

JSWSL/Envt/MoEF&CC/HYR/2021-22/47
08th July 2021

The Director

Ministry of Environment, Forest and Climate Change
Regional Office (SEZ), 1st and 11nd Floor,
Handloom Export Promotion Council,
34, Cathedral Garden Road, Nungambakkam,
Chennai – 600034.

Dear Sir,

Sub: Half Yearly Compliance Report to the period July 2020 to December 2020 – Reg.
Ref: Environmental Clearances F.No. J-11011/281/2006-IA. II(I) dated 07.07.2017 and 10.02.2020

With reference to the above subject, herewith find enclosed half yearly compliance report (EC dated 10.02.2020 & 07.07.2017) for the period of July 2020 to December 2020, as per the conditions given in the Environmental Clearance by Ministry of Environment, Forest & Climate Change, New Delhi.

Receipt of this letter may please be acknowledged for our record purpose.

Thanking you,

Yours faithfully,

For JSW Steel Limited., Salem works


B. N. S. Prakash Rao
Sr. Vice President

Encl: Copies of EC and EC conditions compliance status report.

Cc: Central Pollution Control Board, Zonal Office Bangalore, 1st & 2nd Floors,
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Opp., Pushpanjali Theatre, Bangalore –560 010.

The Member Secretary, Tamil Nadu Pollution Control Board,
100, Anna Salai, Guindy, Chennai – 600 032.

The Joint Chief Environmental Engineer (M), Tamil Nadu Pollution Control Board,
Salem Region, No # 9, 4th Cross Street, Brindhavan road, Fairlands, Salem -16.

The Member Secretary
Ministry of Environment, Forest and Climate Change
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Half Yearly Compliance Report
for the Environmental Clearance
(F.No.J-11011/281/2006-IA.II (I) dated 07.07.2017 &
F.No.J-11011/281/2006-IA.II (I) dated 10.02.2020)
for the period July 2020 to December 2020
issued for 1.0 to 1.3 MTPA Expansion



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COMPLIANCE STATUS REPORT TO ENVIRONMENTAL CLEARANCE (EC)

- (i) F.No.J-11011/281/2006-IA.II (I) Dated.10.02.2020
- (ii) F.No.J-11011/281/2006-IA.II (I) dated 07.07.2017

SIX MONTHLY COMPLIANCE STATUS REPORT

PRESENT STATUS OF THE PROJECT WITH RESPECT TO THE EC DATED.10.02.2020

An Environmental Clearance (F.No. J-11011/281/2006-IA.II (I)) accorded dated 10.02.2020 for our proposed installation of 0.80 MTPA slag grinding unit, new facilities related to value addition and technological upgradation within the existing capacity of 1.3 MTPA Integrated steel plant premises. The Environment Clearance has been issued under para 7(ii) of EIA 2006 and the proposed expansion activity is towards value addition, installation of minor facilities to improve the work area environment. The environment clearance issued vide 10.02.2020 mentions some of the general conditions related to main facilities, which are not applicable in the current EC (dated 10.02.2020) and a representation letter has been submitted to your office through mail dated 26.09.2020. Subsequently Consent to Establishment (CTE order no. 2006131408047(W) & 2006231408047(A) dated. 18.11.2020) has been obtained from TNPCB. After establishment of pickling unit (part of the above EC), Consent To Operate (CTO Exp –II, order no. 2007130760657(W) & 2007230760657(A) dated.18.11.2020) has obtained for the operations of 1.15 MTPA steel plant including pickling unit. The balance establishment activities will be completed before the validity period of EC or would be approached your good office for validity extension.

PRESENT STATUS OF THE PROJECT WITH RESPECT TO THE EC DATED.07.07.2017

An Environmental Clearance (F.No. J-11011/281/2006-IA.II (I)) accorded dated 07.07.2017 for the expansion of 1.0 to 1.3 MTPA steel production and Consent to Establishment (CTE-order no. 170619163265(W) & 170629163265(A) dated 23.09.2017)) has been obtained from TNPCB. Establishment activities were planned in phased manner (Phase-I: 1.0 to 1.15 MTPA and Phase-II: 1.15 to 1.3 MTPA) and after establishment of Phase-I activities, Consent to operate (CTO Exp-I, order no. 1907122515438(W) & 1907222515438(A)) has been obtained for 1.15 MTPA Steel production from TNPCB. To the installation of 0.80 MTPA slag grinding unit, new facilities related to value addition and technological upgradation within the existing capacity of 1.3 MTPA Integrated steel plant premises an Environmental Clearance has been accorded (F.No. J-11011/281/2006-IA.II (I)) dated 10.02.2020 which is currently effective.

The details of the existing units and balance expansion units along with the present status is given in the table below.

S. No	Manufacturing facilities	UOM	Existing capacity	Proposed Expansion as per EC 2017/EC2020	Total Capacity after Expansion	Present status
1	Coke Oven Plant (Non – Recovery type)	MTPA	0.5	-	0.5	In operation
2	Sinter Plant - 1 (20 m ²)	MTPA	0.175	-	0	In operation
3	Sinter Plant - 2 (90 m ²)	MTPA	1.06	-	1.06	In operation
4	Sinter Plant - 3 (90 m ²)	MTPA	-	1.06	1.06	Yet to be installed
5	Blast Furnace - 1 (402 to 650 m ³)	MTPA	0.367	0.316	0.683	Yet to be modified/installed

S. No	Manufacturing facilities	UOM	Existing capacity	Proposed Expansion as per EC 2017	Total Capacity after Expansion	Present status
6	Blast Furnace - 2 (550 to 650 m ³)	MTPA	0.578	0.105	0.683	Project completed and in operation
7	Energy Optimizing Furnace-1 (65 T)	MTPA	0.41	0.23	0.64	Project completed and in operation
8	Energy Optimizing Furnace- 2 (65 T)	MTPA	0.62	0	0.62	In operation
9	Ladle Furnace – 1 (65 T)	Tons/ heat	45	20	65	Project completed and in operation
10	Ladle Furnace – 2 (65 T)	Tons/ heat	65	-	65	In operation
11	Ladle Furnace – 3 (65 T)	Tons/ heat	65	-	65	In operation
12	Ladle Furnace – 4 (65 T)	Tons/ heat	65	-	65	In operation
13	Continuous Casting Machine - 1	MTPA	0.35	-	0.35	In operation
14	Continuous Casting Machine - 2	MTPA	0.50	-	0.50	In operation
15	Continuous Casting Machine - 3	MTPA	-	0.45	0.45	In operation
16	Bar & Rod Mill augmentation	MTPA	0.40	0.08	0.48	Project completed and in operation
17	Blooming Mill augmentation	MTPA	0.36	0.12	0.48	Project completed and in operation
18	Pickling & Annealing steel unit	MTPA	-	0.06	0.06	Project completed and in operation
19	Peeled & ground	MTPA	-	0.04	0.04	0.01 MTPA unit is in operation. 0.03 MTPA installation is under progress
20	Air Separation Plant - 1 (150 T/day)	Tons/ day	150	-	150	In operation
21	Air Separation Plant - 2 (390 T/day)	Tons/ day	390	-	390	In operation
22	Air Separation Plant - 3 (250 T/day)	Tons/ day	-	250	250	Yet to be installed
23	Captive power plant - 1	MW	7	-	7	In operation
24	Captive power plant - 2	MW	2 x 30	-	2 x 30	In operation
25	Captive power plant - 3	MW	-	1 x 30	1 x 30	Project completed and in operation

The production details for the period July 2020 to December 2020 is given in **Annexure –A**.

Compliance status report to the EC dated.10.02.2020

A.	SPECIFIC CONDITIONS:	COMPLIANCE STATUS
i.	Particulate emission from the rod mill of slag grinding unit shall be less than 10 mg/Nm ³	Appropriate air pollution control measures will be installed to meet the emission level.
ii.	Green belt shall be developed in an area of 85 ha (210 acres) in and around the plant in a time frame of two years.	The existing greenbelt developed area is about 82 ha and greenery will be further developed up to 85 hectares.

B. GENERAL CONDITIONS

I. Statutory compliance:

S. No	CONDITION	COMPLIANCE STATUS
i.	The project proponent shall obtain Consent to Establish / Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from the concerned State Pollution Control Board / Committee.	Abide by the order
ii.	The project proponent shall obtain the necessary permission from the Central Ground Water Authority, in case of drawl of ground water / from the competent authority concerned in case of drawl of surface water required for the project.	Abide by the order.
iii.	The project proponent shall obtain authorization under the Hazardous and other Waste Management Rules, 2016 as amended from time to time	Abide by the order

II. Air quality monitoring and preservation

S.No	CONDITION	COMPLIANCE STATUS
i.	The project proponent should install 24x7 continuous emission monitoring system at process stacks to monitor stack emission with respect to standards prescribed in Environment (Protection) Rules 1986 vide G.S.R. 277(E) dated 31st March 2012 (Integrated iron & Steel); G.S.R. 414 (E) dated 30th May 2008 (Sponge Iron) as amended from time to time; S.O. 3305 (E) dated 7th December 2015 (Thermal Power Plant) as amended from time to time and connected to SPCB and CPCB online servers and calibrate these system from time to time according to equipment supplier specification through labs recognized under Environment (Protection) Act, 1986 or NABL accredited laboratories.	<p>There are 32 nos. of Process stacks. Dust & Gaseous emission monitoring systems are installed as per CTO condition and the real time data of SPM, SO₂ & NO_x are transmitted to the Care Air Centre of TNPCB and CPCB servers.</p> <p>There are 27 nos. of Non-process stacks. Dust emission monitoring systems are installed as per CTO condition and the real time data of SPM are transmitted to the Care Air Centre of TNPCB and CPCB servers.</p> <p>Apart from the above, TNPCB is conducting bi-annual survey and Manual monitoring is being conducted by a NABL accredited external laboratory on a monthly basis. The monitoring results are well within the permissible limits. The latest TNPCB survey results of stack emission is given in Annexure –B.</p>

S.No	CONDITION	COMPLIANCE STATUS
ii.	The project proponent shall monitor fugitive emissions in the plant premises at least once in every quarter through labs recognized under Environment (Protection) Act, 1986.	Fugitive emissions in the plant are being monitored by a NABL accredited external laboratory and the reports are being submitted to TNPCB on monthly basis.
iii.	The project proponent shall install system to carryout Continuous Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM ₁₀ and PM _{2.5} in reference to PM emission, and SO ₂ and NO _x in reference to SO ₂ and NO _x emissions) within and outside the plant area at least at four locations (one within and three outside the plant area at an angle of 120° each), covering upwind and downwind directions.	Continuous Ambient Air Quality monitoring stations of four numbers are installed in the plant peripheral covering upwind & downwind directions. One station is installed to monitor PM ₁₀ , PM _{2.5} , SO ₂ , NO _x and CO and other 3 stations are installed to monitor PM ₁₀ , PM _{2.5} , SO ₂ as per the CTO condition. The real time parameters are connected to Care Air Centre of TNPCB.
iv.	The cameras shall be installed at suitable locations for 24x7 recording of battery emissions on the both sides of coke oven batteries and videos shall be preserved for at least one-month recordings.	Our coke oven plant is non-recovery type. The coke oven process works on negative pressure and stamped wet coal is being charged to the ovens which is side loading and thereby no visible emission is noticed. There are Three coke oven batteries which are installed adjacent to each other. One IP camera installed at coal tower#1 of COP with recording option.
v.	Sampling facility at process stacks and at quenching towers shall be provided as per CPCB guidelines for manual monitoring of emissions.	Sampling facilities at process stacks and quenching towers are provided for manual monitoring of emissions as per the guidelines.
vi.	The project proponent shall submit monthly summary report of continuous stack emission and air quality monitoring and results of manual stack monitoring and manual monitoring of air quality/fugitive emissions to Regional Office of MoEF&CC, Zonal Office of CPCB and Regional Office of SPCB along with six-monthly monitoring report.	Monthly summary report of continuous stack emission and ambient air quality monitoring and results of manual stack monitoring and manual monitoring of air quality/fugitive emissions are submitted to Regional Office of MoEF&CC, Zonal Office of CPCB and Regional Office of SPCB. The six-monthly continuous stack emission & air quality monitoring report is given in Annexure -C and the manual stack emission monitoring results are given in Annexure -B .
vii.	Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed stack emission and fugitive emission standards.	Adequate Air Pollution Control measures are installed in the respective processes and raw material handling areas. Water sprinklers, dry fog systems, GI sheets (as dust barrier) are provided in raw material handling areas to control fugitive emission. The stack emission and fugitive emission values are well within the standards.
viii.	The project proponent shall provide leakage detection and mechanized bag cleaning facilities for better maintenance of bags.	Appropriate leakage detection systems and mechanized bag cleaning facilities are provided in all the bag filter systems.
ix.	Secondary emission control system shall be provided at SMS converters.	Dedicated secondary de-dusting systems are provided at EOF & LRF processes for control of fugitive emission.

S.No	CONDITION	COMPLIANCE STATUS
x.	Pollution control system in the steel plant shall be provided as per the CREP guidelines of CPCB.	As per the CREP guidelines of CPCB, Pollution control systems are provided.
xi.	Sufficient number of mobile or stationery vacuum cleaners shall be provided to clean plant roads, shop floors, roofs regularly.	Road sweeping machines are deployed for road cleaning applications and Mobile vacuum cleaners are provided to clean shop floors, roofs regularly.
xii.	Recycle and reuse iron ore fines, coal and coke fines, lime fines and such other fines collected in the pollution control devices and vacuum cleaning devices in the process after briquetting/agglomeration.	Iron ore fines, coal and coke fines, lime fines, and such other fines collected in the pollution control devices are being reused in the sinter plant for agglomeration processes which is replacement of Iron ore.
xiii.	The project proponent use leak proof trucks/dumpers carrying coal and other raw materials and cover them with tarpaulin.	Trucks/dumpers carrying coal and other raw materials are covered with tarpaulin. Leak proof trucks are used for fly ash transportation and other materials.
xiv.	Facilities for spillage collection shall be provided for coal and coke on wharf of coke oven batteries (Chain conveyors, land based industrial vacuum cleaning facility).	Coking coal is transferred through closed conveyor system to stamping station. The stamped coal (wet condition) is charged into coke oven batteries through a dedicated coal charging system. Hence spillage of coal is not anticipated. While coke pushing to wharf, there will be a minimum spillage of coke which is periodically cleaned.
xv.	Land-based APC system shall be installed to control coke pushing emissions.	The coke oven plant was installed in the year 2007. These are heat recovery coke ovens which are operating in negative suction, with no emission of toxic volatile matter. Further, the rate of pushing coke and the height of fall on to the quenching tower is relatively lower, resulting in very low dust emissions. It is not possible to install the dust control systems in the existing coke ovens. The same has been communicated to your good office through mail dated 26.09.2020.
xvi.	Monitor CO, HC and O ₂ in flue gases of the coke oven battery to detect combustion efficiency and cross leakages in the combustion chamber.	Our coke oven plant is non-recovery type. The heat for carbonisation is provided by the radiation heat by burning of evolved gases from the bottom and top of the of the coal mass. The requirement of monitoring of HC, CO and O ₂ were intended for recovery type of coke ovens where in the cross over leakage exists. Thus the monitoring of these parameters are not applicable to heat recovery type coke ovens. The same has been communicated to your good office through mail dated 26.09.2020.
xvii.	Vapor absorption system shall be provided in place of vapor compression system for cooling of coke oven gas in case of recovery type coke ovens.	Not applicable since our Coke oven is non-recovery type.
xviii.	In case concentrated ammonia liquor is incinerated, adopt high temperature incineration to destroy Dioxins and Furans, Suitable NO _x control facility shall be provided to meet the prescribed standards.	Not applicable since our Coke oven is non-recovery type.

