

EXECUTIVE SUMMARY

OF

ENVIRONMENTAL IMPACT ASSESSMENT REPORT & ENVIRONMENTAL MANAGEMENT PLAN

FOR

PUBLIC HEARING

OF

**Proposed Integrated Cement Plant
Clinker - 2.5 MTPA, Cement - 2.5 MTPA,
WHRS - 12 MW & DG Set - 500 KVA**

At

**Villages: Kosampali, Barmuda, Dhanagar and Saraipali,
Tehsil & District - Raigarh (Chhattisgarh)**

APPLICANT



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EXECUTIVE SUMMARY

(i) Project name and location (Village, District, State, and Industrial Estate (if applicable))

M/s. Jindal Panther Cement Pvt. Ltd. is proposing Integrated Cement Project: Clinker – 2.5 MTPA, Cement: 2.5 MTPA, WHRS (12 MW) and DG set (500 KVA) along with Railway Siding at Villages: Kosampali, Barmuda, Dhanagar and Saraipali, Tehsil & District: Raigarh (Chhattisgarh). The clinkerization plant of 2.5 MTPA, cement plant of 2.5 MTPA and WHRS of 12 MW is proposed to be commissioned within 03 years of time span.

As per EIA Notification dated 14th Sept., 2006, as amended from time to time; the project falls under Category “A”, Project or Activity ‘3 (b)’ Cement Production.

(ii) Products and capacities. If expansion proposal, then existing products with capacities and reference to earlier EC.

a) Proposed products and capacities

Sl. No.	Particular	Proposed Capacities
1.	Clinker	2.5 MTPA
2.	Cement	2.5 MTPA
3.	WHRS	12 MW
4.	DG Set	500 KVA

Source: Pre-Feasibility Report

(iii) Requirement of land, raw material, water, power, fuel with source of supply (Quantitative)

a) Land requirement

Total project area for proposed Integrated Cement Project is 65.941 ha, out of which 29.838 ha is government land, 35.267 ha is private land and 0.836 ha is forest land. Out of the total project area, M/s Jindal Steel & Power Ltd. (JSPL) is in possession of 55.429 ha land (26.611 ha Government land & 28.818 ha Private land). The Company is in process of transferring the same to JPCPL through adequate process. During physical survey and reconciliation of land records with the State Government, the Revenue Forest land involved in the proposed project area has now been estimated to be 0.836 Ha. Accordingly, an application for diversion of 0.836 Ha. of Revenue Forest land has been submitted to MoEFCC, Forest division vide Proposal No- SW/290446/2022 dated 28.08.2022.

Plant Area Break - up

S. No.	Unit	Area (ha.)	Percentage (%)
1.	Clinkerization Plant	13.15	19.94%
2.	Grinding Unit	6.48	9.83%
3.	Greenbelt / Plantation	21.76	33%
4.	Roads	6.00	9.10%

5.	Raw material yard	7.00	10.62%
6.	Railway Siding	7.70	11.68%
7	WHRS	0.81	1.23%
8.	Truck parking yard	1.50	2.27%
9.	Others, if any	1.54	2.34%
	Total	65.941	100%

Source: Pre-feasibility Report

b) Raw Material Requirement & Fuel Requirement

Raw material

S. No.	Name of Raw Material	Proposed Quantity (MTPA)	Source	Approx. Distance from Plant site	Mode of Transportation
1.	Limestone	3.88	Godadih Mahal No.2 Tehsil Masturi, District Bilaspur	153 km	By rail from Jairamnagar railway siding to the plant. By road to the captive railway siding located at Jairamnagar at about 35 kms from the mine.
2.	Iron ore/NOF slag	0.075	JSPL Raigarh Steel Plant	< 1 km	Will be transported through tippers by internal roads
3.	BF Slag	1	JSPL Raigarh Steel Plant	< 1 km	Will be transported through tippers by internal roads
4.	Gypsum (mineral and chemical)	0.075	Coromandel Fertilizers, Visakhapatnam OR Imported from Middle East	630 km	By Rail
5.	Fly ash & pond ash	0.375	JSPL Raigarh Power plant	< 1 km	Through bulkers

Source: Pre-feasibility Report

Fuel Requirement

Details regarding quantity of fuel required, their source along with distance and mode of transportation are given below:

S. No.	Name of Fuel/Feedstock	Quantity Required (MTPA)	Calorific value (Kcal. /kg)	% Ash	% Sulphur	Source	Distance & Mode of Transportation
1.	Coal (Indian/ Imported)	0.463	4200	30	0.60	Korba coal fields/ imported	Road / Rail 120 Km
2.	Petcoke	0.241	>7800	0.02 - 0.7	6.3	Indian petroleum industry/Imported	Petcoke will be sourced from India/abroad petroleum industry depending upon economic viability

Source: Pre-feasibility Report

Note: Any one type of fuel or Mixed fuel in appropriate proportion will be used. Also, Alternative Fuels (AFR) will be used as feed stock in kiln as per availability in the nearby area after obtaining prior permission from SPCB.

C) Basic requirement for the project

S. No.	Particular	Total Quantity		Source
1.	Water (KLD)	1000		Mahanadi River
2.	Power (MW)	35		JSPL Raigarh and D.G. Set
3.	Manpower (No. of Persons)	Operation Phase		In operation period the total no. of persons will be approx.574persons from JPCPL & out of these 239 persons may be taken on contract
		Regular	335	
		Contractual	239	
		Total	574	
		Implementation Phase	3080	

Source: Pre-feasibility Report

(iv) **Process description in brief, specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes. Material balance shall be presented.**

a) Process Description

Cement Plant

The proposed project comprises of equipment such as raw mill, Pre- heater & pre-calciner, Rotary Kiln, Clinker Cooler, Coal Mill and Cement Mill & Packers which will be used for cement (PCC, PSC, PPC) manufacturing.

