an average per annum as discussed in previous section). Presently all this rain water is being channelized to existing reservoir through storm water drainage network. This can be harvested and recharged to ground water system through suitable structures.

So it is proposed to group the major roof areas in to two pockets or clusters as shown in Fig. 5.8 and Fig 5.9. The small buildings may be ignored and the rain water from roof area of major sheds/buildings located in each cluster will be channelized to an artificial recharge structure located at a nearby suitable location. This channelization of roof top rain water may be done through a well designed collection gutter system of PVC pipes. Map showing the two clusters of roof top area proposed for artificial recharge and location of proposed recharge structures on plant layout has been given in Fig. 5.10.

5.5.1 Recharging Method

Rainwater will be recharged to ground water system through injection well at the centre of storage cum filtration chamber. Rainwater falling on the roofs of sheds will be channelized to the recharging structure. Gutter will be fitted at the end of the slanting roof for collection of rainwater. Rainfall from individual roof-sheds will be brought down through PVC Pipe and all the landing pipes will be connected to a single PVC Pipe which will be laid down underground and will be connected to the recharge structure.

An injection well up to the depth of 100 m. will be constructed or its depth will be decided during drilling of the borewell to tap probable productive fractures. 4” (102mm)

dia. PVC pipe will be lowered in a 5.5" dia. drilled borehole. The area around the pipe will be surrounded with gravel. Aquifer or fracture zones will be tapped by placing 4" dia. slotted pipe. After construction of the injection well, it will be developed with air compressor to clear the well of all suspended matter.

A storage/filtration chamber will be constructed around the injection well. The dimension of the trench will be 5.0 m x 5.0 m x 3.0 m. taking maximum rainfall intensity of 15 mm/hr. The wall of the trench is to be made of RBC structure as per the design shown in Fig. 5.11. The chamber is to be filled with filtering material i.e. gravel and medium to fine sand. The chamber is to be connected to the roof-tops through PVC Pipe. The approximate design of the recharge structure is shown in fig. 5.11.

Fig. 5.8: Photograph showing Roof Top Clusters for Proposed Rain Water Harvesting & Artificial Recharge

Fig. 5.9: Photograph showing Roof Top Clusters for Proposed Rain Water Harvesting & Artificial Recharge