S.No	CONDITION	COMPLIANCE STATUS
xix.	The coke oven gas shall be subjected to desulphurization if the Sulphur content in the coal exceeds 1%.	The coal usage in coke oven contains Sulphur content less than 1%.
xx.	Wind shelter fence and chemical spraying shall be provided on the raw material stock piles.	GI sheets cover (as dust barrier), wind nets, water sprinkler systems and dry/wet fog systems are provided on the raw material stock piles.
xxi.	Design the ventilation system for adequate air changes as per ACGIH document for all tunnels, motor houses, Oil cellars.	Abide by the order.
xxii.	The project proponent shall install Dry Gas Cleaning Plant with bag filter for Blast Furnace and SMS converter.	The existing plants (BF & EOF of SMS) are installed in the year 1998 & 2007 in line with the EC approved for these facilities in 23.11.1998 and 02.01.2007 respectively. Further there is no modification proposed now in these facilities. It is not feasible and viable to installation of Dry gas cleaning systems in to the existing BF#1, EOF# 1,2 wet gas cleaning system. Whereas, BF#2 Dry gas cleaning system is provided during the establishment stage itself. The same has been communicated to your good office through mail dated 26.09.2020.
xxiii.	Dry quenching (CDQ) system shall be installed along with power generation facility from waste heat recovery from hot coke.	The coke ovens were installed in line with the EC approved in 2007. There is no modification proposed in the existing coke ovens in the recently approved EC. The installation of CDQ in the existing capacity (0.5 MTPA) coke oven is not technically feasible. The same has been communicated to your good office through mail dated 26.09.2020.

III. Water quality monitoring and preservation

S.No	CONDITION	COMPLIANCE STATUS
i.	The project proponent shall install 24x7 continuous effluent monitoring system with respect to standards prescribed in Environment (Protection) Rules 1986 vide G.S.R. 277(E) dated 31st March 2012 (Integrated iron & Steel); G.S.R. 414 (E) dated 30th May 2008 (Sponge Iron) as amended from time to time; S.O. 3305 (E) dated 7th December 2015 (Thermal Power Plant) as amended from time to time and connected to SPCB and CPCB online servers and calibrate these system from time to time according to equipment supplier specification through labs recognized under Environment (Protection) Act, 1986 or NABL accredited laboratories. The project proponent shall monitor regularly ground water quality at least twice a year (pre and post monsoon) at sufficient numbers of piezometers/sampling wells in the plant and adjacent areas through labs recognized under Environment (Protection) Act, 1986 and NABL accredited laboratories.	<p>Flow meters for continuous monitoring system of effluent flow are provided at the Guard pond inlet & outlet and the real time values are connected to TNPCB & CPCB server. A dedicated EMFM is installed in the ETP discharge point along with IP camera (with PTZ option). Analysers are installed with respect to the standards related to Iron & Steel and Thermal Power Plant and the real time parameters are connected to TNPCB/CPCB servers from Aug'2020. EMFM and sensors are being calibrated from time to time according to equipment supplier specification. Apart from this, treated waste water quality is also monitored by NABL accredited laboratory on monthly basis and reports are periodically submitted to TNPCB.</p> <p>Ground water quality around the peripheral of the plant is being monitored by TNPCB and NABL accredited laboratory on quarterly basis. Piezo metric sampling bore well is provided inside the plant premises and the water quality is being monitored on monthly basis.</p>

S.No	CONDITION	COMPLIANCE STATUS
ii.	The project proponent shall submit monthly summary report of continuous effluent monitoring and results of manual effluent testing and manual monitoring of ground water quality to Regional Office of MoEF&CC, Zonal Office of CPCB and Regional Office of SPCB along with six-monthly monitoring report.	Monthly summary reports of continuous effluent monitoring, results of manual effluent testing and manual monitoring of ground water quality by TNPCB & NABL accredited laboratory are being submitted to the Regional Office of MoEF&CC, Zonal Office of CPCB and Regional Office of SPCB. The six-monthly monitoring report is given in Annexure -D .
iii.	The project proponent shall provide the ETP for coke oven and by-product to meet the standards prescribed in G.S.R. 277(E) dated 31st March 2012 (Integrated iron & Steel); G.S.R. 414 (E) dated 30th May 2008 (Sponge Iron) as amended from time to time; S.O. 3305 (E) dated 7th December 2015 (Thermal Power Plant) as amended from time to time.	Our Coke Oven plant is non-recovery type. Not applicable. Sponge iron plant not installed in our plant. Not applicable. Thermal Power plant ZLD provided to the additional 1 x 30 MW which was installed in the FY 2018-19.
iv.	Adhere to 'Zero Liquid Discharge'	Waste water generated from the various process is collected in a guard pond and after pretreatment (clarification), the treated water is 100 % reused in steel plant process to the application of Slag Granulation plant of BF, gas cleaning plant of BF & EOF, slag quenching, coke quenching, dust suppression systems and green belt development. No effluent is discharged outside the plant premises and to ensure the same, dedicated EMFM and IP camera are installed in the waste water treatment facility and the real time details are connected to TNPCB & CPCB server.
v.	Sewage Treatment Plant shall be provided for treatment of domestic wastewater to meet the prescribed standards.	Sewage Treatment Plants are provided for treatment of domestic wastewater and treated water is meeting the prescribed standards. Treated water sample is being collected by TNPCB & NABL accredited laboratory on monthly basis and the six months monitoring result is given in Annexure –E .
vi.	Garland drains and collection pits shall be provided for each stock pile to arrest the run-off in the event of heavy rains and to check the water pollution due to surface run off.	Various collection pits are provided to arrest the run-off and ensure there is no water pollution due to surface run off.
vii.	Tyre washing facilities shall be provided at the entrance of the plant gates	Tyre washing unit is provided at the entrance of the plant gate to control the fugitive emission from vehicular movement.
viii.	CO ₂ injection shall be provided in GCP of SMS to reduce pH in circulating water to ensure optimal recycling of treated water for converter gas cleaning.	Alkalinity of existing circulating water of GCP is the range of 250 to 300 mg/L. Due to the minimum alkalinity, addition of CO ₂ injection is not feasible to maintain the pH in the recycling water and it may lead to severe corrosion. Hence, optimum level of Soda ash is being used to control pH in the GCP cooling water circuit.
ix.	The project proponent shall practice rainwater harvesting to maximum possible extent.	Three rainwater harvesting ponds are existing with the total capacity about 66,500 m ³ and rain water harvesting will be practiced to maximum possible extent.

S.No	CONDITION	COMPLIANCE STATUS
x.	Treated water from ETP of COBP shall not be used for coke quenching.	Not Applicable as our Coke oven is of non-recovery type.
xi.	Water meters shall be provided at the inlet to all unit processes in the steel plants.	Water meters are provided at the inlet to all unit processes in our steel plant
xii.	The project proponent shall make efforts to minimize water consumption in the steel plant complex by segregation of used water, practicing cascade use and by recycling treated water.	Segregation of used water according to the quality characteristics, treated and utilized accordingly. As a continual improvement efforts are being taken to maximize cooling water COC to minimize fresh water consumption in the steel plant.

IV. Noise monitoring and preservation

i.	Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Officer of the Ministry as a part of six-monthly compliance report.	Noise level is being monitored on regular basis by a NABL accredited laboratory and the results are being submitted to the Regional Officer of the Ministry as a part of six-monthly compliance report. The details are given in Annexure -F of the report.
ii.	The ambient noise levels should conform to the standards prescribed under E(P)A Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.	The ambient noise levels are being monitored monthly basis and the results are well within the prescribed limit of limits 75 dB(A) during day time and 70 dB(A) during night time. The details are given in Annexure -F .

V. Energy Conservation measures

i.	The project proponent shall provide TRTs to recover energy from top gases of Blast Furnaces.	The capacity of the existing furnaces is very small and operating at low top pressure (< 1.3 bar). it is not technically feasible to install TRT in the existing blast furnaces. There is no modification in the existing BFs in the EC approved now. The same has been communicated to your good office via mail dated 26.09.2020.
ii.	Coke Dry quenching (CDQ) shall be provided for coke quenching for both recovery and non-recovery type coke ovens.	The coke ovens were installed in line with the EC approved in 2007. There is no modification proposed in the existing coke ovens in the recently approved EC. The installation of CDQ in the existing capacity (0.5 MTPA) coke oven is not technically feasible. The same has been communicated to your good office via mail dated 26.09.2020.
iii.	Waste heat shall be recovered from Sinter Plants coolers and Sinter Machines.	Waste heat from Sinter plant cooler is planned to be diverted to the proposed BF Slag grinding unit to recover sensible heat.
iv.	Use torpedo ladle for hot metal transfer as far as possible. If ladles not used, provide covers for open top ladles.	Usage of torpedo ladle is mostly applicable to bigger size capacity of BF and our BF capacity is smaller one. Ladle covering is done by means of heat insulating compounds such as dry rice husk.
v.	Use hot charging of slabs and billets/blooms as far as possible.	Based on the product specification, hot charging and cold charging is being done as far as possible hot charging will be done.
vi.	Waste heat recovery systems shall be provided in all units where the flue gas or process gas exceeds 300°C.	Waste heat recovery boilers are in operation to recover maximum heat from flue gas and produce energy. It is proposed to utilize the sinter cooler waste heat to the BF slag grinding unit and flue gas will be utilized where ever the temperature is more than 300°C.

S.No	CONDITION	COMPLIANCE STATUS
vii.	Explore feasibility to install WHRS at Waste Gases from BF stoves; Sinter Machine; Sinter Cooler, and all reheating furnaces and if feasible shall be installed.	As mentioned earlier waste gas utilization from BF stoves not feasible and sinter machine waste heat being utilized. Sinter cooler waste heat will be reused for BF slag grinding unit and BF gas is utilized in Mills operations. As a part of energy reduction measures the existing CPP#1 boilers (2*25 TPH with operating pressure of 40 kg/cm ² & temperature of 350°C) will be replaced by installation of 2*8 TPH process boilers (with operating pressure of 12 kg/cm ² & temperature of 270°C) and the existing STG of 7 MW will be stopped.
viii.	Restrict Gas flaring to < 1%	Online monitoring system (SCADA) is installed to maximize the BF gas utilization and efforts are being taken continuously to reduce gas flaring and conserve energy.
ix.	Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly.	Solar panel is installed with the capacity of 5 KW for common areas and parking area. Further implementation are under progress for street lights and township and will be completed in phased manner.
x.	Provide LED lights in their officers and residential areas.	LED based lightings are provided in offices and township area and the replacement of sodium vapour lamp to LED is increased from 350 KW to 750 KW. Further installations are under progress in the process zones.
xi.	Ensure installation of regenerative type burners on all reheating furnaces.	BF gas is used as fuel and regenerative type burners are installed in reheating furnaces (Mills).

VI. Waste Management

S.No	CONDITION	COMPLIANCE STATUS
i.	An attrition grinding unit to improve the bulk density of BF granulated slag from 1.0 to 1.5 kg/l shall be installed to use slag as river sand in construction industry.	It is proposed to install BF slag grinding unit to produce ground granulated BF slag which will be blended with cement for construction purposes.
ii.	In case of Non-Recovery coke ovens, the gas main carrying hot flue gases to the boiler, shall be insulated to conserve heat and to maximize heat recovery.	The gas main carrying hot flue gases to the boilers is completely insulated to conserve heat and to maximize heat recovery.
iii.	Tar Sludge and waste oil shall be blended with coal charged in coke ovens (applicable only to recovery coke ovens).	Not applicable as our coke oven is of recovery type.
iv.	Carbon recovery plant to recover the elemental carbon present in GCP slurries for use in Sinter plant shall be installed.	After clarification and thickener treatment GCP slurry is treated in sludge handling unit and reuse in sinter plant.
v.	Waste recycling Plant shall be installed to recover scrap, metallic and flux for recycling to sinter plant and SMS.	Scrap and metallic contents are recovered and recycled in the SMS.
vi.	Used refractories shall be recycled as far as possible.	Refractories are selected to withstand high temperature whose self-life is longer and generation of used refractories are lesser. The same will be recycled in downstream applications.

S.No	CONDITION	COMPLIANCE STATUS
vii.	SMS slag after metal recovery in waste recycling facility shall be conditioned and used for road making, railway track ballast and other applications. The project proponent shall install a waste recycling facility to recover metallic and flux for recycle to sinter plant. The project proponent shall establish linkage for 100% reuse of rejects from Waste Recycling Plant.	SMS slag is sent for metal recovery system and the crushed slag is reused in internal applications like sinter plant, EOF as hearth layer and cooling media respectively and to cement industries.
viii.	100% utilization of fly ash shall be ensured. All the fly ash shall be provided to cement and brick manufacturers for further utilization and Memorandum of Understanding in this regard shall be submitted to the Ministry's Regional Office.	Fly ash is being 100% utilized and provided to fly ash brick manufacturers.
ix.	Oil collection pits shall be provided in oil cellars to collect and reuse/recycle spilled oil. Oil collection trays shall be provided under coils on saddles in cold rolled coil storage area.	Oil collection pits are provided in oil cellars to collect and reuse the spilled oil. Cold rolled products are not applicable to our plant.
x.	The waste oil, grease and other hazardous waste like acidic sludge from pickling, galvanizing, chrome plating mills etc. shall be disposed of as per the Hazardous & Other waste (Management & Transboundary Movement) Rules, 2016. Coal tar sludge / decanter shall be recycled to coke ovens.	The waste oil, grease and other hazardous waste like acidic sludge from pickling will be disposed as per the Hazardous & Other waste (Management & Transboundary Movement) Rules, 2016. Our coke oven plant is Non Recovery Type. Hence, Coal tar sludge / decanter not applicable.
xi.	Kitchen waste shall be composted or converted to biogas for further use.	Biogas plant is installed and kitchen waste is being converted in to biogas.

VII. Green Belt

i.	Green belt shall be developed in an area equal to 33% of the plant area with native tree species in accordance with CPCB guidelines. The greenbelt shall inter alia cover the entire periphery of the plant.	The total plant area is 237.28 ha and green belt development is established about 82.00 ha which is 34.5 % and 235660 trees exist throughout the plant (till December 2020) with the survival rate of 90 - 95%. The greenbelt is covered the entire periphery of the plant.
ii.	The project proponent shall prepare GHG emissions inventory for the plant and shall submit the programme for reduction of the same including carbon sequestration including plantation.	GHG emissions inventory for the plant and carbon sequestration including plantation are prepared and being submitted every year.

VIII. Public Hearing and Human health issues

i.	Emergency prepared plan based on the Hazard identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented.	Emergency prepared plan based on the Hazard identification and Risk Assessment (HIRA) and Disaster Management Plan is being implemented.
ii.	The project proponent shall carry out heat stress analysis for the workmen who work in high temperature work zone and provide Personal Protection Equipment (PPE) as per the norms of Factory Act.	Heat stress analysis for the workmen working in high temperature work zone are being conducted and suitable Personal Protection Equipment (PPE)s and other adequate requirements are provided as per the norms of Factory Act.

S.No	CONDITION	COMPLIANCE STATUS
iii.	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.	Provisions are made for the expansion project activities and as per the condition temporary structure will be removed after the completion of expansion activities.
iv.	Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.	Health surveillance (Annual Health Check-up) is being conducted for all employees on yearly basis and records are being maintained in the Occupational Health Centre.

IX. Corporate Environmental Responsibility

i.	The project proponent shall comply with the provisions contained in this Ministry's OM vide F.No. 22-65/2017-IA.III dated 1st May 2018, as applicable, regarding Corporate Environmental Responsibility.	Being complied.
ii.	The company shall have a well laid down environmental policy duly approved by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental/forest/wildlife norms/conditions. The company shall have defined system of reporting infringements/deviation/violation of the environmental / forest / wildlife norms / conditions and / or shareholders' / stake holders. The copy of the board resolution in this regard shall be submitted to the MoEF&CC as a part of six-monthly report.	Environmental policy duly approved by the Board of Directors is in place. System for reporting deviation / violation of environmental norms/conditions exists and are being followed.
iii.	A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly to the head of the organization.	Environmental cell is in place with qualified personnel under the control of Senior Executive, who is reporting directly to the head of the organization.
iv.	Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional office along with the Six Monthly Compliance Report.	EMP implementation with action plan and environmental conditions along with responsibility matrix is prepared. The year wise funds earmarked for environmental protection measures are kept as separate account and not be diverted for any other purpose.

S.No	CONDITION	COMPLIANCE STATUS
v.	Self-environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.	Self-environmental audit is being conducted monthly/annually. Environment Audit is being carried out by external agencies once in six months and confirm the standard of ISO 14001:2015.
vi.	All the recommendations made in the Charter on Corporate Responsibility for Environment Protection (CREP) for the Iron and Steel plants shall be implemented.	All the recommendations of the Charter on the Corporate Responsibility for the Environmental Protection (CREP) issued for the steel plants are implemented. The compliance status report is given in Annexure –G.