The process involves in cement production largely comprises of the following steps:

- ⊗ Crushing, Stacking & Reclaiming of Limestone
- ⊗ Crushing, Stacking & Reclaiming of Coal and Use of Alternate Fuel
- ⊗ Raw Mill/ Kiln feed preparation
- ⊗ Clinkerization

- ∞ Cement Grinding and Storage
- ∞ Heat Recovery System
- ∞ Alternate Fuel

Crushing Stacking & Reclaiming of Limestone

- ∞ The Limestone Crushers will crush the limestone and discharge the material onto a belt conveyor which takes it to the stacker. The material will be stacked in stockpiles. Limestone will be extracted transversely from the stockpiles by the reclaimers and conveyed to the Raw Mill hoppers for grinding of raw meal. Other additives and corrective materials will also be mixed during grinding of limestone in raw mill in appropriate proportion for desired quality of clinker.

Crushing, Stacking & Reclaiming of Coal and Use of Alternate Fuel

- ∞ The process of making clinker requires heat. Coal/pet coke/ alternate fuel will be used as the fuel for providing heat. Raw Coal/ pet coke received from the supply industry will be stored in coal yard and conveyed to coal mill for grinding and finally stored in fine coal bins before used in pyro processing.

Raw Mill/ Kiln feed preparation

- ∞ Reclaimed limestone along with additives and corrective material will be fed to the raw mill for grinding and product is called raw meal. The hot gases generated from the clinkerization process will be used in raw mill for drying and for generating power. Raw meal will be finally stored and homogenized in silo. Extracted raw meal from silo is called kiln feed which will be fed to the top of multistage preheater for pyro processing

Clinkerization

- ∞ Clinker will be made by pyro processing of Kiln feed in the preheater and the rotary kiln. Fine coal / pet coke & alternative fuel will be fired to provide the necessary heat in the kiln and the pre-calciner located at the bottom of the preheater. Hot clinker discharged from the Kiln will drop on the grate cooler and will get cooled. The cooler will discharge the clinker onto the pan / bucket conveyor, and it will be transported to the clinker silo. The clinker will be taken from the silo to the Cement mill hoppers for cement grinding.

Cement Grinding and Storage

- ∞ Clinker and Gypsum, fly ash and slag components according to requirement will be extracted from their respective hoppers and fed to the Cement Mill. Cement Mill grind the feed to a fine powder and the mill discharge will be fed to an elevator, which will take the material to a separator, which separates fine product and the coarse product. The Cement, so provided will be transported to RCC Cement Silos for dispatch.

Heat Recovery System

- ∞ Waste heat gases from Preheater and cooler will be fed to Boilers to generate low pressure steam subsequently fed to turbine to generate power.

Alternate Fuel

- ∞ Industrial waste / Municipal waste will be collected in covered shed. It will be processed and fed to Kiln / calciner. This will help in reducing CO₂ emissions and fuel consumption.

Waste Heat Recovery System

The WHR power plant system shall consist the following as a minimum requirement.