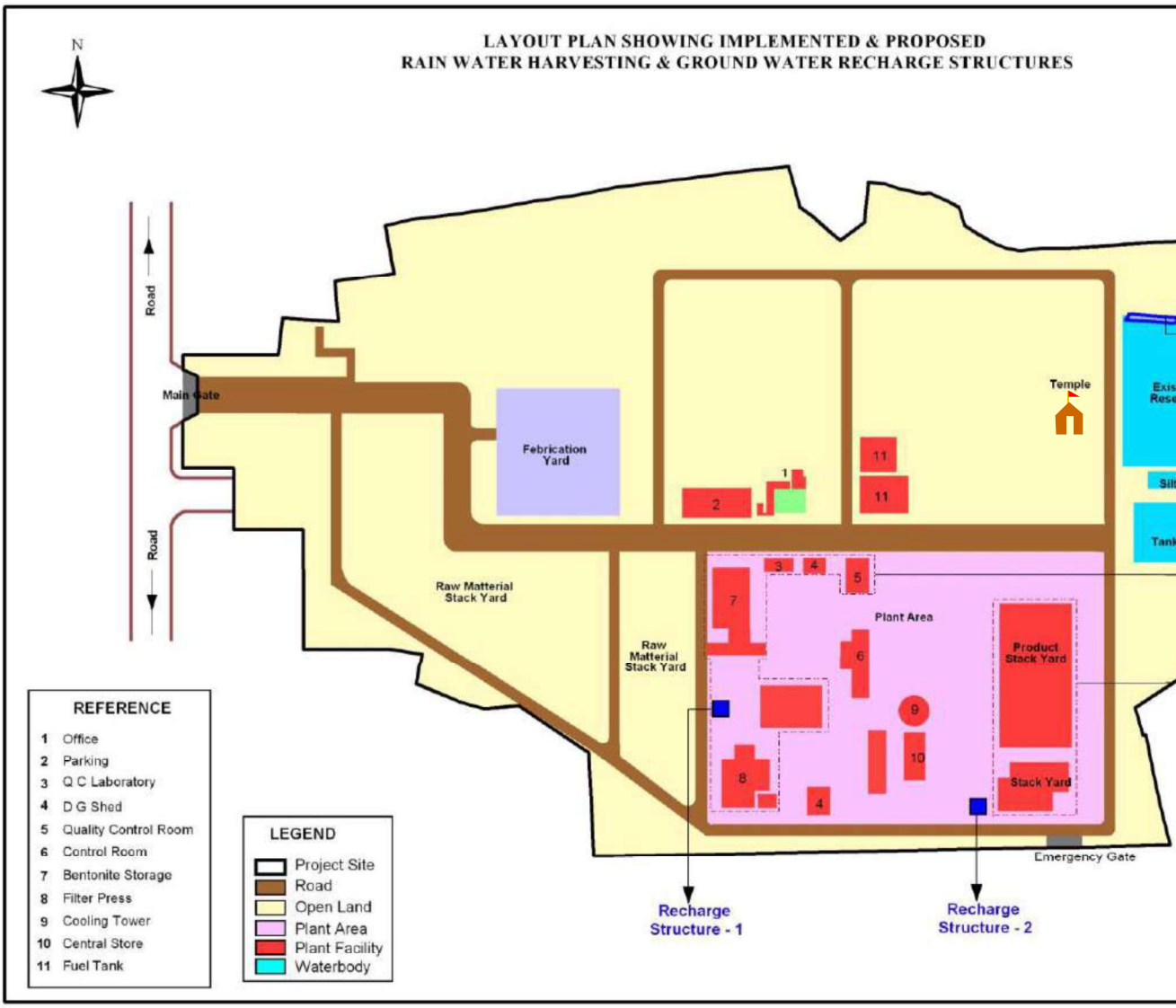

N
LAYOUT PLAN SHOWING IMPLEMENTED & PROPOSED
RAIN WATER HARVESTING & GROUND WATER RECHARGE STRUCTURES
Road
Main Gate
Road
Febrication Yard
Temple
Raw Matterial Stack Yard
Raw Matterial Stack Yard
Plant Area
Product Stack Yard
Stack Yard
Emergency Gate
Recharge Structure - 1
Recharge Structure - 2
REFERENCE
1 Office
2 Parking
3 Q C Laboratory
4 D G Shed
5 Quality Control Room
6 Control Room
7 Bentonite Storage
8 Filter Press
9 Cooling Tower
10 Central Store
11 Fuel Tank
LEGEND
Project Site
Road
Open Land
Plant Area
Plant Facility
Waterbody