X. Miscellaneous

i.	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising in at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition, this shall also be displayed in the project proponent 's website permanently.	Environmental Clearance accorded from MoEF&CC dated on 10.02.2020 and the same was advertised in two local newspapers on 14.02.2020 (Dinamani and The New Indian Express) which are widely circulated in the region of which Tamil is the vernacular language of the locality concerned. EC accorded is displayed in our website permanently. Copy of the same is attached as Annexure –H.
ii.	The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.	Copy of the environmental clearance dated.10.02.2020 is submitted to the Heads of local bodies on 30.05.2020 and Panchayats on 20.02.2020. Copy of the same is attached as Annexure –I.
iii.	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.	The compliance of the stipulated environment clearance conditions including results of monitored data is uploaded on our website at half-yearly basis.
iv.	The project proponent shall monitor the criteria pollutants level namely; PM ₁₀ , SO ₂ , NO _x (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.	The criteria pollutant levels namely; PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO are displayed near the entrance of main gates of our company in the public domain & also uploaded in our website as Annexure -C in the six monthly compliance report.
v.	The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the of ministry of Environment, Forest & Climate Change at environmental clearance portal.	Abide by the order.
vi.	The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.	The environmental statement as prescribed under the Environment (Protection) Rules, 1986, for each financial year ending 31 st March in Form-V is being submitted every year and displayed on the website of the company. To the FY 2020-21 the report has been submitted on 29.06.2021.

S.No	CONDITION	COMPLIANCE STATUS
vii.	The Project authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities, commencing the land development work and start of production operation by the project.	Date of financial closure and land development work will be informed to the Regional Office as well after obtaining CTE.
viii.	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.	Abide by the order.
ix.	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.	Abide by the order.
x.	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).	Abide by the order.
xi.	Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.	Abide by the order.
xii.	The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.	Abide by the order.
xiii.	The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.	Abide by the order.
xiv.	The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information / monitoring reports	Abide by the order.
xv.	The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.	Abide by the order.
xvi.	Any appeal against this EC shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010	Abide by the order.

Compliance status to the EC dated 07.07.2017

A.	SPECIFIC CONDITIONS	COMPLIANCE STATUS
i.	The occupational health survey of the active workmen involved shall be carried as per the ILO guidelines and all the employees shall cover in every 5 years @ 20% every year.	Occupational health survey of the active workmen involved is being carried out as per the ILO guidelines and all the employees are being covered in health survey by 100% every year. All the medical records are available in OHC for ready reference.
ii.	The amount allocated for ESC i.e. Rs.13 Crores shall be provided as CAPEX and the ESC shall be treated as project and monitored annually and the report of same shall be submitted to Regional office of MoEF&CC.	The amount allocated for ESC i.e. Rs.13 Crores is provided as CAPEX and as the action plans are being implemented. The proposed expansion activity is planned in a phased manner (Viz Phase-I: 1.0 MTPA to 1.15 MTPA and Phase-II: 1.15 MTPA to 1.3 MTPA) at an estimated cost of Rs. 1025 Cr. Phase-I expansion activities were completed and the cost involvement is about Rs.650 Crs and till date the amount spent towards ESC is about 4.0 Crs. Due to the steel market condition and the present pandemic (COVID19) situation the phase-II expansion activity is postponed and the same will be established with in the time line of EC validity. Based on the above, Phase II activities are rescheduled towards ESC. JSW assures that the commitments made shall be fulfilled. The details are attached in Annexure –J of this report. The same has been communicated to your good office via mail dated 26.09.2020.
iii.	The project proponent shall provide for solar light system for all common areas, street lights, villages, parking around project area and maintain the same regularly.	Solar panel is installed with the capacity of 5 KW for common areas and parking area. Further implementation are under progress for street lights and township in phased manner.
iv.	The project proponent shall provide for LED lights in their offices and residential areas.	LED based lightings are provided in offices and township area and the replacement of sodium vapour lamp to LED is increased from 350 KW to 750 KW. Further installations are under progress in the process zones.
v.	The project proponent should install 24X7 air monitoring devices to monitor air emission and submit report to Ministry and its Regional Office.	There are 32 nos. of Process stacks. Dust & Gaseous emission monitoring systems are installed as per CTO condition and the real time data of SPM, SO ₂ & NO _x are transmitted to the Care Air Centre of TNPCB and CPCB servers. There are 27 nos. of Non-process stacks. Dust emission monitoring systems are installed as per CTO condition and the real time data of SPM are transmitted to the Care Air Centre of TNPCB and CPCB servers. Apart from the above, TNPCB is conducting bi-annual survey and manual monitoring is being conducted by a NABL accredited external laboratory on a monthly basis. The monitoring results are well within the permissible limits. The six monthly monitoring results of stack emissions is given in Annexure – B .

A.	SPECIFIC CONDITIONS	COMPLIANCE STATUS
vi.	The ETP for Blast furnace effluent should be designed to meet Cyanide standards as notified by the MoEF&CC.	There are two blast furnaces in our plant. BF#1 is having wet type gas cleaning plant and BF#2 is having dry type GCP. Presence of Cyanide level is not detected in Blast Furnace #1 effluent and the same is periodically ensured with external NABL accredited lab analysis. Sources for cyanide not anticipated in the input material.
vii.	No effluent shall be discharged outside the plant premises and 'zero' discharge shall be adopted. (Zero discharge for the complete steel plant complex including CPPs" as amended in EC dated.07.08.2019)	Waste water generated from the various process of steel plant & partially treated water from CPPII is collected to the guard pond and after pretreatment (clarification), the treated water is 100 % reused in steel plant process to the application of BF slag granulation, gas cleaning plant of BF & EOF, BF slag quenching, coke quenching, dust suppression systems and green belt development. No effluent is discharged outside the plant premises and to ensure the same, dedicated EMFMs and an IP camera are installed in the waste water treatment facility and the real time details are connected to TNPCB & CPCB server.
viii.	The ETP for coke oven by-product should be designed to meet EPA notified standards especially the cyanide and phenol.	Our Coke oven plant is non-recovery type. Hence, ETP plant is not envisaged.
ix.	Coke oven plant should meet visible emission standards notified by the MoEF&CC.	As per EPA notification, visible emissions are prescribed to by-product type coke oven. Our plant is non-recovery type and also the coke oven process works on i) negative pressure ii) stamped wet coal is being charged to the ovens which is side loading and thereby no visible emission is noticed.
x.	The standards issued by the Ministry vide G.S.R. 277(E) dated 31 st March 2012 shall be strictly adhered to and the standards prescribed for the Coke oven plant shall be monitored and the report should be submitted along with the six-monthly compliance report.	The standards issued by the Ministry vide G.S.R. 277(E) dated 31 st March 2012 are related to emission standards of Iron and Steel plant. As per the standard the emission related to coke oven plant is applicable to by product type and our Coke Oven plant is of non-recovery type. Emission standards with respect to stack (COP waste gas is used for steam generation and COP stacks are functioning as emergency stack) and fugitive emissions to the COP are being monitored and the results are submitted along with the six-monthly compliance report. Since, our plant is non-recovery type ETP is not anticipated for COP. All other emissions & effluent parameters related to sinter plant, blast furnace, steel making shop, mills are being monitored monthly and the values are well within the standard prescribed. The six months monitoring results (maximum, minimum and average) by TNPCB and NABL accredited laboratory for stack emissions are given in Annexure - B and Effluent quality monitoring results are given in Annexure-D .

A.	SPECIFIC CONDITIONS	COMPLIANCE STATUS
xi.	<p>The emission standards specified in the Environmental (Protection) Amendment Rules, 2015 issued by vide S.O. 3305 (E) dated 7th December 2015 for the Thermal Power Plant shall be strictly adhered to.</p>	<p>At present CPP-II power generation capacity is 90 MW (2x30 MW and additional 1x30 MW). The emission standards specified in the Environmental (Protection) Amendment Rules, 2015 issued by vide S.O. 3305 (E) dated 7th December 2015 for Thermal Power Plant is applicable to coal-based boiler which is installed in CPP II. The boiler was installed in the year 2006 and the parameters of SPM, SO₂, Mercury are in the range of 35-40, 400-450, BDL against the norms of 50, 600, 0.03 mg/Nm³ respectively. Specific water consumption is 3.1 m³/Mwh against the norms of 3.5 m³/Mwh. To comply with NO_x emissions, at present no proven technology is available and actions are being initiated to explore BAT. Fly ash generated is 100% disposed to local fly ash brick manufacturers. In the additional 1 x 30 MW CPP, an air cooled condenser is installed and specific water consumption is about 0.3 m³/Mwh and ZLD ETP with SEP is installed to meet the norms of TPP.</p>
xii.	<p>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.</p>	<p>To meet the National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R. No. 826(E) dated 16th November 2009 Continuous Ambient Air Quality monitoring stations of four numbers are installed in the plant peripheral. One station is installed to monitor PM₁₀, PM_{2.5}, SO₂, NO_x and CO and other 3 stations are installed to monitor PM₁₀, PM_{2.5}, SO₂ as per the CTO condition. The real time data are connected to Care Air Centre of TNPCB & CPCB. Apart from this, ambient air quality is monitored in the surrounding villages by TNPCB during the bi- annual survey and also monitored by a NABL accredited laboratory to the defined locations to the parameters issued by the Ministry vide G.S.R. No. 826(E) dated 16th November 2009. The monitored results (maximum, minimum & average) is enclosed in Annexure -C.</p>
xiii.	<p>On-line ambient air quality monitoring and continuous stack monitoring facilities for all the stacks shall be provided and sufficient air pollution control devices viz. Electrostatic precipitator (ESP), and bag filters etc. shall be provided.</p>	<p>Continuous Ambient Air Quality monitoring stations of four numbers are installed in the plant peripheral. One station is installed to monitor PM₁₀, PM_{2.5}, SO₂, NO_x and CO and other 3 stations are installed to monitor PM₁₀, PM_{2.5}, SO₂ as per the CTO condition. The real time data are connected to Care Air Centre of TNPCB & CPCB. Online continuous monitoring systems are installed in process and non-process stacks as per the CTO condition to monitor SPM, SO₂ & NO_x. The real time data is connected with TNPCB & CPCB servers. Adequate Air Pollution Control measures are installed in the respective processes and to control the fugitive emissions secondary de-dusting systems are installed in BF & SMS. The details of APC measures installed are given in Annexure -K.</p>

A.	SPECIFIC CONDITIONS	COMPLIANCE STATUS
xiv.	A statement on carbon budgeting including the quantum of equivalent CO ₂ being emitted by the existing plant operations, the amount of carbon sequestered annually by the existing green belt and the proposed green belt and the quantum of equivalent CO ₂ that will be emitted due to the proposed expansion shall be prepared by the project proponent and submitted to the Ministry and the Regional Office of the Ministry. This shall be prepared every year by the project proponent. The first such budget shall be prepared within a period of 6 months and subsequently it should be prepared every year.	A statement on carbon budgeting is prepared as per the condition and detailed report is submitted to Ministry dated on 15.02.2018, 11.06.2019 and 23.09.2020. The quantum of equivalent CO ₂ being emitted by the existing plant operations in FY21 is 2637297 MT/year. The amount of carbon sequestered in FY21 by the existing green belt is 3776.0 MT. The proposed green belt for FY22 is 15000 Nos. The quantum of equivalent CO ₂ that will be emitted due to the proposed expansion would be calculated during phase II expansion. As per the condition the compliance report is submitted periodically. The statement report for the financial year 2021 is attached herewith as Annexure – O.
xv.	For the employees working in high temperature zones falling in the plant operation areas, the total shift duration will be 4 hrs or less per day where the temperature is more than 50°C. Moreover, the jobs of these employees will be alternated in such a way that no employee is subjected to working in high temperature area for more than 1 hr continuously. Such employees would be invariably provided with proper protective equipment, garments and gears such as head gear, clothing, gloves, eye protection etc. There should also be an arrangement for sufficient drinking water at site to prevent dehydration etc.	Employees working in high temperature zones are in the range of 45°C and of those employees are alternated to other jobs and ensure that no employee is subjected to work in high temperature area for more than 1 hr continuously. They are provided with proper protective equipment, garments and gears such as head gear, clothing, gloves, eye protection, etc., and arrangements are made for sufficient drinking water, butter milk and lime juice at plants to prevent dehydration.
xvi.	In-plant control measures and dust suppression system shall be provided to control fugitive emissions from all the vulnerable sources. Dust extraction and suppression system shall be provided at all the transfer points, coal handling plant and coke sorting plant of coke oven plant. Bag filters shall be provided to hoods and dust collectors to coal and coke handling to control dust emissions. Water sprinkling system shall be provided to control secondary fugitive dust emissions generated during screening, loading, unloading, handling and storage of raw materials etc.	Dust suppression systems are provided to control fugitive emissions from all the vulnerable sources like raw material unloading and storage yards. Bag filters and Dry & Wet fog systems are provided in raw material transfer points, coal handling and coke sorting plant of coke oven. To control dust emission bag filters are provided in coal handling area of COP. Water sprinkler systems are provided in various locations to control secondary fugitive dust emissions generated during screening, loading, unloading, handling and storage of raw materials. A tyre washing unit is installed in the main gate entry to control vehicular movement dust emission.
xvii.	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 30 th May, 2008 and regularly monitored. Guidelines / Code of Practice issued by the CPCB shall be followed.	The G.S.R. 414(E) dated 30 th May, 2008 is related to sponge iron plant. Hence, it is not applicable. In this connection, a representation is submitted to MoEF&CC dated 22.07.17.

A.	SPECIFIC CONDITIONS	COMPLIANCE STATUS
xviii.	Hot gases from DRI Kiln should be passed through dust settling chamber (DSC) to remove coarse solids and After Burning Chamber (ABC) to burn CO completely and used in Waste Heat Recovery (WHRB). The gas then shall be cleaned in ESP before dispersion out into the atmosphere through ID fan and stack. ESP shall be installed to control the particulate emission from WHRB.	The existing and expansion of the steel plant is following blast furnace route and there is no DRI process in our operations. Hence, it is not applicable. In this connection, a representation is submitted to MoEF&CC dated 22.07.17.
xix.	Efforts shall further be made to use maximum water from the rain water harvesting sources. If needed, capacity of the reservoir shall be enhanced to meet the maximum water requirement.	Three rainwater harvesting ponds are exists and the present total capacity is about 66,500 m ³ and rain water harvesting will be practiced to maximum possible extent. In FY21, additional RWH capacity enhanced about 8000 m ³ .
xx.	Risk and Disaster Management Plan along with the mitigation measures 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.	Study on Risk and Disaster Management Plan was conducted and the detailed report with summary is submitted to Ministry's Regional Office, SPCB, and CPCB on 01.02.2018.
xxi.	All the blast furnace (BF) slag shall be granulated and provided to cement manufacturers for further utilization. Flue dust from sinter plant and SMS and sludge from BF shall be re-used in sinter plant. Coke breeze from coke oven plant shall be used in sinter and pellet plant. SMS slag shall be given for metal recovery and properly utilized. All the other solid waste including broken refractory mass shall be properly disposed-off in environment-friendly manner.	All the Blast Furnace Slag is converted to Granulated slag and sold to cement industries. Flue dust from blast furnace, sludge from BF & EOF, Coke breeze from coke oven plant are re-used in sinter plant. Pellet plant is not installed in our process. SMS slag is sent for metal recovery system and the crushed slag is reused in internal applications like sinter plant, EOF as hearth layer and cooling media respectively and to cement industries. Based on the R&D initiative trial runs are being conducted to make paver from crushed EOF slag. Refractories are selected to withstand high temperature whose self-life is longer and generation of used refractories are lesser. The same will be recycled in downstream applications/disposed to recycling vendors.
xxii.	Coal and coke fines shall be recycled and reused in the process. The breeze coke and dust from the air pollution control system shall be reused in sinter plant. The waste oil shall be properly disposed of as per the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.	Coal and coke fines are recycled and reused in the Sinter plant and Blast Furnace. Coke breeze and dust from the air pollution control systems are collected and reused in the Sinter Plant. The waste oil generated from the process is being disposed to authorized vendor as per the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.
xxiii.	Green belt shall be developed in 33 % of plant area. Selection of plant species shall be as per the CPCB guidelines in consultation with the DFO.	The total plant area is 237.28 ha and Green belt development is established about 82 ha which is 34.5 % and 235660 trees exist throughout the plant (till December 2020) with the survival rate of 90 - 95%. The native species are planted in consultation with DFO. The tree plantation details are given in Annexure – L .