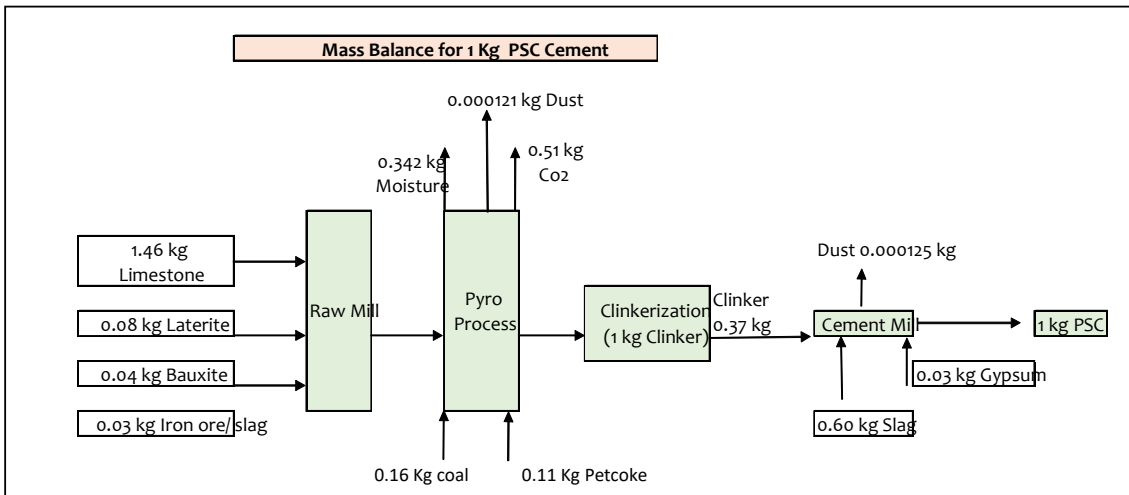
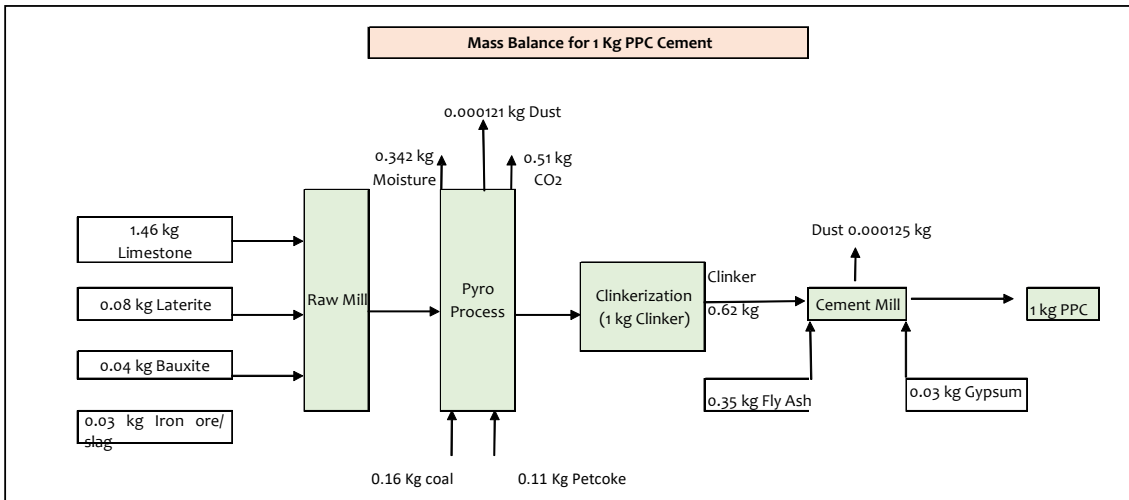
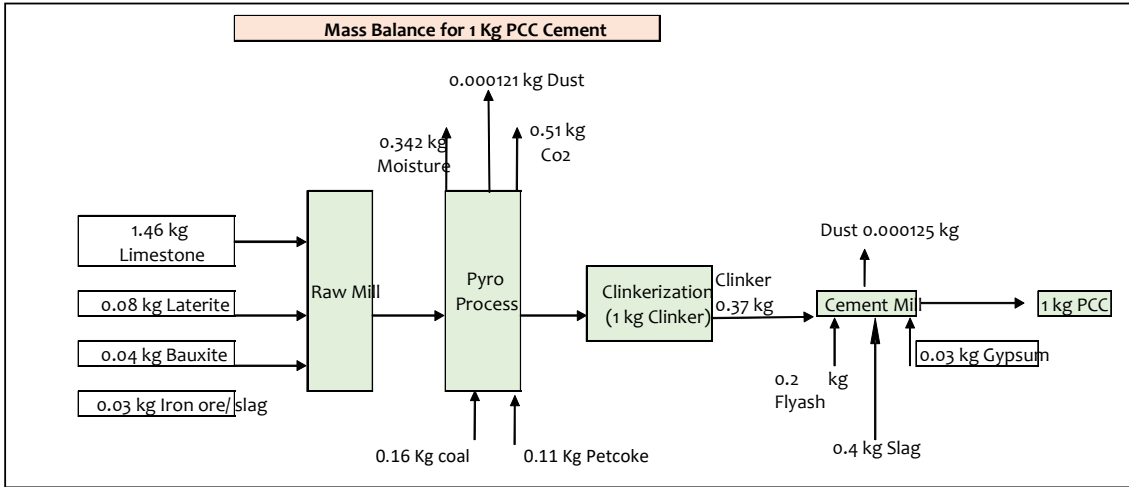
- ⊗ 1 no. of Waste heat recovery boiler with auxiliaries for preheater exhaust gases.
- ⊗ 1 no. of waste heat recovery boiler for clinker cooler gases (shall have two tappings i.e., from mid tap-1 and mid tap-2 of the cooler) with associated auxiliaries will be supplied as per main plant suppliers.
- ⊗ HP & LP steam headers and HP & LP steam piping system.
- ⊗ Common constant pressure de-aerator cum storage tank having deaerating capacity equal to twenty (20%) higher than the gross MCR steam generation capacity of boilers.
- ⊗ Piping, PRDS, Valves (MOV, Control valves, NRV, safety valves), required necessary Instrumentation for 30% HP steam and 100% LP steam up to the Inlet of respective dump condenser Inlet shall be provided. Dump steam parameters shall be considered for 30% TMCR In HP steam and 100% TMCR In LP steam.
- ⊗ Mechanical Dust disposal system from the various dust collecting points of PH and AQC boilers.
- ⊗ Fresh air blower with Guillotine damper at discharge side and multicover damper/IGV at suction side shall be considered. Fresh air blower motor shall be with WF drive compatible.
- ⊗ Complete piping for steam system, feed water system, condensate system, DM water system from the outlet of DM tank, instrument and service air system from the Inlet of air receiver, auxiliary steam system etc.
- ⊗ Complete electrical system (Motors, MOV, cable trays, earthing system, Interconnected power and control cable, LPBS, Lightning protection, SPDB, Cables from MOV to LPBS etc. within the battery limit of boilers shall be provided.
- ⊗ Complete C&I system up to field JB Including control, Instruments & power cables, FJB along with necessary fixtures and erection hardware.
- ⊗ 1 no. dual pressure Injection, condensing STG and Auxiliaries along with Generator transformer and NGR shall be procured from reputed supplier.

a) **Gaseous Emission, Liquid Effluent and Solid & Hazardous Wastes**

Particulars	Type	Source	Management
Emissions	PM, SO ₂ , NO _x	Cement Plant	<ul style="list-style-type: none"> ○ Installation of efficient Air Pollution Control Equipment such as Bag House filter and ESP. ○ Pyro-process itself acts as a long SO₂ scrubber ○ Low NO_x burners & De-NO_x system. ○ Incline Calciner for low NO_x formation. ○ Installation of analyzer at the inlet of Kiln to monitor O₂ & NO_x.

Particulars	Type	Source	Management
Fugitive Emission	SPM	Raw Material Handling & Storage	<ul style="list-style-type: none"> ○ Covered Conveyor belts will be used for transfer of raw materials / finished products inside the plant ○ Fly ash will be received through closed bulkers & fed into silo through automatic pneumatic system ○ Clinker, fly ash and Cement will be stored in the silos ○ Gypsum, Slag, Coal and Pet coke will be stored in the covered storage yard ○ Water sprinkling will be done to control dust. ○ Proper maintenance of vehicles will be done to reduce gaseous emissions ○ Concrete movement area ○ Use of Vacuum sweeping for better housekeeping ○ Greenbelt / plantation development will be done in 33% of the total project area in and around the plant boundary to attenuate air pollution.
		Transportation activity	
Process Waste Water	Waste water	RO Plant & WHRS	Blow down and RO reject water (50 KLD) will be reused for dust suppression after neutralization.
Domestic Waste water	Waste Water	Plant	<ul style="list-style-type: none"> ○ Sewage Treatment Plant (STP) of capacity 90 KLD will be installed for the treatment of domestic waste water (84 KLD) from plant. ○ Treated water (84 KLD) from STP will be used in greenbelt development / plantation.
Solid & Hazardous waste	Dust	Cement Plant	Dust collected from various APCE will be totally recycled into the process.
	MSW	Plant	Bio-degradable waste will be composted and non-degradable wastes will be disposed of suitably.
	STP Sludge	STP	Used as manure for greenbelt development / plantation
	Used or Spent Oil	Plant Maintenance	Will be sold to CPCB authorized recycler
	Contaminated cotton rags		
Empty barrels			

b) Material Balance



(v) **Measures for mitigating the impact on the environment and mode of discharge or disposal**