Fig. 5.10

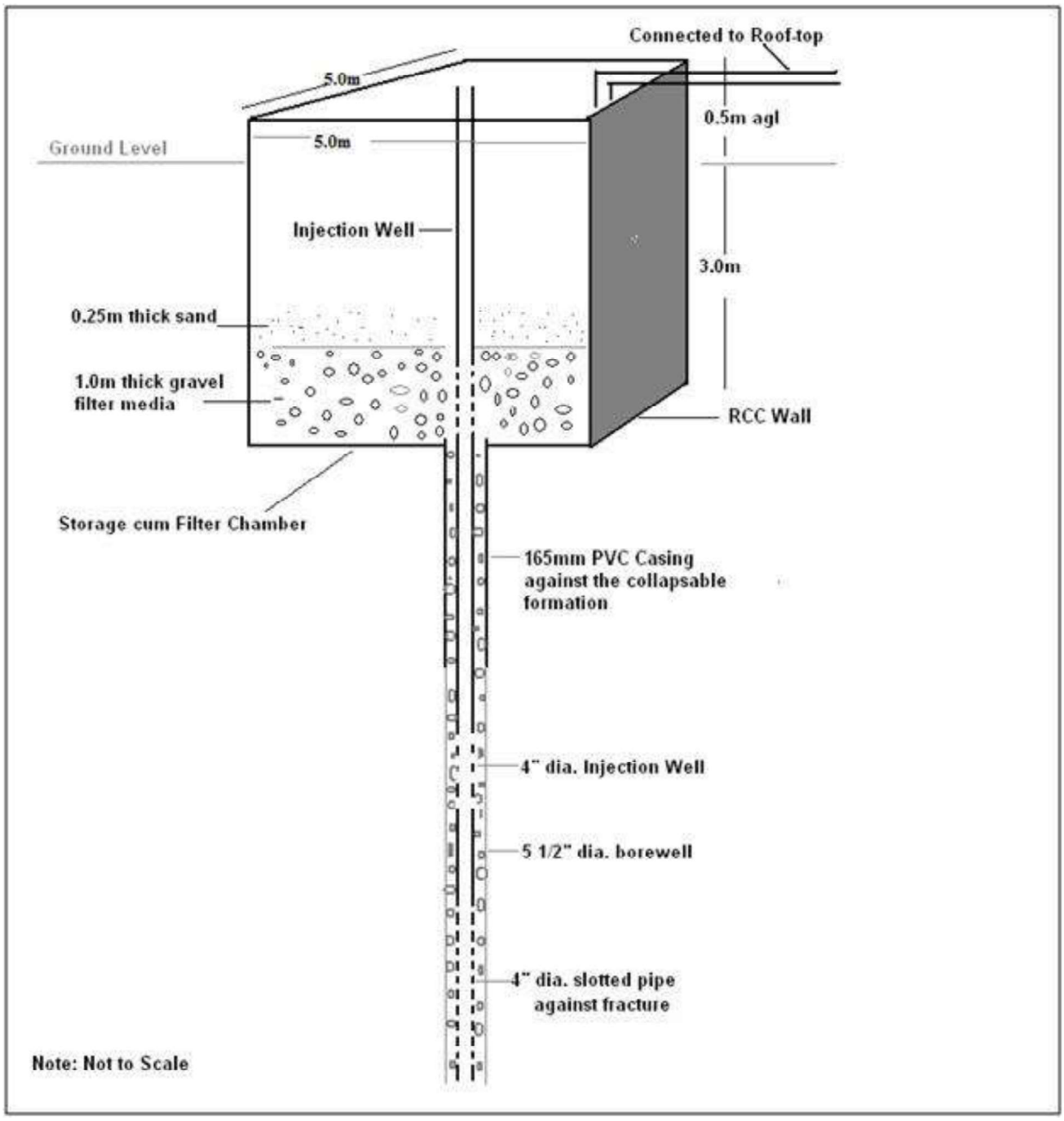


Fig. 5.11 Design of Recharge structure

CHAPTER - 6

CONCLUSION

The rain water harvesting and artificial recharge schemes will result in numerous direct and indirect beneficial impacts which include:

- Conservation and harvesting of surplus monsoon runoff in ground water reservoir which otherwise was going un-utilized outside the watershed/ basin and to sea.
- Rise in ground water levels due to additional recharge to ground water. In case where continuous decline of ground water level was taking place, a check to this and/or the intensity of decline subsequently reduces. The energy consumption for lifting the water also reduces.
- The ground water structures in the benefitted zone of artificial structures gains sustainability and the wells provides water in lean month when these were going dry. The domestic wells will become sustainable and many of the areas become tanker free.
- The cropping pattern in the benefitted zone will undergo marked change due to additionality of ground water and cash crops will start growing. Orchards which went dry earlier due to ground water scarcity may rehabilitated and new plantation be grown.
- Green vegetation cover may increase in the zone of benefit and also along the structures due to additional availability of soil moisture.
- The quality of ground water may improve due to dilution.
- Besides the direct measurable impacts, the artificial recharge schemes will generate indirect benefit in terms of decease in soil erosion, improvement in fauna and flora, influx of migratory birds, etc. Besides, the social and economic status of farmers of benefitted zone will also substantially improve due to increase in crop production.

Periodic maintenance of artificial recharge structures is essential because infiltration capacity reduces rapidly as a result of silting, chemical precipitation and accumulation of organic matter. In case of surface spreading structures, annual maintenance consists of scraping the infiltration surfaces to remove accumulated silt and organic matter. In the case

of injection wells, periodic maintenance of the system consists of pumping and /or flushing with a mildly acidic solution to remove encrusting chemical precipitates and bacterial growths on the well screens. The intervals between periodic cleanings can be extended by converting injection wells into dual purpose wells. However, in the case of spreading structures constructed with an overflow or outlet mechanism, annual desilting is a must.

Several issues are to be considered in the operation and maintenance of artificial recharge structures. These have been categorised as issues of high concern and moderate concern (ASCE, 2001). Safety, optimisation techniques and programs, value of wet-dry cycles, frequency of pond cleaning and condition of filters attached to the structures fall under issues of high concern, whereas security issues and rising ground water levels are among those of moderate concern in this regard. The following monitoring and surveillance activities are suggested to be carried out in periodic intervals:

- Measurement of Inflow and outflow rates, duration and quality of inflow and outflow into and out of each unit of the recharge system.
- Depth to water level and quality of ground water in the area being recharged and adjacent areas.
- Thickness and composition of surface clogging layer when the structure is dry (in case of surface structures).
- Precipitation and evaporation from surface ponds.

Preventive maintenance of artificial recharge structures implies a periodic action taken to forestall major repair or replacement of its components. It may be drying up and scarifying of recharge ponds, periodic pumping of recharge wells, or regular application of lubricants / protective substances to the mechanical parts or replacement of minor parts that are subject to deterioration or repeated failure. It also involves regular observation and recording of the behaviour of both static and dynamic components of the system to detect changes in their inherent condition that indicates the need for unscheduled maintenance. These include reduction in the recharge rates, temperature of mechanical parts or rate of settlement.

Maintenance of roof top rainwater harvesting system (RRHS) is simple and costs little. Cleanliness of surroundings as well as the system including its various components such as roof, gutters, filtration unit and the storage tank, will ensure supply of water of

potable quality throughout the water scarcity period for the drinking and cooking purposes of the household. The following few maintenance activities are suggested in this regard:

- Always keep the surroundings of the tank clean and hygienic
- Remove algae from the roof tiles and asbestos sheets before the monsoon
- Drain the tank completely and clean the inside of the tank thoroughly before the monsoon
- Clean the water channels (gutters) often during rainy season and definitely before the first monsoon rain
- Avoid first 15 or 20 minutes of rainfall depending on the intensity of rain. Use the first flush arrangement to drain off this first rainwater.
- Change the filter media every rainy season
- Cover all inlet and outlet pipes with closely knit nylon net or fine cloth or cap during non-rainy season to avoid entry of insects, worms and mosquitoes
- Leakage or cracks in the storage tank should be immediately attended to. This will obviate the need for major repairs caused by propagation of cracks.
- Heavy loads should not be applied on the lid.
- Water should not be allowed to stagnate in the collection pit
- The filter material should be washed thoroughly before replacing in the filter bucket