A.	SPECIFIC CONDITIONS	COMPLIANCE STATUS
xxiv.	All the recommendations made in the Charter on Corporate Responsibility for Environment Protection (CREP) for the Steel plants and Coke Oven Plants shall be implemented.	Complied. All the recommendations of the Charter on the Corporate Responsibility for the Environmental Protection (CREP) issued for the steel plants are implemented. Compliance report of CREP is enclosed vide Annexure – G.
xxv.	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 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.	As per the EC Specific condition ii, Rs.13 Crores is allotted towards ESC have been earmarked. Public Hearing issues, locals need and item-wise details along with time bound action plan is prepared and actions are being taken in a time bound manner. The proposed expansion activity is planned in a phased manner (Viz Phase-I: 1.0 MTPA to 1.15 MTPA and Phase-II: 1.15 MTPA to 1.3 MTPA) at an estimated cost of Rs. 1025 Cr. Phase-I expansion activities were completed and the cost involvement is about Rs.650 Crs and till date the amount spent towards ESC is about 4.0 Crs. Due to the steel market condition and the present pandemic situation the phase-II expansion activity is postponed and the same will be established with in the time line EC validity. Based on the above, Phase II activities are rescheduled towards ESC. JSW assures that the commitments made shall be fulfilled. The details are attached in Annexure –J of this report. The same has been communicated to your good office via mail dated 26.09.2020.
xxvi.	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. The plan so prepared shall be based on SMART (Specific, Measurable, Achievable, Relevant and Time bound) concept. The expenditure should be aimed at sustainable development and direct free distribution and temporary relief should not be included.	<p>CSR plan for 5 years (from 2017 to 2022) is prepared 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 considering and actions are initiated for compliance. As per the Companies Act, 2013 under clause 135, 2% of the average net profits of previous 3 years is earmarked as separate budget head towards CSR activities.</p> <p>The various activities of the plan are submitted to Ministry's Regional Office as part of the RO compliance report and the details of the CSR plan is uploaded in our company website and also provided in our company Annual Report.</p> <p>All the activities are planned and prepared based on SMART (Specific, Measurable, Achievable, Relevant and Time bound) concept. The expenditures are aimed at sustainable development and direct free distribution. The details are enclosed vide Annexure -M.</p>

A.	SPECIFIC CONDITIONS	COMPLIANCE STATUS
xxvii	All the commitments made to the public during the Public Hearing /Public Consultation meeting shall be satisfactorily implemented and a separate budget for implementing the same shall be allocated and information submitted to the Ministry's Regional Office at Chennai.	Commitments made to the public during the Public Hearing is satisfactorily implemented.
xxviii	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.	Provisions are made for the expansion project activities and as per the condition temporary structure will be removed after the completion of expansion activities.
B.	GENERAL CONDITIONS	COMPLIANCE STATUS
i.	The project authorities must strictly Adhere to the stipulations made by the concerned State Pollution Control Board and the State Government.	Stipulations made by the Tamil Nadu Pollution Control Board and the State Government is strictly adhered to compliance.
ii.	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).	There is no further expansion or modification in the plant is carried out without prior approval of Ministry of Environment, Forests and Climate Change (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 PM ₁₀ , PM _{2.5} , SO ₂ and NO _x are anticipated in consultation with the SPCB. Data on ambient air quality and stack emission shall be regularly submitted to this Ministry including its Regional Office at Chennai and the SPCB/CPCB once in six months.	With the consultation of TNPCB four numbers of Continuous Ambient Air Quality monitoring stations are installed in the plant premises where maximum ground level concentration of PM ₁₀ , PM _{2.5} , SO ₂ and NO _x is taking place. Data on Ambient Air Quality and Stack emission reports are being submitted to Ministry, MoEF&CC, Regional Office at Chennai and the SPCB/CPCB once in six months.
iv.	Industrial waste water shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19 th May, 1993 and 31 st December 1993 or as amended from time to time. The treated waste water shall be utilized for plantation purpose.	Industrial waste water is being collected, treated and reused 100 % in the processes for cooling application and plantation purpose. Quality parameters are conformed to the prescribed standards under GSR 422 (E) dated 19 th May, 1993 and 31 st December 1993. The treated waste water analysis report given by TNPCB & NABL accredited laboratory is given in Annexure -D.
v.	The overall noise levels in and around the plant shall be kept well within the standards (85 dB(A)) 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 dB(A) during day time and 70 dB(A) during night time.	Source and Ambient noise levels are measured in and around the plant areas on monthly basis and control measures like acoustic hoods, silencers, and enclosures are provided wherever required. The noise levels of source and ambient are well within the standards prescribed under EPA Rules, 1989. Apart from this visual display boards are displayed to wear earplug, ear muff as PPE wherever required. The noise monitoring results by NABL accredited laboratory is enclosed in Annexure –F.

B.	GENERAL CONDITIONS	COMPLIANCE STATUS
vi.	Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.	Health surveillance (Annual Health Check-up) is being conducted for all employees on yearly basis and records are being maintained in the Occupational Health Centre.
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.	Rain water harvesting structures are provided to harvest rainwater for utilization in the lean season for recharging the ground water table.
viii.	The project proponent shall also comply with all the environmental protection measures and safeguards recommend 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.	To comply the environmental protection measures and safeguards as per the recommendation of EIA/EMP report, dust suppression systems like water sprinklers and dry fog systems for control of fugitive emissions arising from material handling. Bag filters are provided in the Sinter plant for dust control during crushing of raw materials. ESPs are provided for dust control in the Sintering process and Coal based boiler. Cast house de-dusting systems are installed in both the Blast Furnace I & II for fugitive dust control in the casting process. Wet Gas cleaning systems are provided in Blast Furnace I and Dry Gas cleaning systems are provided in Blast Furnace II. Quenching tower with grit arrestor is provided to control emission during coke quenching (wet type). Secondary de-dusting system (bag filters) are provided in Energy Optimizing Furnaces I & II, Ladle Refining Furnaces. Apart from the above we undertake socio-economic development activities in the surrounding villages like community development programmes, educational programmes, drinking water supply and health care etc. The details are given the six months' report of CSR.
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 (MoEF&CC) 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 Chennai. The funds so provided shall not be diverted for any other purpose.	For environment pollution control measures capital cost and recurring cost/annum for environment pollution control measures are being implemented to the completed projects. Till December 2020 the cost of Rs.76.32 crores (appx.) has been spent for environment pollution control measures as capital cost. Recurring cost/annum to the environment pollution control measures of Rs.13.85 crores (appx.) has been spent. The funds provided will not be diverted for any other purposes. The details are given in Annexure -N .

B.	GENERAL CONDITIONS	COMPLIANCE STATUS
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 website of the company by the proponent.	Copy of clearance letter is submitted to local administration on 14.07.2017. The copy of clearance letter is uploaded in our website.
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 MoEF&CC at Chennai. 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.	<p>The compliance of the stipulated environment clearance conditions including results of monitored data is uploaded in our website once in six months.</p> <p>Simultaneously the compliance reports are being submitted (email) to the Regional Office of the MoEF&CC at Chennai and the Zonal Office of CPCB, Bangalore and the TNPCB, Chennai.</p> <p>The criteria pollutant levels namely; PM₁₀, PM_{2.5}, SO₂, NO_x, CO (real time values) and stack emissions (manually monitored values) are displayed near both entrance of our company in the public domain.</p>
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 MoEF&CC, the respective Zonal Office of CPCB and the SPCB. The Regional Office of this Ministry at Chennai/CPCB/SPCB shall monitor the stipulated conditions.	Environmental conditions and compliance status report including results of monitored data is being submitted once in six months to the Regional Office of MoEF&CC, Chennai (by email), and Zonal Office of CPCB, Bangalore and TNPCB, Chennai.
xiii.	The environmental statement for each financial year ending 31 st 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 MoEF&CC at Chennai by e-mail.	As prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, the environmental statement for each financial year ending 31 st March in Form-V and status of compliance of environmental conditions is being submitted to the Regional Office of the MoEF&CC at Chennai. To the FY 2020-21 the report has been submitted on 29.06.2021. The same is uploaded on our company website.

B.	GENERAL CONDITIONS	COMPLIANCE STATUS
xiv	<p>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 sent at website of the Ministry of Environment, Forests, and Climate Change (MoEF&CC) 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 Chennai.</p>	<p>Environmental Clearance accorded from MoEF&CC dated on 07.07.2017 and the details have been advertised in Dinamani and The Indian Express on 14.07.2017. The same was advertised two local newspapers (Dinamani and The Indian Express) which are widely circulated in the region of which Tamil is the vernacular language of the locality concerned. A copy of the same is submitted to the MoEF&CC Regional office at Chennai on 15.07.2017.</p>
xv	<p>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.</p>	<p>Date of financial closure and land development work is informed to Regional Office vide letter dated 12.10.2017.</p>

Annexure –A

Production details for the period of
Jul'20 – Dec'20

Annexure -A

Production details for the period of Jul'20 – Dec'20

Month	Steel Plant						CPP-II	
	Products		By product				Intermediate product	Product
	Steel production	Power Generation (By Blast Furnace gas)	Ferrous Sulfate	Liquid Oxygen	Liquid Nitrogen	Liquid Argon	Pig Iron	Power generation
UoM	MT	MW (Avg load)	Million TPA				MT	MW (Avg load)
Jul-20	84380	2.8	0.0	0.0	0.0	0.0	2389	60.1
Aug-20	83132	2.7	0.0	0.0	0.0	0.0	1547	62.9
Sep-20	90263	3.0	0.0	0.0	0.0	0.0	507	63.0
Oct-20	91643	2.9	0.0	0.0	0.0	0.0	189	62.6
Nov-20	88302	3.2	0.0	0.0002	0.0	0.0001	729	57.3
Dec-20	82158	3.0	0.0	0.0004	0.0	0.0002	375	65.3
Total	519878	2.9	0.0	0.0006	0.0	0.0003	5736	61.9
UoM	MT/year	MW	Million TPA				MT/year	MW
Consented quantity per Annum	1150000	7.0	0.0012	0.015	0.002	0.008	300000	90.0
Production (Jul'20 to Dec'20)	519878	2.9	0.00	0.0006	0.00	0.0003	5736	61.9

Note:

- MT – Million Ton
- MW – Mega watt

Annexure –B

Stack emission monitoring report of TNPCB & NABL
accredited laboratory for the period of
Jul'20 – Dec'20

Annexure -B

Stack emission monitoring report of TNPCB & NABL accredited laboratory for the period Jul'20 to Dec'20.

I. Stack emission monitoring results of TNPCB					
Sl. No	Stack attached to	Discharge rate in (Nm ³ /Hr)	Pollutants Concentration (mg/Nm ³)		
			PM	SO ₂	NO _x
1	Sinter Plant - I - Sinter Machine	77600	62	42	12
2	Sinter Plant – I - Cooling System	73405	40	16	8
3	Sinter Plant – I - Dedusting System	499853	51	-	-
4	Sinter Plant - I - Dust Extraction system for RMHS	22919	53	-	-
5	Sinter plant - II - Sinter Machine	476617	75	48	6
6	Sinter Plant - II - Cooling & De-dusting System	361471	43		
7	Sinter plant - II - RMHS	32399	48		
8	Blast Furnace - I - Hot stove	72215	28	37	10
9	Blast Furnace - I - Stock House dedusting system	45150	41	-	-
10	Blast Furnace - I - RMHS	21855	45	-	-
11	Blast Furnace - I - Cast House dedusting system	207923	63	11	6
12	Blast Furnace - II - Hot stove	89612	28	32	24
13	Blast Furnace - II - Stock House dedusting system	216428	36	-	-
14	Blast Furnace - II - Cast House dedusting system	281188	82	9	4
15	Blast Furnace - II - Pulverized Coal Injection mill	30915	67	32	8
16	CPP-I Boiler - (25 TPH x 2 No's) Common stack	66466	27	37	12
17	Vacuum Degassing Unit (Boiler)	14130	37	48	25
18	Energy optimizing furnace (SMS I)	24864	43	53	16
19	Energy Optimizing Furnace (SMS II)	77459	65	59	12
20	Secondary De-dusting System of EOF I to II (Common stack)	329094	81	-	-
21	Ladle Furnaces (LF-SMS-1)	20962	35	27	13
22	Ladle Furnaces (common stack) SMS –II	46253	42	32	10
23	Continuous Casting Machine (Billet cast) (SMS I)	26284	57	-	-
24	CCM-III Steam Exhaust system	17491	66	-	-
25	CCM-II Steam Exhaust System – II		-	-	-
26	CCM-II Cut Fumes Exhaust System	48010	44	-	-
27	BRM - Reheating Furnace	51498	70	59	10
28	BLM - Reheating Furnace	25158	42	43	12
29	Coke oven WHRB – I	34720	37	182	12
30	Coke oven WHRB – II	42871	36	166	12
31	Coke oven WHRB – IV	44473	44	214	10
32	LRF-Sec. De-dusting I to IV	330548	38	27	6
33	BF Gas Fired Boiler	30570	31	134	10
34	625 KVA (DG SET)	396	34	21	12
35	1250 KVA (DG SET)	585	36	27	12
36	CPP-II - AFBC – Boiler	156546	25	205	32
37	Coal crusher house - CPP-II	4392	62	-	-

II. Stack emission monitoring report of NABL accredited Laboratory

Stack No.	Source name	Stack emission Average (mg/Nm ³)			Discharge (Nm ³ /hr)
		SPM	SO ₂	NO _x	
1	Sinter Machine (Sinter Plant I)	84.8	57.7	51.7	95399
2	Cooling System (Sinter Plant I)	51.6	30.1	26.2	85647
3	Dedusting System (Sinter Plant I)	48.4	–	–	114880
4	Dust Extraction System For RMHS (Sinter Plant I)	35.5	–	–	17653
5	Hot Stove (Blast Furnace I)	25.7	48.6		54100
6	GCP Flare (Blast Furnace I) -Emergency stack	–	–	–	–
7	Stock House Dedusting System (Blast Furnace I)	50.3	–	–	62129
8	Dust Extraction System for RMHS (Blast Furnace I)	38.6	–	–	17039
9	Cast House Dedusting System (Blast Furnace I)	37.6	–	–	269141
10	CPP I Boiler 2 Nos of 25 TPH each (Common Stack)	31.2	55.5	50.5	62024
11	Energy Optimizing Furnace (Steel Melting Shop I)	56.2	53.4	47.4	24945
12	Ladle Furnaces (Steel Melting Shop I)	49.3	30.3	26.8	18064
13	Continuous Casting Machine (Steel Melting Shop I)	26.1	–	–	23481
14	Energy Optimizing Furnace (Steel Melting Shop II)	61.0	55.3		43816
15	Secondary Dedusting System EOF I&II (Combined SMS II)	49.9	–	–	337388
16	Sec. Dedusting System of LRF IV(Common) (SMS II)	46.3	–	–	49296
17	Ladle Furnaces(Common Stack) (Steel Melting Shop II)	35.3	43.2	37.4	336947
18	Vacuum Degasing Unit (Boiler) (Steel Melting Shop II)	53.9	38.8	33.8	14576
19	Steam Exhaust System (2 Nos) (Bloom Caster	27.3	–	–	21257
20	Cut Fumes Exhaust System (Bloom Caster)	33.7	–	–	50829
21	Reheating Furnace (Furnace 1 No2 Chimney) (BLM)	30.8	54.6	45.3	25043
22	Reheating Furnace (Furnace 1 No1 Chimney) (BLM)	25.2	36.4	32.4	23188
23	Coke Oven Chimney I (Coke Oven) -Emergency stack	–	–	–	–
24	Coke Oven Chimney II (Coke Oven) -Emergency stack	–	–	–	–
25	Coke Oven Chimney III (Coke Oven) -Emergency stack	–	–	–	–
26	Waste Heat Recovery Boiler I (Coke Oven)	30.9	259.8	191.5	58547
27	Waste Heat Recovery Boiler II (Coke Oven)	29.6	261.4	196.3	57963
28	Waste Heat Recovery Boiler III (Coke Oven)	31.1	259.1	193.0	60417
29	Waste Heat Recovery Boiler IV (Coke Oven)	30.4	250.4	192.1	55678
30	Waste Heat Recovery Boiler V (Coke Oven)	28.0	257.8	186.8	54831
31	BF Gas Fired Boiler	26.8	24.0	20.6	33752
32	Reheating Furnace (Bar & Rod Mill)	32.9	51.6	45.8	28831
33	Sinter Machine (Sinter Plant II)	116.6	57.8	49.6	510975
34	Plant Dedusting and Cooling (Sinter Plant II)	60.3	–	–	434036
35	Crushing of Fuel & Raw Materials (Sinter Plant II)	45.6	–	–	102111
36	Hot Stove (Blast Furnace II)	29.1	48.5	43.4	85922
37	GCP Flare (Blast Furnace II) -Emergency stack	–	–	–	–
38	Stock House Dedusting & RMHS (Blast Furnace II)	61.5	–	–	238796
39	Cast House Dedusting System (Blast Furnace II)	45.6	–	–	493779
40	Pulverized Coal Injection (Blast Furnace)	61.7	28.9	25.7	35460
41	Steam Exhaust System - CCM-III	30.6	–	–	25546
42	Pickling Plant- Acid Fumes exhaust system stack	7.0	–	–	27881
43	Pickling Plant- Acid - Hot water Generator Stack	54.3			2505
44	CPPII-AFBC Boiler	25.7	373.7	358.7	151491