Particulars	Details
Air Quality Management	<ul style="list-style-type: none"> ☞ The limestone from captive limestone mine at Chilhati located in district Bilaspur will be transported through rail from railway siding located at Jairamnagar to the plant site. Limestone will be transported by road from mine to the Railway siding (35 Kms). ☞ The Limestone Crushers will crush the limestone and discharge the material onto a belt conveyor which takes it to the stacker. ☞ A set of water spray nozzles will be provided over the conveyor belt in the stacker feed point. ☞ Bag filters will be installed at all material transfer points. ☞ Sprinkling of water on roads will be done. ☞ Regular cleaning and sweeping of roads, near-by area of storage facilities will be done by vacuum sweeping machine. ☞ Greenbelt/ plantation will be done in 33% (i.e., 21.76 ha) of the total project area to attenuate the air pollution. ☞ Efficient Air Pollution Control Equipment (APCE) like Bag House in Raw Mill & Kiln, Coal Mill, Cement Mill and Bag Filters at various transfer points; ESP at Clinker Cooler and CPP Boiler will be installed at all above mentioned stacks to keep the emissions within the permissible limits. ☞ SO₂ emissions are absorbed in pyro processing itself. ☞ NO_x generation takes place at high temperature and excess air. Low NO_x burner & De-NO_x system will be installed for fuel burning along with calciner for low NO_x formation. ☞ Vehicles and machineries will be regularly maintained. Proper up keep and maintenance of vehicles will be done. ☞ Interlocking System will be installed and accordingly, automatic shutdown will take place due to non-working of APCE. ☞ All the stack will be equipped with Continuous Online Monitoring Systems and connected with Central Control Room in the plant for monitoring the emissions. ☞ Proper maintenance of Air Pollution Control Equipment will be done periodically.
Water Management	<ul style="list-style-type: none"> ☞ Waste water will not be discharged outside the plant premises as Boiler Blow down (17.28 KLD) generated from plant will be treated in ETP (20 KLD) and treated water will be used for Dust suppression/Green belt development ☞ Domestic wastewater (about 84 KLD) generated from plant & colony will be treated in STP (Capacity 90 KLD) & treated water will be reused for greenbelt development. ☞ Rain water harvesting will be practiced inside the plant premises ☞ Regular monitoring of water quality will be carried out. ☞ Training and awareness programmes on water conservation measures will also be organized for the locals.

Particulars	Details
Noise Management	<ul style="list-style-type: none"> ⊗ Equipment/ machinery will be selected with low noise and will be housed in insulated ceiling. ⊗ Machine operators and Persons working just close to machine will be provided with personal protective equipment viz. Ear plugs / Ear muffs etc. ⊗ Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise. ⊗ Compressors and turbine will be installed in closed building. ⊗ Greenbelt of appropriate width at the project boundary will be developed. ⊗ Regular monitoring of noise level will be carried out and corrective measures in concerned machinery will be adopted accordingly.
Solid & Hazardous Waste Management	<ul style="list-style-type: none"> ⊗ The waste generated due to site clearing prior to the construction phase will be mainly utilized in the leveling. ⊗ Left over construction material having a high recycling value and reuse value thus will be sold to the respective recyclers. ⊗ Dry & wet solid waste generated by the construction workers will be managed by placing proper segregated litter bins and will be transferred to the identified nearby secondary stations. Recyclable contents will be sold to authorized recyclers and organic waste will be composted. ⊗ Refractory bricks will be disposed of to external vendors for their use in other industries. ⊗ Dust collected from various Air Pollution Control Equipment's like ESP; Bag House / Bag Filters will be recycled back into the process. ⊗ STP sludge will be used as manure in greenbelt development/ plantation. ⊗ Used Oil/spent oil generated as hazardous waste will be sold to CPCB authorized recycler and co-processed in Cement Kiln along with Cotton rags or cleaning material wastes. ⊗ Dry & wet solid waste generated from plant will be collected in the segregated manner. The biodegradable waste will be compost and then will be used as manure for greenbelt/ plantation, whereas the non - biodegradable waste will be disposed scientifically
Green Belt Development / Plantation	<ul style="list-style-type: none"> ⊗ Total Plant area is 65.941 ha (Cement Plant, CPP & Colony). About 33% i.e., 21.76 ha (approx. 33%) area will be covered under greenbelt development / plantation along the plant boundary and inside the plant. ⊗ About 2000-2500 trees will be planted per hectare of land ⊗ Native plant species will be planted in plant to achieve the targeted green belt development.

(vi) **Capital cost of the project, estimated time of completion.**

S. No.	Particular	Details
1.	Total Cost of the Project	Rs. 2119 Crores
2.	Cost for Environment Management Plan	
	a. Capital Cost	Rs. 100 Crores
	b. Recurring Cost	Rs. 5 Crores / annum
3.	Time of completion of the project	36 months (after placement of main machinery order)

(vii) **Site selected for the project - Nature of land- agricultural (single/double crop), barren, Govt./private land, status of its acquisition, nearby (in 2-3 km) water body, population, within 10 km other industries, forest, eco-sensitive zones, accessibility (Note- in case of industrial estate this information may not be necessary)**

a) **Nature of land**

Total project area for proposed Integrated Cement Project is 65.941 ha, out of which 29.838 ha is government land, 35.267 ha is private land and 0.836 ha is forest land.