Annexure –C

Online stack emission monitoring & Ambient air
quality monitoring report for the period of
Jul'20 – Dec'20

Annexure -C

Online stack emission monitoring & Ambient air quality monitoring report for the period Jul'20 to Dec'20

I. Online stack emission monitoring summary report (Jul '20 to Dec'20)

Stack No.	Source name	Parameter	UoM	Stack emission monthly average					
		Month		Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	Sinter Machine (Sinter Plant I)	SPM	mg/m ³	75.00	81	75	84	76	117.60
		SO ₂	mg/m ³	57.61	52.76	57.16	59.36	62.04	57.23
2	Cooling System (Sinter Plant I)	SPM	mg/m ³	54.16	56.74	51.69	56.26	43.57	47.16
3	Dedusting System (Sinter Plant I)	SPM	mg/m ³	48.72	51.82	56.82	59.37	37.24	36.59
4	Dust Extraction System For RMHS (Sinter Plant I)	SPM	mg/m ³	35.66	42.65	34.27	33.41	34.08	33.09
5	Hot Stove (Blast Furnace I)	SPM	mg/m ³	28.41	23.97	28.34	26.78	23.94	22.64
		SO ₂	mg/m ³	46.30	48.26	50.36	47.22	50.14	49.54
		NOx	mg/m ³	40.17	41.81	44.12	42.15	44.36	45.98
		CO	ppm	1769	1755	1801	1852	1795	1789
6	GCP Flare (Blast Furnace I) -Emergency stack	NA	NA	—	—	—	—	—	—
		NA	NA	—	—	—	—	—	—
7	Stock House Dedusting System (Blast Furnace I)	SPM	mg/m ³	46.38	51.23	47.36	50.29	53.81	52.69
8	Dust Extraction System for RMHS (Blast Furnace I)	SPM	mg/m ³	35.43	47.41	41.57	37.06	35.44	34.56
9	Cast House Dedusting System (Blast Furnace I)	SPM	mg/m ³	32.04	35.64	38.92	35.71	39.64	43.49
10	CPP I Boiler 2 Nos of 25 TPH each (Common Stack)	SPM	mg/m ³	32.60	28.7	32.4	30	31	32.40
		SO ₂	mg/m ³	53.84	55.03	63.35	52.49	54.89	53.12
11	Energy Optimizing Furnace (Steel Melting Shop I)	SPM	mg/m ³	59.42	54.28	61.48	55.32	50.14	56.82
12	Ladle Furnaces (Steel Melting Shop I)	SPM	mg/m ³	53.71	40.03	62.07	45.05	48.05	47.12
13	Continuous Casting Machine (Steel Melting Shop I)	SPM	mg/m ³	27.82	29.31	27.41	28.36	22.06	21.64
14	Energy Optimizing Furnace (Steel Melting Shop II)	SPM	mg/m ³	82.47	51.92	65.73	49.74	52.68	63.54
15	Secondary Dedusting System EOF I&II (Combined SMS II)	SPM	mg/m ³	47.64	43.05	48.63	51.89	55.47	52.80
16	Sec. Dedusting System of LRF IV(Common) (SMS II)	SPM	mg/m ³	38.42	40.18	44.7	45.04	51.28	57.94
17	Ladle Furnaces(Common Stack) (Steel Melting Shop II)	SPM	mg/m ³	53.71	40.03	62.07	45.05	48.05	47.12
18	Vacuum Degassing Unit (Boiler) (Steel Melting Shop II)	SPM	mg/m ³	38.45	34.15	38.28	36.13	33.59	31.26
19	Steam Exhaust System 1 (Bloom Caster	SPM	mg/m ³	26.97	25.64	28.06	26.81	25.71	24.57
19	Steam Exhaust System 2 (Bloom Caster	SPM	mg/m ³	25.53	30.44	27.93	29.34	26.95	23.38
20	Cut Fumes Exhaust System (Bloom Caster)	SPM	mg/m ³	33.64	35.73	37.15	35.41	30.42	29.66
21	Reheating Furnace (Furnace 1 No2 Chimney) (BLM)	SPM	mg/m ³	30.62	28.59	32.42	30.67	31.69	30.55
		SO ₂	mg/m ³	58.06	56.34	59.39	49.02	51.99	52.99
22	Reheating Furnace (Furnace 1 No1 Chimney) (BLM)	SPM	mg/m ³	24.65	27.11	25.34	25.81	24.56	23.89
		SO ₂	mg/m ³	41.17	39.57	35.47	33.06	34.16	34.99
23	Coke Oven Chimney I (Coke Oven) -Emergency stack	NA	NA	—	—	—	—	—	—
		NA	NA	—	—	—	—	—	—
24	Coke Oven Chimney II (Coke Oven) -Emergency stack	NA	NA	—	—	—	—	—	—
		NA	NA	—	—	—	—	—	—
25	Coke Oven Chimney III (Coke Oven) -Emergency stack	NA	NA	—	—	—	—	—	—
		NA	NA	—	—	—	—	—	—

Stack No.	Source name	Parameter	UoM	Stack emission monthly average					
		Month		Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
26	Waste Heat Recovery Boiler I (Coke Oven)	SPM	mg/m ³	27.35	24.73	33.66	32.02	34.15	33.26
		SO ₂	mg/m ³	245.53	255.36	271.15	264.58	269.77	252.54
27	Waste Heat Recovery Boiler II (Coke Oven)	SPM	mg/m ³	30.59	26.08	29.43	31.55	30.66	29.45
		SO ₂	mg/m ³	250.41	244.82	268.21	277.61	278.63	248.46
28	Waste Heat Recovery Boiler III (Coke Oven)	SPM	mg/m ³	26.14	27.41	34.17	29.57	35.21	34.16
		SO ₂	mg/m ³	242.52	251.78	289.63	259.24	271.6	239.68
29	Waste Heat Recovery Boiler IV (Coke Oven)	SPM	mg/m ³	31.06	27.39	35.23	33.16	28.04	27.56
		SO ₂	mg/m ³	233.57	238.08	278.07	268.42	251.07	233.12
30	Waste Heat Recovery Boiler V (Coke Oven)	SPM	mg/m ³	27.18	22.31	29.79	27.48	31.2	30.13
		SO ₂	mg/m ³	248.76	245.14	282.13	263.01	267.15	240.64
31	BF Gas Fired Boiler	SPM	mg/m ³	29.62	24.6	24.14	29.7	26.81	25.98
32	Reheating Furnace (Bar & Rod Mill)	SPM	mg/m ³	34.47	34.15	35.59	32.59	30.74	29.99
		SO ₂	mg/m ³	51.23	54.28	57.31	38.61	54.26	53.64
33	Sinter Machine (Sinter Plant II)	SPM	mg/m ³	110.00	121	109	112	118	129.50
		SO ₂	mg/m ³	56.08	54.24	59.83	57.24	60.23	59.34
34	Plant Dedusting and Cooling (Sinter Plant II)	SPM	mg/m ³	56.97	51.81	56.33	63.83	68.34	64.49
35	Crushing of Fuel & Raw Materials (Sinter Plant II)	SPM	mg/m ³	47.05	45.25	41.08	45.68	47.35	46.91
36	Hot Stove (Blast Furnace II)	SPM	mg/m ³	33.69	21.41	34.06	31.51	26.81	27.03
		SO ₂	mg/m ³	44.26	51.53	52.64	50.07	46.88	45.62
		NOx	mg/m ³	42.52	44.72	43.02	44.68	42.15	43.19
		CO	ppm	1825	1724	1749	1803	1842	1833
37	GCP Flare (Blast Furnace II) -Emergency stack	NA	NA	–	–	–	–	–	–
		NA	NA	–	–	–	–	–	–
38	Stock House Dedusting & RMHS (Blast Furnace II)	SPM	mg/m ³	61.37	49.95	63.48	66.94	64.15	62.85
39	Cast House Dedusting System (Blast Furnace II)	SPM	mg/m ³	38.51	41.17	44.85	53.24	48.59	46.95
40	Pulverized Coal Injection (Blast Furnace)	SPM	mg/m ³	60.14	64.52	61.71	66.15	59.03	58.36
		SO ₂	mg/m ³	27.48	23.98	26.37	29.61	32.54	33.16
41	Steam Exhaust System - CCM-III	SPM	mg/m ³	32.48	31.28	29.52	26.87	33.14	30.47
42	CPPII-AFBC Boiler	SPM	mg/m ³	25.79	23.86	29.05	25.91	27.33	22.17
		SO ₂	mg/m ³	374.59	363.24	379.87	368.65	381.82	374.26
		NOx	mg/m ³	356.18	347.15	368.83	355.72	372.07	352.17

II. Continuous Ambient Air Quality Monitoring Results (Jul'20 to Dec'20)

Month	CAAQMS#1					CAAQMS#2		
	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	PM ₁₀	PM _{2.5}	SO ₂
UoM	µg/m ³	µg/m ³	µg/m ³	µg/m ³	mg/m ³	µg/m ³	µg/m ³	µg/m ³
Jul-20	50	47	23	19	0.25	45	29	22
Aug-20	47	35	27	20	0.43	40	38	33
Sep-20	38	31	19	16	0.97	41	29	35
Oct-20	34	33	15	23	0.31	34	25	29
Nov-20	35	29	21	16	0.36	23	17	30
Dec-20	30	25	20	18	0.68	37	32	21

Month	CAAQMS#3				CAAQMS#4		
	PM ₁₀	PM _{2.5}	SO ₂		PM ₁₀	PM _{2.5}	SO ₂
UoM	µg/m ³	µg/m ³	µg/m ³		µg/m ³	µg/m ³	µg/m ³
Jul-20	39	21	11		30	19	11
Aug-20	37	26	8		26	22	13
Sep-20	40	12	16		31	10	24
Oct-20	34	20	10		44	21	24
Nov-20	28	21	14		39	28	18
Dec-20	32	27	12		29	22	16

Tolerance limit: PM10: 100 µg/m³, PM2.5: 60 µg/m³, NOx: 80 µg/m³, SO₂: 80 µg/m³,
CO: 1 hr avg - 4 mg/m³, 8 hr avg - 2 mg/m³

The results are well within the prescribed standards.

III. Ambient Air Quality Monitoring results of NABL Accredited laboratory

Month	AQ-1				AQ-2			
	PM ₁₀	PM _{2.5}	SO ₂	NO _x	PM ₁₀	PM _{2.5}	SO ₂	NO _x
Jul-20	52.2	23.1	6.50	16.39	48.6	21.3	6.27	16.27
Aug-20	54.4	25.0	6.79	16.76	45.8	16.5	5.83	16.19
Sep-20	55.0	24.7	6.18	16.34	45.2	16.4	5.98	15.69
Oct-20	50.6	21.7	6.07	15.67	39.7	15.7	5.23	14.28
Nov-20	51.3	21.0	5.72	16.17	45.1	17.9	5.70	15.66
Dec-20	52.1	21.0	6.64	16.59	47.5	18.0	6.10	15.73
Month	AQ-3				AQ-4			
	PM ₁₀	PM _{2.5}	SO ₂	NO _x	PM ₁₀	PM _{2.5}	SO ₂	NO _x
Jul-20	48.4	20.7	6.19	16.09	49.7	22.2	6.50	16.27
Aug-20	49.9	18.8	6.35	15.59	52.1	22.9	6.74	16.50
Sep-20	53.0	22.0	6.74	16.57	53.0	22.9	6.77	16.13
Oct-20	44.9	19.1	5.87	15.28	45.9	21.8	5.79	15.40
Nov-20	49.7	18.7	6.19	15.23	53.4	23.3	6.62	16.26
Dec-20	50.5	19.9	6.34	15.85	53.9	23.4	6.94	16.63
Month	AQ-5				AQ-6			
	PM ₁₀	PM _{2.5}	SO ₂	NO _x	PM ₁₀	PM _{2.5}	SO ₂	NO _x
Jul-20	46.9	21.8	6.39	15.90	44.1	20.4	5.88	15.47
Aug-20	52.1	21.9	5.86	16.51	46.1	17.1	6.60	16.54
Sep-20	54.3	23.6	6.20	16.37	46.4	16.8	5.78	15.37
Oct-20	48.7	21.4	5.86	15.66	38.3	15.1	5.10	14.58
Nov-20	50.1	21.0	6.16	16.03	52.5	24.0	6.36	16.20
Dec-20	49.3	19.3	6.23	16.02	54.3	24.1	6.72	16.50
Month	AQ-7				AQ-8			
	PM ₁₀	PM _{2.5}	SO ₂	NO _x	PM ₁₀	PM _{2.5}	SO ₂	NO _x
Jul-20	53.3	25.2	6.52	16.46	47.1	21.0	6.23	15.81
Aug-20	53.4	23.0	6.54	15.90	53.5	22.8	6.80	16.36
Sep-20	56.8	25.4	6.57	16.38	53.1	22.9	6.66	16.04
Oct-20	45.2	20.6	5.77	15.32	48.8	23.1	6.12	15.73
Nov-20	48.1	20.8	5.70	15.40	53.6	24.1	6.55	16.38
Dec-20	47.4	20.1	6.28	15.83	52.0	23.3	6.49	16.18

Tolerance limit: PM₁₀: 100 µg/m³, PM_{2.5}: 60 µg/m³, NO_x: 80 µg/m³, SO₂: 80 µg/m³

AQ1- Udayanur, AQ2-Temple Gate, AQ3-Township STP, AQ4- Kuttapattipudur

AQ5- Parry Nagar, AQ6- Guest House, AQ7- Pottaneri, AQ8- Pump House

IV. Analysis of Ambient Air Quality Monitoring results

PM ₁₀ in µg/m ³								
Location	AQ-1	AQ-2	AQ-3	AQ-4	AQ-5	AQ-6	AQ-7	AQ-8
Minimum	50.60	39.70	44.90	45.90	46.90	38.30	45.20	47.10
Maximum	55.00	48.60	53.00	53.90	54.30	54.30	56.80	53.60
Average	52.60	45.32	49.40	51.33	50.23	46.95	50.70	51.35
Standard deviation	1.74	3.08	2.67	3.05	2.62	5.81	4.45	2.75
98 th Percentile	54.94	48.49	52.75	53.85	54.08	54.12	56.46	53.59
PM _{2.5} in µg/m ³								
Location	AQ1	AQ-2	AQ-3	AQ-4	AQ-5	AQ-6	AQ-7	AQ-8
Minimum	21.00	15.70	18.70	21.80	19.30	15.10	20.10	21.00
Maximum	25.00	21.30	22.00	23.40	23.60	24.10	25.40	24.10
Average	22.75	17.63	19.87	22.75	21.50	19.58	22.52	22.87
Standard deviation	1.80	2.01	1.29	0.63	1.40	3.86	2.38	1.03
98 th Percentile	24.97	20.97	21.87	23.39	23.43	24.09	25.38	24.02
SO ₂ in µg/m ³								
Location	AQ-1	AQ-2	AQ-3	AQ-4	AQ-5	AQ-6	AQ-7	AQ-8
Minimum	5.72	5.23	5.87	5.79	5.86	5.10	5.70	6.12
Maximum	6.79	6.27	6.74	6.94	6.39	6.72	6.57	6.80
Average	6.32	5.85	6.28	6.56	6.12	6.07	6.23	6.48
Standard deviation	0.40	0.36	0.28	0.41	0.21	0.61	0.40	0.26
98 th Percentile	6.78	6.25	6.70	6.92	6.37	6.71	6.57	6.79
NO _x in µg/m ³								
Location	AQ-1	AQ-2	AQ-3	AQ-4	AQ-5	AQ-6	AQ-7	AQ-8
Minimum	15.67	14.28	15.23	15.40	15.66	14.58	15.32	15.73
Maximum	16.76	16.27	16.57	16.63	16.51	16.54	16.46	16.38
Average	16.32	15.64	15.77	16.20	16.08	15.78	15.88	16.08
Standard deviation	0.38	0.72	0.51	0.43	0.31	0.77	0.48	0.27
98 th Percentile	16.74	16.26	16.52	16.62	16.50	16.54	16.45	16.38

Tolerance limit: PM₁₀: 100 µg/m³, PM_{2.5}: 60 µg/m³, NO_x: 80 µg/m³, SO₂: 80 µg/m³

AQ1- Udayanur, AQ2-Temple Gate, AQ3-Township STP, AQ4- Kuttapattipudur

AQ5- Parry Nagar, AQ6- Guest House, AQ7- Pottaneri, AQ8- Pump House

The results are within the norms prescribed by CPCB.

Annexure –D

Online effluent monitoring report and effluent &
ground water quality manual monitoring report of
TNPCB & NABL accredited laboratory

Annexure -D

Online effluent monitoring report and effluent & ground water quality manual monitoring report of NABL accredited laboratory

I. Online effluent monitoring report

S.No	Description	UoM	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	Effluent Inlet flow	m ³	74922.0	52913.9	60356.3	68412.4	68112.0	59171.3
2	Treated effluent water reuse in process	m ³	59600.9	56241.3	62716.6	62394.6	59307.0	56583.5
3	ETP outlet discharge flow	m ³	0	0	0	0	0	0

II. Treated trade effluent of Steel by NABL Accredited laboratory

S.No	Parameter	Unit	TNPCB Tolerance Limit	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	pH @ 25°C	--	5.5 - 9.0	7.79	7.79	7.23	6.92	7.56	7.81
2	Colour	Hazen	--	20	20	30	20	25	30
3	Odour	--	--	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
4	Temperature	°C	Shall not exceed 5 °C above the receiving water temperature	29	29	29	29	29	29
5	Particle size of suspended solids	--	Shall pass 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve
6	Dissolved solids (Inorganic)	mg/l	2100	1187	1187	1328	1152	1247	1401
7	Suspended solids	mg/l	100	26	26	32	16	19	24
8	Chloride as Cl	mg/l	1000	305	305	389	357	422	496
9	Sulphate as SO ₄	mg/l	1000	143	143	156	151	175	208
10	BOD @ 27°C for 3 Days	mg/l	30	8	8	10	14	12	14
11	Oil & Grease	mg/l	10 (DL: 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)
12	COD	mg/l	250	39	39	62	88	70	92
13	Arsenic as As	mg/l	0.2 (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)
14	Mercury as Hg	mg/l	0.01 (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)
15	Lead as Pb	mg/l	0.1 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
16	Zinc as Zn	mg/l	1.0 (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)
17	Copper as Cu	mg/l	3.0 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
18	Cadmium as Cd	mg/l	2.0 (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)
19	Nickel as Ni	mg/l	3.0 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
20	Cyanide as CN	mg/l	0.2 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
21	Phenolic compounds as C ₆ H ₅ OH	mg/l	1.0 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
22	Percent Sodium	%	--	28	28	29	31	32	30
23	Residual Sodium Carbonate	mg/l	--	NIL	NIL	NIL	NIL	NIL	NIL
24	Sulphide as S	mg/l	2.0 (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)
25	Boron as B	mg/l	2.0 (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
26	Total Chromium as Cr	mg/l	2.0 (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)
27	Hexavalent Chromium (Cr ⁶⁺)	mg/l	0.1 (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)
28	Fluoride as F	mg/l	2.0 (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
29	Dissolved Phosphate as P	mg/l	5.0	0.56	0.56	0.72	0.61	0.75	0.69
30	Total Residual Chlorine	mg/l	1.0 (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
31	Free ammonia as NH ₃	mg/l	5.0	0.63	0.63	0.8	0.34	0.39	0.44
32	Ammonical Nitrogen as N	mg/l	50	3.47	3.47	4.63	1.09	1.26	2.05
33	Total kjeldahl Nitrogen as N	mg/l	100	5.09	5.09	6.59	1.25	1.53	2.98

III. Treated trade effluent of CPPII by NABL accredited laboratory

S.No	Parameter	Unit	TNPCB Tolerance Limit	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	pH @ 25°C	--	5.5 - 9.0	7.79	7.79	7.23	6.92	7.56	7.81
2	Colour	Hazen	--	20	20	30	20	25	30
3	Odour	--	--	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
4	Temperature	°C	Shall not exceed 5°C above the receiving water temperature	29	29	29	29	29	29
5	Particle size of suspended solids	--	Shall pass 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve	passes through 850 u I.S Sieve
6	Dissolved solids (Inorganic)	mg/l	2100	1187	1187	1328	1152	1247	1401
7	Suspended solids	mg/l	100	26	26	32	16	19	24
8	Chloride as Cl	mg/l	1000	305	305	389	357	422	496
9	Sulphate as SO ₄	mg/l	1000	143	143	156	151	175	208
10	BOD @ 27°C for 3 Days	mg/l	30	8	8	10	14	12	14
11	Oil & Grease	mg/l	10 (DL: 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)	BDL (DL : 1.0)
12	COD	mg/l	250	39	39	62	88	70	92
13	Arsenic as As	mg/l	0.2 (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)
14	Mercury as Hg	mg/l	0.01 (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)
15	Lead as Pb	mg/l	0.1 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
16	Zinc as Zn	mg/l	1.0 (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)
17	Copper as Cu	mg/l	3.0 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
18	Cadmium as Cd	mg/l	2.0 (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)	BDL (DL : 0.005)
19	Nickel as Ni	mg/l	3.0 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
20	Cyanide as CN	mg/l	0.2 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
21	Phenolic compounds as C ₆ H ₅ OH	mg/l	1.0 (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
22	Percent Sodium	%	--	28	28	29	31	32	30
23	Residual Sodium Carbonate	mg/l	--	NIL	NIL	NIL	NIL	NIL	NIL
24	Sulphide as S	mg/l	2.0 (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)
25	Boron as B	mg/l	2.0 (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
26	Total Chromium as Cr	mg/l	2.0 (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)
27	Hexavalent Chromium (Cr ⁶⁺)	mg/l	0.1 (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)	BDL (DL : 0.03)
28	Fluoride as F	mg/l	2.0 (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
29	Dissolved Phosphate as P	mg/l	5.0	0.56	0.56	0.72	0.61	0.75	0.69
30	Total Residual Chlorine	mg/l	1.0 (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
31	Free ammonia as NH ₃	mg/l	5.0	0.63	0.63	0.8	0.34	0.39	0.44
32	Ammonical Nitrogen as N	mg/l	50	3.47	3.47	4.63	1.09	1.26	2.05
33	Total kjeldahl Nitrogen as N	mg/l	100	5.09	5.09	6.59	1.25	1.53	2.98

IV. Result of analysis of treated trade effluent by TNPCB

S.No	Parameter	Unit	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	pH @ 25°C	Number	7.51	7.62	7.59	6.64	7.11	6.86
2	TSS at 103°C - 105°C	mg/l	8	8	8	16	16	8
3	Total Dissolved Solids at 180°C	mg/l	1012	1160	984	788	832	1688
4	Chloride as Cl	mg/l	285	310	275	285	275	205
5	Sulphates as SO ₄	mg/l	239	243	168	120	87	140
6	Oil & Grease	mg/l	<4	<4	<4	<4	<4	<4
7	BOD (at 27°C for 3 days)	mg/l	<2	<2	2.7	3.4	3	<2
8	COD	mg/l	24	16	24	32	24	16
9	Phenolic compounds	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
10	Ammonical Nitrogen as NH ₃ -N	mg/l	3.36	2.24	2.8	4.48	2.80	2.80
11	Cyanide	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

V. Result of analysis ground water by NABL Accredited laboratory

S.No	Parameter	Unit	Jul-20		Aug-20			Sep-20	
			Pottaneri - Location#1	Karapatti pallam	Pottaneri - Location#2	Parinagar	Kuttapatti pudur	Moorthipatti - Location -I	Kuttapatti pudur
1	Colour	Hazen	BDL[DL:1.0]	BDL[DL:1.0]	BDL[DL:1.0]	BDL[DL:1.0]	BDL[DL:1.0]	BDL[DL:1.0]	BDL[DL:1.0]
2	Odour	--	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)
5	pH @ 25°C	--	7.46	7.75	7.59	7.47	7.39	7.17	7.36
6	Chloride as Cl	mg/l	137	241	456	260	7.39	786	382
7	Total Hardness as CaCO3	mg/l	694	584	1394	815	1395	1282	568
8	Calcium as CA	mg/l	158	98	243	162	251	183	114
9	Magnesium as Mg	mg/l	72	81	189	98	184	198	68
10	Dissolved solids (Inorganic)	mg/l	1498	1214	2218	1391	2965	2985	1340
11	Sulphate as SO ₄	mg/l	602	95	896	459	894	810	157
12	Copper as Cu	mg/l	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)
13	Iron as Fe	mg/l	0.05	0.06	0.07	0.06	0.09	0.06	0.08
14	Manganese as Mn	mg/l	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)
15	Nitrate as NO ₃ -N	mg/l	1.42	3.4	2.8	1.46	1.96	2.53	4.57
16	Fluoride as F	mg/l	1.75	1.91	1.71	1.45	1.69	1.9	1.79
17	phenolics	mg/l	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)
18	Mercury as Hg	mg/l	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)
19	Cadmium as Cd	mg/l	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)
20	Selenium as Se	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
21	Arsenic as As	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
22	Cyanide as CN	mg/l	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)
23	Lead as Pb	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
24	Zinc as Zn	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
25	Total Chromium as Cr	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
26	Total Residual Chlorine	mg/l	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
27	Alkalinity	mg/l	165.0	248.0	250.0	218.0	364.0	359.0	286.0
28	Aluminium as AL	mg/l	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
29	Boron as B	mg/l	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
30	Free ammonia as NH ₃	mg/l	0.34	0.26	0.23	0.25	0.28	0.21	0.27
31	Nickel as Ni	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
32	Sulphide as S	mg/l	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)

S.No	Parameter	Unit	Oct-20		Nov-20		Dec-20	
			Ervadi	Moorthipatti - Location -II	Kavandanur	Pudur Panankadu	Pottaneri - Location#1	Karapatti pallam
1	Colour	Hazen	BDL[DL:1.0]	BDL[DL:1.0]	BDL[DL:1.0]	BDL[DL:1.0]	BDL[DL:1.0]	BDL[DL:1.0]
2	Odour	--	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)	BDL (DL : 0.5)
5	pH @ 25°C	--	7.63	7.81	7.81	7.41	7.55	7.61
6	Chloride as Cl	mg/l	1305	344	440	614	159	256
7	Total Hardness as CaCO ₃	mg/l	2198	569	802	1098	714	542
8	Calcium as CA	mg/l	328	77	87	50	162	85
9	Magnesium as Mg	mg/l	331	90	140	233	74	79
10	Dissolved solids (Inorganic)	mg/l	3862	1315	1756	2205	1605	1065
11	Sulphate as SO ₄	mg/l	1189	180	151	269	684	81
12	Copper as Cu	mg/l	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)
13	Iron as Fe	mg/l	0.1	0.07	0.06	0.08	0.06	0.07
14	Manganese as Mn	mg/l	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)
15	Nitrate as NO ₃ -N	mg/l	18.6	2.38	5.7	2.05	1.96	0.377
16	Fluoride as F	mg/l	1.85	1.93	1.74	1.67	1.59	1.53
17	phenolics	mg/l	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)
18	Mercury as Hg	mg/l	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)
19	Cadmium as Cd	mg/l	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)	BDL (DL : 0.001)
20	Selenium as Se	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
21	Arsenic as As	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
22	Cyanide as CN	mg/l	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)
23	Lead as Pb	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
24	Zinc as Zn	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
25	Total Chromium as Cr	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
26	Total Residual Chlorine	mg/l	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
27	Alkalinity	mg/l	214.0	254.0	518.0	373.0	190.0	216.0
28	Aluminium as AL	mg/l	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
29	Boron as B	mg/l	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)	BDL (DL : 0.1)
30	Free ammonia as NH ₃	mg/l	0.22	0.19	0.23	0.22	0.30	0.28
31	Nickel as Ni	mg/l	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)	BDL (DL : 0.01)
32	Sulphide as S	mg/l	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)	BDL (DL : 0.05)

VI. Result of analysis of ground water by TNPCB

S.No	Parameter	Unit	Balan house Panankadu	Kaliyammal house	Govt bore well kavandanur	Govt bore well Moorthipatti	Open well, Mr. Venkatesan, Pottaneri	Open well mr.Rajamani / kuttapattipud ur	Govt hand pump Eravati	govt bore well parrynagar
			Jul-20				Aug-20		Sep-20	
1	Turbidity	NTU	1.80	2.60	1.8	2.6	2.50	2.40	3.20	3.60
2	Colour	ml	<5	<5	<5	<5	<5	<5	<5	<5
3	Conductivity at 25°C	umhos/cm	1554.00	1871.00	1554	1871	2390.00	4970.00	6660.00	1865.00
4	pH @ 25°C	Number	8.09	8.00	8.09	8	7.97	8.16	7.49	7.84
5	Total Suspended Solids at 103°C- at 105°C	mg/l	4.00	4.00	4	4	8.00	8.00	4.00	4.00
6	TDS at 180°C	mg/l	1056.00	1308.00	1056	1308	1680.00	3428.00	4408.00	1228.00
7	Chloride as Cl	mg/l	240.00	265.00	240	265	320.00	1124.00	1575.00	255.00
8	sulphates as SO4	mg/l	98.00	241.00	98	241	563.00	930.00	759.00	285.00
9	Oil & Grease	mg/l	<4	<4	<4	<4	<4	<4	<4	<4
10	BOD (at 27°C for 3 days)	mg/l	<2	2.00	<2	2	<2	<2	<2	<2
11	COD	mg/l	16.00	16.00	16	16	16.00	24.00	16.00	16.00
12	Manganese	mg/l	<0.1	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1
13	Ammonical Nitrogen as NH ₃ -N	mg/l	1.12	1.12	1.12	1.12	1.12	1.68	2.24	<2
14	Total Kjeldahl Nitrogen	mg/l	2.24	2.24	2.24	2.24	2.24	3.36	3.36	2.24
15	Fluoride as F	mg/l	2.83	2.52	2.826	2.515	0.06	0.03	0.07	0.05
16	PH. Compound	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
17	% Sodium	mg/l	46.00	54.00	46	54	28.00	31.00	51.00	58.00
18	Total Hardness as CaCO ₃	mg/l	540.00	490.00	540	490	780.00	1120.00	1140.00	810.00
19	Alkalinity as CaCO ₃	mg/l	420.00	330.00	420	330	460.00	630.00	350.00	210.00
20	Ph. Alkalinity	mg/l	70.00	40.00	70	40	<1	<1	10.00	10.00
21	Nitrate Nitrogen as NO ₃	mg/l	1.22	1.52	1.221	1.522	0.13	2.09	0.82	0.07
22	Nitrate Nitrogen as NO ₂	mg/l	0.01	0.03	0.006	0.03	0.05	0.26	0.07	0.01
23	Phosphate as PO ₄	mg/l	0.10	0.08	0.097	0.078	0.07	0.14	0.05	0.06
24	Cyanide	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
25	Calcium as Ca	mg/l	68.00	72.00	68	72	128.00	156.00	256.00	116.00
26	Magnesium as Mg	mg/l	89.90	75.00	89.9	75	112.00	177.00	122.00	126.00
27	sodium as Na	mg/l	208.00	276.00	208	276	143.00	233.00	550.00	79.00
28	Potassium as K	mg/l	3.70	11.00	3.7	11	31.00	28.00	32.00	39.00
29	Iron Total as Fe	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
30	Free Ammonia	mg/l	0.60	0.60	0.595	0.595	1.47	1.49	1.19	0.60
31	Boron	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
32	Hexavalent chlorine	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
33	Total Residual Chlorine	mg/l	<1	<1	<1	<1	<1	<1	<1	<1
34	SAR	mg/l	3.90	5.40	3.9	5.4	2.20	3.00	4.80	7.10
35	Residual Sodium Carbonte	mg/l	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
36	Total Chromium	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
37	Copper	mg/l	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.10
38	Zinc	mg/l	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.10	0.01
39	Lead	mg/l	<0.015	<0.015	<0.015	<0.015	0.18	0.08	<0.015	<0.015
40	Cadmium	mg/l	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
41	Nickel	mg/l	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.58	0.30