Status of its acquisition

Out of the total project area, M/s Jindal Steel & Power Ltd. (JSPL) is in possession of 55.429 ha land (26.611 ha Government land & 28.818 ha Private land). The Company is in process of transferring the same to JPCPL through adequate process. During physical survey and reconciliation of land records with the State Government, the Revenue Forest land involved in the proposed project area has now been estimated to be 0.836 Ha. Accordingly, an application for diversion of 0.836 Ha. of Revenue Forest land has been submitted to MoEFCC, Forest division vide Proposal No-SW/290446/2022 dated 28.08.2022.

c) **Nearby (in 2-3 km) water body, forest, eco-sensitive zones, accessibility**

S. No.	Particulars	Details (with approximate aerial distance & direction from the nearest boundary of project site)
1.	Nearest Village	Village Kosampalli (~50 m in East direction)
2.	Nearest Town & City	Raigarh (~5.5 km in SE direction)
3.	National Highway / State Highway	<ul style="list-style-type: none"> ➤ NH 200 (~ 2.0 km in NE direction) ➤ NH - 49 (~2 km in direction) ➤ SH-16 (~1.0 km in South direction)
	Other Roads	Village roads
4.	Nearest Railway station	➤ Kirorimalnagar Railway Station (~1.5 km in NW direction)
		➤ Raigarh Railway Station (~5.5 km in ESE direction)
		➤ Bhupdeopur Railway Station (~10 km in NW direction)
5.	Nearest Airport	Jharsuguda Airport (~75 km in East direction)

S. No.	Particulars	Details (with approximate aerial distance & direction from the nearest boundary of project site)
6.	National Parks, Wildlife Sanctuaries, Biosphere Reserves, (PF) etc. within 10 km radius.	No National Park, Wildlife Sanctuary, Biosphere Reserve falls within the 10 km radius study area.
7.	Reserve Forest (RF) / Protected Forest (PF) etc. within 10 km radius.	<ul style="list-style-type: none"> ➤ Protected Forest (~8.5 km in ESE direction) ➤ Protected Forest (~7.5 km in NE direction) ➤ Lakha PF (~8.0 km in NNE Direction) ➤ Barkachhar RF (~9.5 km in NNE Direction) ➤ Dungapani PF (~8.5 km in NE Direction) ➤ Barlia PF (~9.5 km in NE Direction) ➤ Boidadar RF (~7.5 km in ENE Direction) ➤ Gajmar RF (~8.0 km in ESE Direction) ➤ Lamhidarha PF (~7.5 km in ENE Direction) ➤ Protected Forest (~6.0 km in NE Direction) ➤ Urdana RF (~2.5 km in ENE Direction)
8.	Water Bodies within 10 km radius study area	<ul style="list-style-type: none"> ➤ Kelo River (~6.5 km in ENE direction) ➤ Mand River (~6 km in WSW direction) ➤ Kanthi Tal (~3.0 Km in SSW direction) ➤ Tipakhol Tal (~3.5 in NNE direction) ➤ Kokritaral Tal (~3.5 Km in NW direction) ➤ Ramjharan Nala (~6.5 Km in West direction) ➤ Pathari Nala (~6.5 km in WSW direction) ➤ Doliva Nala (~5.0 km in WSW direction) ➤ Sanapkhari Nala (~6.5 km in ENE direction)
9.	Seismic Zone	Zone - II [as per IS 1893 (Part-I): 2002]

Source: Pre-feasibility Report

d) List of industries within 10 km radius study area

S. No.	Name of the industry	Product manufacturing	Approx. Distance & Direction from the proposed site
1.	Jindal Steel Pvt Ltd	Steel	~0.60 km in North
2.	Raigarh PS power grid	Power	~4.5 km in SE
3.	Raigarh Solvent extraction Pvt	Chemical	~5.5 km in SE
4.	Crushing Units	Mineral	~5.5 km in NW
5.	Vazron industries Pvt Ltd	Sponge Iron plant	~7.80 km in NNE
6.	Maa kali alloys udyog pvt. ltd. Raigarh	Sponge Iron plant	~8.5 km in North
7.	Vimla Infrastructure (India) Pvt Ltd	Coal Washery	~9.0 km in WNW
8.	Salasar steel and Power Ltd	Steel	~8.5 km in North

9.	RR Energy Limited	Electric Utility	~9.5 km in ESE
10.	Chandra Hasini Ispat Pvt Limited	Steel	~9.5 km in NNE
11.	Shree Rupanadham Steel pvt Ltd	Steel	~9.5 km in NNW
12.	Gurushree Industries Private Limited	Finest grade of Ferro Vanadium and Vanadium Chemicals	~9.6 km in NNW
13.	Sreechem Resins Ltd	Synthetic PF Resins viz, Novolak Resin and Resol Resin	~10 km in ESE

(viii) **Baseline environmental data - air quality, surface and ground water quality, soil characteristic, flora and fauna, socio economic condition of the nearby population.**

a) Presentation of Results (Air, Noise, Water & Soil)

Ambient Air Quality Monitoring Results

Baseline study of the study area was conducted during Pre-Monsoon Season (March to May, 2022). Ambient Air Quality Monitoring reveals that the concentrations of PM_{2.5} & PM₁₀ for all the 09 AAQM stations are given respectively. The observed values varies between 50.4 µg/m³ at Village Katra to 86.4 µg/m³ at town Raigarh and 27 µg/m³ at Village Katra to 51.3 µg/m³ at town Raigarh and found within the prescribed NAAQ standards of 60 µg/m³ and 100 µg/m³ respectively.

As far as the gaseous pollutants SO₂ and NO₂ are concerned, the prescribed CPCB limit of 80 µg/m³ has never surpassed at any station. The concentrations of SO₂ and NO₂ were found to be in range of 12 to 29.9 µg/m³ and 6.1 to 13.7 µg/m³ respectively. CO concentration at one location i.e. Village Katra was observed Below Detection Limit (DL 0.5) and maximum value was observed 0.96 mg/m³ at town Raigarh.

Ambient Noise Quality Monitoring Results

Ambient noise levels were measured at 9 locations in and around the project site during the day and night time. During day time, a Noise level varies from minimum – 51.7 Leq dB (A) at Village Baghanpur to maximum – 61.3 Leq dB (A) at Jindal Steel Plant. Also, the project site during the day time observed the noise level of 58.4 Leq dB (A). During night time, Noise level varies from 41.9 Leq dB (A) at Village Kosampali to 54.7 Leq dB (A) at Jindal Steel Plant during night time. Also, the project site during the night time observed the noise level of 46.1 Leq dB (A).

Surface Water Analysis

Surface water sample was collected from the 04 water bodies during the study period.