S.No	Parameter	Unit	Govt bore well Karapatti pallam	open well mr. vellaiyan moorthipatti	Govt bore well moorthipatti	Govt bore well /Kavadanur	Open well mr.Balan/pudur.panankadu	Kaliyammal house	Govt hand pump Eravati	Open well, Mr. Venkatesan, Pottaneri	Govt bore well Karapatti pallam
			Sep-20		Oct-20				Dec-20		
1	Turbidity	NTU	2.40	2.80	1.2	3.4	1.80	3.20	2.90	3.20	2.10
2	Colour	ml	<5	< 5	<5	<5	<5	<5	<5	<5	<5
3	Conductivity at 25°C	umhos/cm	1706.00	2060.00	2500	4130	3750.00	4090.00	6880.00	4250.00	3840.00
4	pH @ 25°C	Number	7.50	7.70	7.81	7.44	7.43	7.74	6.67	7.48	7.20
5	Total Suspended Solids at 103°C- at 105°C	mg/l	4.00	8.00	4	4	4.00	4.00	4.00	4.00	4.00
6	TDS at 180°C	mg/l	1132.00	1336.00	1624	2672	2592.00	2612.00	5092.00	2652.00	2472.00
7	Chloride as Cl	mg/l	255.00	315.00	340	345	870.00	785.00	2250.00	300.00	725.00
8	sulphates as SO4	mg/l	204.00	187.00	482	194	496.00	669.00	829.00	557.00	528.00
9	Oil & Grease	mg/l	<4	<4	<4	<4	<4	<4	<4	<4	<4
10	BOD (at 27°C for 3 days)	mg/l	2.50	<2	<2	<2	<2	<2	<2	<2	<2
11	COD	mg/l	32.00	16.00	16	16	16.00	16.00	16.00	16.00	16.00
12	Manganese	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
13	Ammonical Nitrogen as NH ₃ -N	mg/l	2.24	<2	1.12	2.24	1.12	2.24	<2	<2	<2
14	Total Kjeldahl Nitrogen	mg/l	3.36	2.24	3.36	5.6	3.36	4.48	2.24	2.24	2.24
15	Fluoride as F	mg/l	0.06	0.05	0.057	0.103	0.09	0.06	0.09	0.11	0.06
16	PH. Compound	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
17	% Sodium	mg/l	35.00	40.00	30	41	50.00	56.00	27.00	25.00	53.00
18	Total Hardness as CaCO ₃	mg/l	540.00	640.00	940	600	910.00	620.00	2400.00	900.00	860.00
19	Alkalinity as CaCO ₃	mg/l	180.00	360.00	370	420	440.00	580.00	300.00	260.00	376.00
20	Ph. Alkalinity	mg/l	<1	20.00	20	40	20.00	40.00	20.00	20.00	44.00
21	Nitrate Nitrogen as NO ₃	mg/l	1.24	0.44	0.364	0.293	0.41	0.10	0.14	0.08	0.04
22	Nitrate Nitrogen as NO ₂	mg/l	0.02	0.02	0.106	0.025	0.02	0.03	0.01	0.08	0.12
23	Phosphate as PO ₄	mg/l	0.04	0.04	0.097	0.083	0.14	0.11	0.07	0.04	0.07
24	Cyanide	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
25	Calcium as Ca	mg/l	104.00	88.00	112	64	96.00	68.00	320.00	128.00	104.00
26	Magnesium as Mg	mg/l	68.00	102.00	160	107	163.00	109.00	388.00	140.00	145.00
27	sodium as Na	mg/l	138.00	195.00	177	192	424.00	384.00	408.00	145.00	466.00
28	Potassium as K	mg/l	12.00	7.00	3.2	4.6	4.80	22.00	30.10	34.70	4.60
29	Iron Total as Fe	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.22	0.20	0.36
30	Free Ammonia	mg/l	1.19	0.60	0.595	1.18	0.60	1.18	0.89	0.30	0.89
31	Boron	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
32	Hexavalent chlorine	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
33	Total Residual Chlorine	mg/l	<1	<1	<1	<1	<1	<1	<1	<1	<1
34	SAR	mg/l	2.10	2.90	2.3	6.7	6.10	6.37	3.60	2.10	6.60
35	Residual Sodium Carbonte	mg/l	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg
36	Total Chromium	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
37	Copper	mg/l	<0.0015	<0.0015	0.043	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
38	Zinc	mg/l	0.08	<0.0015	0.0024	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
39	Lead	mg/l	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
40	Cadmium	mg/l	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
41	Nickel	mg/l	0.10	0.12	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.10

Annexure –E

Treated sewage quality monitoring report of NABL
accredited laboratory for the period of
Jul'20 – Dec'20

Annexure -E

Treated sewage quality monitoring report of TNPCB & NABL accredited laboratory for the period of Jul '20 to Dec'20

Result of analysis of treated sewage by TNPCB (Plant STP)

S.No	Parameter	Unit	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	pH @ 25°C	Number	6.88	7.37	6.86	6.89	7.45	7.16
2	TSS at 103°C - 105°C	mg/l	8	4	8	24	8	8
3	BOD (at 27°C for 3 days)	mg/l	<2	<2	<2	<2	<2	<2
4	COD	mg/l	16	16	16	16	16	16
5	Ammonical Nitrogen as NH ₃ N	mg/l	2.24	<2	<2	1.68	<2	2.24
6	Total Nitrogen	mg/l	9.55	9.74	2.4	4.30	3.08	3.54
7	Feacal Coliform	MPN/100ML	17	6.8	2	6.8	2.0	14.0
8	Total Coliform	MPN/100ML	46	14	6	14	7.8	33

Result of analysis of treated sewage by TNPCB (Township STP)

S.No	Parameter	Unit	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	pH @ 25°C	Number	6.91	7.31	6.51	6.90	7.73	7.24
2	TSS at 103°C - 105°C	mg/l	4	4	8	20	16	8
3	BOD (at 27°C for 3 days)	mg/l	<2	<2	<2	<2	<2	<2
4	COD	mg/l	16	16	16	16	16	16
5	Ammonical Nitrogen as NH ₃ N	mg/l	2.24	<2	<2	1.12	2.24	2.24
6	Total Nitrogen	mg/l	9.17	8.90	3.10	5.54	3.89	3.51
7	Feacal Coliform	MPN/100ML	17	7.8	2.0	6.8	4.0	9.1
8	Total Coliform	MPN/100ML	47	17	6.1	13	11	24

Result of analysis of treated sewage by NABL accredited laboratory (Plant STP)

S.No	Parameter	Unit	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	pH @ 25°C	--	7.56	7.86	7.23	6.85	7.26	7.46
2	Total Dissolved solids	mg/l	422	505	446	560	601	685
3	Total uspended solids	mg/l	11	13	11	9	10	8
4	BOD at 27 C for 3 days	mg/l	4	5	6	8	7	6.4
5	COD	mg/l	18	21	25	28	25	28
6	Ammonical Nitrogen as N	mg/l	2.49	3.12	2.91	1.27	1.42	1.79
7	Total Kjeldhal Nitrogen as N	mg/l	3.73	3.96	3.23	1.63	1.89	2.33
8	Fecal Coliform	MPN/100ml	34	20	44	51	47	1.61

Result of analysis of treated sewage by NABL accredited laboratory (Township STP)

S.No	Parameter	Unit	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	pH @ 25°C	--	7.19	7.47	7.09	6.89	7.05	7.19
2	Total Dissolved solids	mg/l	376	391	318	447	512	413
3	Total uspended solids	mg/l	8	7	6	8.0.	7	6
4	BOD at 27 C for 3 days	mg/l	3	4	5	6	5	4.8
5	COD	mg/l	15	12	14	19	16	14
6	Ammonical Nitrogen as N	mg/l	2.147	2.97	2.18	1.18	1.05	1.26
7	Total Kjeldhal Nitrogen as N	mg/l	3.05	3.54	3.07	1.56	1.36	1.3
8	Fecal Coliform	MPN/100ml	30	40	38	45	40	32

Annexure –F

Ambient & Source Noise level monitoring report of
NABL accredited laboratory for the period of
Jul'20 – Dec'20

Annexure -F

Ambient & Source Noise level monitoring report of NABL accredited laboratory for the period of Jul'20 to Dec'20

I. Ambient Noise Monitoring results (Jul '20 to Dec '20)

S.No	Location	Day Time Noise Level in dB(A)									
		Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Max	Min	AVG	STD Deviation
1	Main gate	68.3	69.2	68.7	69.4	69.7	68.9	69.7	68.3	69.0	0.50
2	Guest house	64.0	65.3	68.0	68.5	67.3	68.2	68.5	64.0	66.9	1.82
3	Ground hopper BF II	65.4	66.4	66.4	67.8	69.0	69.7	69.7	65.4	67.5	1.67
4	ASP I & II	67.8	65.0	67.6	65.2	66.8	65.2	67.8	65.0	66.3	1.29
5	Temp gate	68.0	66.8	66.2	67.0	65.9	67.0	68.0	65.9	66.8	0.73
6	New Reservoir	65.9	67.9	65.8	66.7	65.2	66.8	67.9	65.2	66.4	0.95
7	RS Gate	63.4	68.4	68.1	65.9	67.6	65.4	68.4	63.4	66.5	1.93
8	Raw water pump house	67.2	65.3	67.5	67.1	68.4	68.6	68.6	65.3	67.4	1.18
9	Railway Quarters	61.9	63.7	68.3	65.5	66.5	65.3	68.3	61.9	65.2	2.22
10	South East corner	65.1	67.0	65.9	67.3	67.1	68.1	68.1	65.1	66.8	1.07
11	Near rail end	67.5	65.1	67.4	68.6	69.3	68.5	69.3	65.1	67.7	1.48

S.No	Location	Night Time Noise Level in dB(A)									
		Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Max	Min	AVG	STD Deviation
1	Main gate	59.7	57.8	57.1	58.7	58.2	57.5	59.7	57.1	58.2	0.93
2	Guest House	56.4	54.6	56.4	57.3	56.9	56.0	57.3	54.6	56.3	0.93
3	BF II Ground hopper	57.2	56.9	55.9	56.6	58.7	58.2	58.7	55.9	57.3	1.04
4	ASP I & II	58.0	61.3	58.5	56.2	55.3	54.3	61.3	54.3	57.3	2.54
5	Temp gate	52.3	57.5	59.4	54.5	54.0	58.7	59.4	52.3	56.1	2.86
6	New Reservoir	55.9	59.0	54.6	55.9	54.6	55.9	59.0	54.6	56.0	1.61
7	RS Gate	57.3	56.2	58.0	54.1	59.5	56.1	59.5	54.1	56.9	1.85
8	Raw water pump house	56.8	54.7	59.3	60.4	59.1	57.8	60.4	54.7	58.0	2.05
9	Railway Quarters	54.1	52.8	61.2	58.8	57.4	59.2	61.2	52.8	57.3	3.21
10	South East corner	54.6	58.7	56.8	59.0	57.8	59.6	59.6	54.6	57.8	1.83
11	Near rail end	55.3	56.1	57.7	58.3	59.0	57.4	59.0	55.3	57.3	1.38

Standard limit for Ambient noise level at Daytime is 75 dB (A), Standard limit for Ambient noise level at Nighttime is 70 dB (A). The ambient noise level monitoring results are within the CPCB norms.

II. Source Noise Monitoring Results (Jul'20 to Dec'20)

S.No	Plant	Location	Unit	STD	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	AVG
1	SP-1	Mixing & Nodulizing Drum area	dB	90	86.8	86.0	86.7	85.5	85.9	86.4	86.2
2		Waste Gas fan area	dB	90	83.6	85.2	86.4	86.0	86.7	86.0	85.7
3		Cooling air fan area	dB	90	85.9	84.7	83.9	84.4	85.2	84.7	84.8
4		RMHS	dB	90	86.4	87.1	86.0	87.1	86.4	86.9	86.7
5	SP-2	Near de-dusting fan area	dB	90	83.1	83.9	84.1	83.3	83.8	83.1	83.6
6		Near circular cooler area	dB	90	86.0	86.5	85.8	86.6	85.5	86.6	86.2
7		Near Crusher house area	dB	90	84.6	85.4	84.6	85.2	86.3	86.8	85.5
8		Near waste gas fan area	dB	90	87.5	87.2	87.2	86.8	87.1	87.5	87.2
9		Product Screen House Area	dB	90	87.3	86.8	86.3	85.7	86.6	85.3	86.3
10	BF-1	Stock House area	dB	90	83.8	86.1	83.8	87.3	87.8	87.2	86.0
11		Furnace area	dB	90	86.9	87.4	83.1	86.1	86.4	87.5	86.2
12		Short Valve area	dB	90	84.2	85.6	81.7	85.5	84.1	84.8	84.3
13		GCP area	dB	90	85.0	85.9	86.6	87.9	87.0	85.9	86.4