The pH of the surface water samples was observed to vary from minimum (7.02) at Tipakhol Talto, maximum (7.35) at Kokaritaral Tal indicating the water samples have a pH quality slightly alkaline in nature. The turbidity was observed Below Detection Limit (DL 1) at all the sampling location. The odour was found agreeable at all sampling locations and the taste parameter was not conducted for the surface water body monitoring. The minimum and maximum observed value of the surface water quality indicators varies from: Total hardness as CaCO₃ (143.5 mg/l Tipakhol Tal to 222.7 mg/l Mand River); alkalinity CaCO₃ (61.7 at Tipakhol Tal mg/l to 133 mg/l at Kokaritaral Tal); total dissolved solids (184 mg/l at Tipakhol Tal to 351 mg/l at Kokaritaral Tal); BOD (BDL (DL – 1.0) at Kelo River to

7.2 mg/l at Mand River); COD (8 mg/l at Kelo River to 28 mg/l at Mand River). The level of DO varies from 7 mg/l at Mand River to 7.7 mg/l at Kelo River. The concentration of chloride varies from (34.9 mg/l at Tipakhhol Tal to 51.4 mg/l at Kokaritaral Tal) and sulphate from (48.02 mg/l at Tipakhhol Tal to 87.03 mg/l at Mand River), Magnesium (19.2 mg/l at Mand River to 20.4 mg/l at Kokaritaral Tal); Calcium (48.86 mg/l at Tipakhhol Tal to 57.4 mg/l at Mand River); Fluoride varies from (0.28 mg/l Kelo River to 0.97 mg/l at Kokaritaral Tal). Surface water quality was also analyzed for Residual Free Chlorine, Cyanide, Iron, Aluminum, Boron, Phenolic Compounds, Anionic detergents, Zinc, Copper, Manganese, Lead, Selenium, Arsenic, Nickel, Mercury, Hexa Chromium etc. and were found below the detection limit.

Ground Water Analysis

The quality of ground water was studied by collecting 08 water samples from representative open bore wells and Hand pumps. The physico-chemical quality of groundwater was compared with drinking water standard (IS: 10500- 2012).

The pH of the ground water at the sampled villages varies from minimum (6.95) at Village Lakha to maximum (7.42) at project site indicating the water samples have a pH quality slightly alkaline in nature. The color and turbidity were found to be BDL (DL 1.0) and BDL (DL 1.0) respectively at all the sampled locations. The odour and taste were found agreeable at all sampling locations. The observed value of the ground water quality indicators varies from: Total hardness as CaCO₃ (282.1 mg/l at Village Lakha to 529.6 mg/l at project site); alkalinity CaCO₃ (251.7 mg/l at Village Lakha to 422.7 mg/l at Project site); total dissolved solids (444 mg/l at Village Lakha to 809 mg/l at Project site). The concentration of chloride varies from (87.4 mg/l at village Dhanagar to 179.9 mg/l at Project site) and sulphate from (74.82 mg/l at Village Lakha to 163.56 mg/l at village Chiraipani), Magnesium (14.4 mg/l at Project site to 42.1 mg/l at Village Chiraipani); Calcium (73.3 mg/l at Village Lakha to 188.1 mg/l at Project site); Iron varies from BDL (DL – 0.02) to 0.23 mg/l at Village Usraut); Fluoride varies from (0.34 mg/l at Village Usraut to 0.93 mg/l at Project site).

The conductivity is observed to be minimum 694 µs/cm at Village Lakha and maximum of 1266 µs/cm at Project Site.

Ground water quality was also analyzed for Cyanide as (CN), Aluminium as (Al), Boron, Phenolic Compounds, Anionic Detergents as (MBAS), Hexa Chromium as (Cr+6), Chromium as (Cr), Zinc as (Zn), Copper as (Cu), Manganese as (Mn), Cadmium as (Cd), Lead as (Pb), Arsenic as (As), Mercury as (Hg), Phosphate as (PO₄), Nickel, Total Suspended Solid (TSS) are reported to be their Below detection limit at all the sampled locations.

Soil Quality Monitoring Results

Soil samples were collected from 08 sampling locations, which indicated pH of the soil samples varies from 6.67 at Project Site to 7.45 at the Village Kosampalli which indicates the soil samples are neutral to moderately alkaline in nature. The texture of the soil samples majorly consists of Silt Clay and Clay Silt. The soil samples majorly exhibit Dark Brown, Yellowish Brown and Light Yellowish colour at all the sampled villages. The soil type at the project site consists of Clay Silt Texture and dark brown color. The indicator such as organic matter varies from 1.1% to 1.97 % and Organic carbon varies from 0.64 % to 1.14 %. The minimum values were observed at village Deori and maximum at Village Chiraipani. The Water holding capacity varies from 32.86 % at the Village Lkaha to 54.55 % at the Village Dhanagar. Examined six essential nutrients required for an ideal plant

growth are Nitrogen, Phosphorus, Potassium, Magnesium, Sulfur and calcium. All the essential nutrients were observed to be Nitrogen (208.68 kg/ha at project site to 401.45 kg/ha at Village Dhanagar), Phosphorous (23.19 kg/ha at Project site to 44.61 kg/ha at Village Dhanagar), Potassium (102.36 kg/ha at Village Deori to 406.67 kg/ha at Village Usraut), Magnesium (232.83 mg/kg at Raigarh Town to 384.21 mg/kg at Village Usraut), Calcium (1068.93 mg/kg at the project site to 1662.75 mg/kg at Raigarh Town) and Sodium (18.51 mg/kg at Village Chiraipani to mg/kg at Project Site). The SAR value was observed under the limits at all the sampling locations with maximum value of 0.44 at Project Site to minimum value of 0.11 at Village Chiraipani. All the essential nutrients were observed to be present in a higher amount than the other micro nutrient such as Nitrogen 186.0 kg/ha to 318.96 kg/ha, Phosphorous 26.78 kg/ha to 49.82 kg/ha, Potassium 158.7 kg/ha to 346.70 kg/ha, Magnesium 396.74 mg/kg to 568.42 mg/kg, Calcium 1964.45 mg/kg to 3968.23 mg/kg and Sodium 58.95 mg/kg to 96.74 mg/kg.

b) Biological Environment

No Schedule I species of Fauna were recorded in the study area during field survey as per Indian Wildlife Protection Act, 1972.

Flora: Most common species found in the area are *Ficus religiosa* (Peepal), *Acacia nilotica* (Babul), *Annona squamosa* (Seetaphal, sareefa), *Azadirachta Indica* (Neem), *Gmelima arborea* (Khamer / Gamari), *Mangifera indica* (Aam / Mango), *Chamaedorea elegans* (Bamboo palm), *Datura metal* (Datura), etc.

Fauna: Commonly found species in the study area are *Cuon alpinus* (Wild dog), *Felis chaus* (Jungle cat), *Lepus nigricollis* (Common Indian Hare), *Oryctolagus cuniculus algerus* (Rabbit), *Sus scrofa* (Wild pig), *Calotes versicolor* (Garden lizard), *Danais chrysippus* (Plain tiger), etc

c) Socio-Economic Environment

As per 2011 Census, the population recorded is 248936 (for 10 km radius buffer zone). Total no. of household is 5872, 41158 and 10856 respectively in primary, secondary and outer zone. Sex ratio is 897, 958.6 and 995 (females per 1000 males) observed in primary, secondary and outer zone respectively. SC population distribution is 3908, 30324 and 5799 respectively in primary, secondary and outer zone. ST population distribution is 5268, 22671 and 11141 respectively in primary, secondary and outer zone respectively. Average household size is 4 which is the standard family size in India. The literacy rate of the study area is 72.45%. The sex ratio of the study area is 959.

(ix) Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.

Risk Assessment table along with mitigation measures

S. No.	Activity	Associated hazards	Associated risk/ health impact	Mitigation Measures
1.	Storage & handling of raw material & chemicals	Heat, Fire & dust	Exposure, physical injuries, burning, air pollution due to fugitive emissions	<ul style="list-style-type: none"> ○ Use of PPEs. ○ Continuous water sprinkling ○ Training to workers for proper handling

S. No.	Activity	Associated hazards	Associated risk/ health impact	Mitigation Measures
				<ul style="list-style-type: none"> ○ Proper system for loading & unloading operations ○ Firefighting & first aid facility ○ Storage should be away from ignition source ○ Proper housekeeping facilities
2.	Working in Cement Plant	Heat, Fire, Dust, Smoke & Explosion	Physical injuries, burning, air pollution, CO poisoning	<ul style="list-style-type: none"> ○ Firefighting & first aid facility ○ Use of PPEs. ○ Use of proper APCEs like Bag house ESP/Bag Filters ○ Inspection & regular monitoring ○ Training to workers for proper handling of raw materials
3.	APCD failure	Release of PM in ambient air	Air pollution	<ul style="list-style-type: none"> ○ Regular monitoring & inspection will be done. ○ The plant shall immediately shut down on APCE failure
4.	Working at height	Slip, trips & falls of operators	Physical injuries	<ul style="list-style-type: none"> ○ Individual alertness of the workers. ○ First aid boxes shall be provided
5.	Electrical maintenance work	Electric shock, short circuits in power room	Electrical shocks, Injury or burn	<ul style="list-style-type: none"> ○ Regular checking and maintenance of electrical units ○ Use of PPEs ○ Provision of First aid box
6.	Working near D.G. sets during emergency	High noise	Noise induced hearing losses	<ul style="list-style-type: none"> ○ Provision of PPEs to the workers.

(x) Likely impact of the project on air, water, land, flora-fauna and nearby population.

S. No.	Project Activity	Aspect	Impact	Mitigation Measures
1.	Transportation of Limestone by Road/Rail	Fugitive Dust Emission	<ul style="list-style-type: none"> ▪ There will be increase in the concentration of fugitive dust in very lesser quantity 	<ul style="list-style-type: none"> • Water spray nozzles over the conveyor belt in the stacker feed point • Installation of Bag Filters at transfer points

S. No.	Project Activity	Aspect	Impact	Mitigation Measures
				<ul style="list-style-type: none"> Greenbelt development along the periphery of plant
2.	Transportation of other raw materials by road	Fugitive Dust Emission	Increase in the fugitive dust concentration in the ambient air which will affect the biotic environment	<ul style="list-style-type: none"> Use of PUC Certified vehicles Vehicles to be covered with tarpaulin and not over loaded Speed limit to be maintained Paved road in plant premises
3.	Raw Material & Finished Product - storage and handling		<ul style="list-style-type: none"> Increase in the fugitive dust concentration in the ambient air Workers affected by respiratory diseases due to working in the high dust-zone area 	<ul style="list-style-type: none"> Covered yard for storage of Gypsum, Coal & Pet-coke as feedstock. Personal Protective Equipment to the workers
4.	Raw Mix Preparation	Particulate Matter Emission	Increase in the concentration of particulate matter in the ambient air	<ul style="list-style-type: none"> Transportation of material to the raw mill by covered conveyor belt Installation of Bag Filters at transfer points
5.	Clinkerization (Calcination)	Particulate Matter Emission, Gaseous Emission & Fugitive Dust Emission	Increase in Particulate Matter, SO ₂ & NO ₂ and fugitive dust concentration in air environment	<ul style="list-style-type: none"> Installation of adequate APCEs such as Bag House& ESP. Low NO_x burners Installation of De-NO_x system. Development of greenbelt / plantation Personal Protective Equipment (Goggles, Mask etc.) to workers
6.	Clinker Grinding / Cement Mill (including Fly ash handling)	Particulate Matter Emission & Fugitive Dust Emission	Increase in Particulate Matter and fugitive dust concentration in air environment	<ul style="list-style-type: none"> Installation of Bag House Fly ash received through closed bulkers & fed into Silo through pneumatic system. Development of greenbelt / plantation.
		Noise generation due to Exhaust fans	<ul style="list-style-type: none"> Increase in noise levels near source generation Hearing impairments 	<ul style="list-style-type: none"> Earmuffs/ Earplugs to persons working in high noise zone. Proper lubrication & maintenance of machinery

S. No.	Project Activity	Aspect	Impact	Mitigation Measures
		and Cement grinding	<ul style="list-style-type: none"> ▪ Other health effects 	<ul style="list-style-type: none"> • Development of greenbelt / plantation within the plant premises • Periodic Occupational Health Surveillance of worker
7.	Cement Packing & Dispatch	Fugitive Dust Emission	<ul style="list-style-type: none"> ▪ Area source - Increase in fugitive dust concentration in air environment ▪ Respiratory Diseases 	<ul style="list-style-type: none"> • Dust extraction arrangement • Spilled cement collected and recycled • Installation of Bag Filters at transfer points • Development of greenbelt • Personal Protective Equipment (Goggles, Mask etc.) to worker. • Periodic Occupational Health Surveillance
8.	Coal handling & Grinding	Fugitive Dust Emission	Increase in fugitive dust concentration in air environment	<ul style="list-style-type: none"> • Dust extraction arrangement • Installation of Bag Filters at transfer points • Development of greenbelt

(xi) Emergency preparedness plan in case of natural or in plant emergencies.

M/s. Jindal Panther Cement Private Limited will have an Emergency Plan (Onsite & offsite) at the plant site. Suitable Risk Control Measures with respect to Risk Assessment will be implemented to minimize the risk to an acceptable level. Regular Training, Implementation of SOPs and compliance of relevant Personal Protective Equipment's (PPEs) will help to minimize the health hazards and incidental casualties.

(xii) Socio-economic Development Plant with proposed expenditure

As per OM dated 30th September, 2020 and 20th Oct., 2020, company will prepare physical targets of the socio-economic developmental activities for implementation of the commitments made during Public Hearing.

(xiii) Occupational Health Measures

Hazard	Mitigation Measure
Dust	<ul style="list-style-type: none"> ▪ Implementation of adequate dust control systems and good housekeeping. ▪ Water sprinkling in the places where dust dispersion can occur. ▪ Regular sweeping of roads within plant premises ▪ Providing dust masks to employees working in handling and storage yards. ▪ Periodic work zone monitoring
Noise	<ul style="list-style-type: none"> ▪ Proper maintenance of machineries

Hazard	Mitigation Measure
	<ul style="list-style-type: none"> ▪ Installation of compressors in closed buildings ▪ Regular monitoring of noise level ▪ Display of noise level with permission level ▪ Display instructions for using PPEs at high noise level area ▪ Periodic health checkup for Audiometry for the individuals working in high noise area
Heat stress	<ul style="list-style-type: none"> ▪ Scheduling hot jobs in cooler part of the day ▪ Monitor those workers who are at risk of heat stress ▪ Provide rest periods with water breaks ▪ Use of personal protective equipment
Electrical Hazards	<ul style="list-style-type: none"> ▪ Proper Earthing as per IS 3043 will be done ▪ Low Voltage Supply will be ensured ▪ Isolating Transformers ▪ Double Insulated Tools ▪ Over Load Protection ▪ Protection Against Leakages (G.F.C.I.) ▪ Flame- Proof Equipment ▪ Lightning Protection ▪ Protection against Static Electricity and safely using ladders and scaffolds
Fire and Explosion	<ul style="list-style-type: none"> ▪ Suitable fire extinguisher, fire buckets and fire hydrant system. Dry power type in oil and fire buckets will be kept near transformer, cable, general store and office area. Hydrant line at all location in plant area along with coal, clinker storage area. Fire tender is to be kept ready at plant main gate. ▪ Permit and safety instruction will be given to use welding / gas cutting in the area of oil, gas, coal and bag go down. ▪ Predictive interlock in transformers so as to give alarm and trip the system. ▪ Adequate height of brick walls for separation of all transformers, soak pits for storage of oil leakages from transformers will be done.
Other Hazards	<ul style="list-style-type: none"> ▪ Structural soundness of silos and buildings. ▪ Installing light arrestors at all tall buildings. ▪ Permit to be taken to work at height with work instruction to use safety belts etc. ▪ Testing of all lifting tools, tackles and pressure vessel to avoid failure. ▪ Safe working pressure maintained in air receiver. ▪ Safe working load on cranes and ropes etc. ▪ Good housekeeping & Speed limit of vehicles will be 20 km/hr. inside the proposed plant area. ▪ Display of emergency number at all suitable location. ▪ Fire tender, ambulance and emergency staff ready at the plant main gate at all the time ▪ First aid kits are kept at the sites and training provided ▪ Use of mobile while driving, alcohol, smoking etc. are ban inside the proposed plant area. ▪ Proper illumination in plant area (100 to 150 LUX), office (250 to 300 LUX) and road area (20 to 30 LUX)

(xiv) **Post-project Monitoring Plan**

Frequency and location for post-project monitoring

S. No.	Description	Frequency of Monitoring	Location
1.	Ambient Air Quality	Twice a Week & Continuous Online Monitoring	Plant Site, Villages in Upwind & Downwind direction from the plant site and as per EC / CTO conditions
2.	Fugitive Emission Monitoring	Quarterly	Cement Mill, Packing Plant, Raw Materials Handling Area & Coal Yard
3.	Stack Emission Monitoring	Monthly & Continuous Online Monitoring	Raw Mill / Kiln, Coal Mill, Cement Mill, Clinker Cooler
4.	Stack Emission Monitoring (AFR)	Yearly	
5.	Water Quality	Twice in a year & as per EC / CTO/CGWA NOC	Nearby Ground water sources and as per CGWA NOC
6.	Water Level	Pre-monsoon & Post-Monsoon	
7.	Waste Water Monitoring	Monthly & as per CTO	Inlet and outlet of STP
8.	Noise Level Monitoring	Quarterly & as per EC / CTO	Plant Boundary, High noise generating areas within the Plant Boundary and as per CTO conditions
9.	Medical Checkup of Employee	Yearly / Six Monthly or as per Factories Act	Health Management Centre
10.	Performance evaluation of APCE's / Adequacy Study	Once in three years.	Raw Mill / Kiln Bag House, Coal Mill Bag House, Cement Mill Bag House, Clinker Cooler ESP and CPP ESP