S.No	Plant	Location	Unit	STD	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	AVG
14	BF-2	Blower house area	dB	90	81.9	82.4	85.9	84.2	85.3	86.6	84.4
15		GCP area	dB	90	86.0	84.8	86.2	83.5	83.1	83.9	84.6
16		Near Furnace area	dB	90	83.3	81.0	87.0	82.9	82.4	84.0	83.4
17		Stock house area	dB	90	87.2	85.9	84.9	85.0	86.5	85.7	85.9
18		Snort valve area	dB	90	83.2	84.7	86.4	86.4	86.9	86.1	85.6
19		PCI Inner area	dB	90	86.7	87.6	85.2	86.7	87.6	86.8	86.8
20	CPP-I	Near Boiler area	dB	90	87.4	87.7	87.0	87.5	87.9	87.0	87.4
21		Near Turbine area	dB	90	84.9	83.1	84.9	83.2	84.7	85.6	84.4
22		Near Condenser area	dB	90	84.5	85.6	86.4	86.9	85.4	86.8	85.9
23		Near ID fan area	dB	90	87.3	86.9	85.2	85.6	85.1	85.9	86.0
24	EOF-I	Near Furnace area	dB	90	86.8	86.0	86.8	86.0	87.3	87.5	86.7
25		Near ID fan area	dB	90	86.5	85.3	86.3	87.2	87.6	87.1	86.7
26	EOF-II	Near Furnace area	dB	90	85.0	86.8	87.4	85.5	84.8	82.9	85.4
27		Near ID fan area	dB	90	84.1	83.2	85.0	86.4	86.2	87.7	85.4
28	CCM	Near Tundish area	dB	90	86.9	87.4	86.9	85.3	86.0	84.5	86.2
29	LRF	Furnace area	dB	90	87.7	86.9	87.3	87.8	88.1	87.8	87.6
30	BRM	Near Furnace area	dB	90	83.4	82.1	83.6	83.0	83.9	84.5	83.4
31		Three High Rod mill area	dB	90	86.8	87.3	85.8	84.4	82.7	82.1	84.9
32		Near Blower area	dB	90	84.1	85.9	84.5	84.9	85.5	86.7	85.3
33	ASP-2	LOX Pump area	dB	90	86.3	85.4	85.2	86.7	86.3	87.2	86.2
34		Main Compressor House area	dB	90	84.9	84.2	83.0	84.4	85.8	85.3	84.6
35		Air Compressor area - Inner	dB	90	86.7	87.7	87.1	87.9	87.2	86.1	87.1
36	COP	Coke Cutter area - during operation	dB	90	87.0	87.8	87.4	86.5	86.0	87.0	87.0
37		Double duct screen house area	dB	90	84.9	85.3	86.8	85.2	84.7	86.1	85.5
38		Warf area	dB	90	86.8	86.2	85.5	85.0	85.9	87.0	86.1
39		Hammer Mill area	dB	90	86.1	87.0	86.1	86.9	86.2	86.8	86.5
40		Stamping Station Area - I	dB	90	87.3	87.7	87.3	86.1	87.5	87.9	87.3
41		Stamping Station Area - II	dB	90	85.5	86.4	86.9	87.8	88.1	88.4	87.2
42		Single Duct Screen	dB	90	82.0	85.3	83.7	85.4	86.8	87.7	85.2
43	BLM	UV Bag Inspection area	dB	90	88.4	88.6	88.0	88.4	88.7	89.3	88.6
44		Near CP-6 Hacksaw	dB	90	87.9	87.3	88.5	88.9	89.2	89.5	88.6
45		Near CP-5 Mill area	dB	90	85.6	88.0	88.3	88.7	88.0	88.8	87.9
46	CPP-2	Near Admin Building area	dB	90	78.0	77.5	75.9	76.4	77.4	75.0	76.7
47		Near STG building Inner area	dB	90	76.9	76.0	77.3	76.0	76.8	78.4	76.9
48		Near Turbine area - 1	dB	90	83.2	81.9	80.6	82.5	83.6	85.2	82.8
49		Near Cooling Tower area	dB	90	81.6	83.2	85.8	83.7	80.6	82.8	83.0
50		Near ID fan area	dB	90	84.3	83.7	84.4	81.9	82.5	81.3	83.0
51		Near Turbine area - 2	dB	90	85.4	85.1	85.7	84.3	85.3	86.7	85.4
52		Near ESP Area	dB	90	77.3	83.8	81.0	82.2	84.0	85.9	82.4

Annexure –G

Compliance status report for the CREP conditions

Annexure -G

Compliance status report for the conditions prescribed in the Corporate Responsibility for Environmental Protection (CREP) to our plant

S.No	Condition	Compliance status/Action taken
1	Coke Oven Plant: To meet the parameters PLD (% leaking doors), PLL (% leaking lids), PLO (% leaking off take) of the notified standards under EPA. To rebuild at least 40% of the coke oven batteries* in next 10 years by December 2012.	It is Non-recovery type coke oven and this requirement is not applicable.
2	Steel Melting Shop Fugitive Emission Status To reduce 30% by March 2004 and 100% by March 2008 (including installation of secondary de-dusting facilities).	SMS comprises of an Energy Optimizing Furnace wherein a "wet scrubbing system" comprising of a Down comer, quench chamber, venturi scrubber and cyclone separator and the cleaned gas sent through a chimney. The secondary steel making unit viz. Ladle Furnace is already equipped with a dry scrubbing system comprising of bag filters, belt conveyors and dust silo. The dust is being collected and reused in the Sinter Plant. Dedicated secondary dedusting systems are installed in EOF & LRF and fugitive emissions are significantly reduced.
3	Blast Furnace - Direct inject of reducing agents in blast furnace.	Pulverized Coal injection system installed and commissioned along with bag filter as an air pollution control measures (bag filter with stack) to reduce emission during direct injection. The rate of pulverised coal injection is increased and resulting in reduction of coke consumption in BF which leads to energy saving.
4	Solid Waste/Hazardous Waste Management Utilization of Steel Melting Shop (SMS) / Blast Furnace (BF) slag as per the following. <ul style="list-style-type: none"> • By 2004 – 70% • By 2006 – 80% and • By 2007 – 100% Hazardous Waste: - Charge of tar sludge/ETP sludge to coke oven by June 2003. - Inventorization of Hazardous waste as per Hazardous waste (M & H) Rules, 1989 as amended in 2000 and implementation of the rules by December 2003. (Tar sludge, acid sludge, waste lubricating oil and type fuel fall in the category of HZ).	All the Blast Furnace Slag is converted to Granulated slag and sold to cement industries. Flue dust from sinter plant, BF, SMS, sludge from BF & EOF and coke breeze from coke oven plant is re-used in sinter plant. Pellet plant is not installed in our operation. SMS slag is sent for metal recovery system and after crushing reused internal applications & sent cement industries. Refractories are selected to withstand high temperature whose shelf life is longer and generation of used refractories are lesser. The same will be recycled in downstream applications and also sold to customers involved with recycling and the disposal is in environment friendly manner. Our coke oven plant is non-recovery type and hence Tar sludge & ETP sludge is not applicable. The waste oil and other hazardous wastes generated is being disposed to authorized vendors as per the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.
5	Water Conservation / Water Pollution - To reduce specific water consumption to 5 m ³ / t for long products and 8 m ³ / t for flat products by December 2005.	We are presently manufacturing only long products and our specific water consumption is well within the prescribed limit
6	Installation of continuous stack monitoring	There are 29 nos. of Process stacks. Dust & Gaseous emission monitoring systems are installed as per CTO condition and the real time data of SPM, SO ₂ & NO _x are transmitted to the Care Air Centre of TNPCB and CPCB servers. There are 26 nos. of Non-process stacks. Dust emission monitoring systems are installed as per CTO condition and the real time data of SPM are transmitted to the Care Air Centre of TNPCB and CPCB servers. Apart from the above, TNPCB is conducting bi-annual survey and Manual monitoring is being conducted by a NABL accredited external laboratory on a monthly basis. The monitoring results are well within the permissible limits.

S.No	Condition	Compliance status/Action taken
7	The unit shall operate the existing pollution control equipment efficiently and to keep proper record of run hours, failure time and efficiency with immediate effect. Compliance report in this regard be submitted to TNPCB every three months.	The existing pollution control equipments are being operated efficiently and proper records are maintained for running hours, failure time and efficiency. Any failure leads to APC is resulted exceedance alarm from TNPCB server and justification alongwith corrective action reports are being submitted to TNPCB on monthly basis.
8	To implement the recommendations of Life Cycle Assessment (LCA) Study sponsored by MoEF by December 2003.	Complied.
9	<p>The industry will initiate the steps to adopt the following clean technologies/measures to improve the performance of industry towards production, energy and environment.</p> <ul style="list-style-type: none"> ✓ Energy recovery of top blast furnace (BF) gas. ✓ Use of tar-free runner linings. ✓ De-dusting of cast house at tap holes, runners, skimmers ladle and charging points. ✓ Suppression of fugitive emissions using nitrogen gas or other inert gas. ✓ To study the possibility of slag and fly ash transportation back to the abandoned mines, to fill up the cavities through empty railway wagons while they return back to the mines and its implementation. ✓ Processing of the waste containing flux & ferrous wastes through waste recycling plant. ✓ To implement rainwater harvesting. ✓ Reduction of green house gases by, <ul style="list-style-type: none"> • Reduction in power consumption. • Use of by-products gases for power generation. • Promotion of energy optimization technology including energy audit. • To set targets for resource conservation such as raw material, energy and water consumption to match International Standards. • Up-gradation in the monitoring and analysis facilities for air and water pollutants. Also to impart elaborate training to the manpower so that realistic data is obtained in the environmental monitoring laboratories. • To improve over all house keeping. 	<p>Our BF gas pressure (plant capacity is 0.683 MTPA only) is not adequate to install TRT.</p> <p>Our coke oven plant is non-recovery type and hence not applicable.</p> <p>The de-dusting system commissioned at BF-I & II cast house covering tap holes, runners, skimmers ladles and charging points.</p> <p>Water sprinkling system, Dry & Wet fog systems and the compressed air are used for suppression of fugitive emissions.</p> <p>Since we are purchasing raw materials from outside sources, it is not applicable.</p> <p>The waste containing flux & ferrous waste is utilized to the maximum extent possible in the sinter plant. 100 % of waste containing flux and ferrous is utilized in the plant.</p> <p>Three rain water harvesting ponds are provided. Two are in the plant premises and third one in township.</p> <p>Various initiatives and measures are being taken to reduce the GHG emissions and present level of GHG emission is 2.69 MT of CO₂/TCS. Major focus are being given to maximise the waste heat utilisation and resource conservation.</p> <p>To reduce the power consumption VFDs are being installed wherever possible. LED lights are installed to replace the sodium vapor lamps and many Kaizens are implemented to conserve power.</p> <p>By product BF gas is being used as fuel in Power Plant for power generation.</p> <p>All the upcoming projects are wetted to the best energy consumption through selection of equipments. Energy audit is being carried out and implementations are done in phased manner to minimize the energy consumption of GCal.</p> <p>Raw material, Energy and water consumption targets are being fixed as a key performance indicator and actions are being implemented to match the international standards through Best Available Technology.</p> <p>A separate Environment cell is already available and full-fledged lab set up and need based training is being imparted to the monitoring personnels as and when required. Presently the monitoring and analysis being done through M/s Green Chem Solution Pvt. Ltd. Chennai, certified by NABL.</p> <p>5S system is being followed to maintain and improve housekeeping throughout the plant. Due to the implementation, saving in area, inventory control, retrieval time period and standardization practices are well improved.</p>

Annexure –H

Copy of advertisement in local newspaper for EC
dated. 10.02.2020



NOTICE

We would like to inform you that the Ministry of Environment, Forest and Climate change accorded Environmental Clearance vide letter no. F.No. J-11011/281/2006-IA, II (I) Dated 10.02.2020 for the installation of 0.8 MTPA slag grinding unit and new facilities related to value addition and technological upgradation within the existing 1.3 MTPA capacity Integrated Steel Plant at JSW Steel Limited, Salem. The copy of Environmental Clearance is available at State Pollution Control Board and at MoEF&CC website: <http://environmentclearance.nic.in>. This is issued as per the directives of MoEF&CC.

JSW Steel Limited, Salem

வெள்ளிக்கிழமை, 14 பிப்ரவரி 2020

★★ தினமணி தருமபுரி 3

அறிவிப்பு

தி/வா. ஜே.எஸ். டபுள்யூ. எம்.எல்.லிமிடெட் நிறுவனத்திற்கு 0.8 MTPA எல்லாக் அரைக்கும் அலகு நிறுவதல் மற்றும் மதிப்பு கூட்டல் தொடர்பான புதிய வசதிகள் மற்றும் தொழில்நுட்ப மேம்பாடு வசதிகளை தற்போதுள்ள 1.3 MTPA திறன் ஒருங்கிணைந்த எஃகு ஆலைக்குள் நிறுவ சுற்றுச்சூழல், வனம் மற்றும் பருவநிலை மாற்ற அமைச்சகம் கடித எண். (F.No. J-11011/281/2006-IA, II (I) 10.02.2020 தேதியிட்டது) அனுமதி வழங்கி உள்ளது. மேற்காணும் விபரத்தை தமிழ்நாடு மாகாணகட்டுப்பாடு வாரியம் மற்றும் இணையதளம் <http://environmentclearance.nic.in> மூலம் தெரிந்து கொள்ளலாம். MoEF&CC அறிவுறுத்தலின் பேரில் இந்த அறிவிப்பு வெளியிடப்படுகிறது.

ஜே.எஸ். டபுள்யூ. எம்.எல்.லிமிடெட், சேலம்

Annexure –I

Copy of acknowledgement of EC copy submission to
Heads of local bodies & Panchayats

JSW Steel Limited



20th Feb 2020

The District Collector

Salem District

Dear sir,

We enclose herewith the environmental clearance letter dated 10-02-2020 issued by the Environment, Forest and Climate change (Impact Assessment Division), Government of India for the installation of 0.8 MTPA Slag grinding unit and new facilities related to value addition and Technological upgradation within the existing 1.3 MTPA Integrated Steel Plant premises by M/s JSW Steel Limited for your information please .

Thanking you,

Yours Truly,

For JSW Steel Ltd, Salem Works,

Brigadier S .Thakur (Rtd)

AVP (PR, Admin and Security)

Encl : EC for Slag Grinding Unit



Salem Works

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O P Jindal Group



JSW Steel Limited

Salem Works : P.O.Pottaneri,
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Website : www.jsw.in

20th Feb 2020

**The President
Pottaneri Panchayath
Pottaneri 636453**

Dear Madam,

We enclose herewith the environmental clearance letter dated 10-02-2020 issued by the Environment, Forest and Climate change (Impact Assessment Division), Government of India for the installation of 0.8 MTPA Slag grinding unit and new facilities related to value addition and Technological upgradation within the existing 1.3 MTPA Integrated Steel Plant premises by M/s JSW Steel Limited for your information please .

Thanking you,

Yours Truly,

For JSW Steel Ltd, Salem Works,

N. R.



Authorized Signatory,

Copy received
The Signy
கலைவர்
பொட்டனேரி ஊராட்சி,
மேச்சேரி ஒன்றியம்.



Part of O.P. Jindal Group

Registered Office : JSW Centre
Bandra Kurla Complex,
Bandra (East), Mumbai - 400 051.

Phone : +91 22-4286 1000
Fax : +91 22-4286 3000



JSW Steel Limited

Salem Works : P.O.Pottaneri,
Mecheri, Mettur - Tk,
Salem - Dt. Pin : 636 453
Tamilnadu, India.

CIN No : L27102MH1994PLC152925
GSTIN : 33AAACJ4323N1ZN

Phone : +91 4298 272000
Fax : +91 4298 272272
Website : www.jsw.in

20th Feb 2020

The President

M Kalipatty Panchayath

M Kalipatty 636453

Dear Sir ,

We enclose herewith the environmental clearance letter dated 10-02-2020 issued by the Environment, Forest and Climate change (Impact Assessment Division), Government of India for the installation of 0.8 MTPA Slag grinding unit and new facilities related to value addition and Technological upgradation within the existing 1.3 MTPA Integrated Steel Plant premises by M/s JSW Steel Limited for your information please.

Thanking you,

Yours Truly,

For JSW Steel Ltd, Salem Works,

N. R.



Authorized Signatory,

Received copy

P. H. W.
PANCHAYAT SECRETARY
M. Kalipatty Panchayat
Mecheri Union .



Part of O.P. Jindal Group

Registered Office : JSW Centre
Bandra Kurla Complex,
Bandra (East), Mumbai - 400 051.

Phone : +91 22-4286 1000
Fax : +91 22-4286 3000

Annexure –J

Report of ESC fund allocation & spent for the period
Jul'20 – Dec'20 with cumulative

Annexure -J

ESC - Fund Allocation & Spent (in Crs.)													
S.No	Description of activities	No's	Year I (Jul'17 to Dec'17)		Year II (Jan'18 to Dec'18)		Year III (Jan'19 to Dec'19)		Year IV (Jan'20 to Dec'20)		Year V	Total Rs . (in Crs)	
			Committed	Spent	Committed	Spent	Committed	Spent	Committed	Spent	Committed	Committed	Spent
1	Toilets	2000	0.50	0.32	0.75	0.19	0.75	0.04	0.50	0.00	0.50	3.00	0.55
2	Health center	1	0.25	0.00	0.25	0.00	0.25	0.22	0.25	0.25	0.00	1.00	0.47
3	Community hall	2	0.00	0.00	0.50	0.00	0.50	0.00	0.00	0.00	0.00	1.00	0.00
4	Hospital	1	0.50	0.00	0.50	0.00	0.50	0.00	0.25	0.25	0.25	2.00	0.25
5	Modern school New with GYM and Play ground	1	0.00	0.00	0.00	0.00	1.00	0.00	0.50	0.00	0.50	2.00	0.00
6	Watershed program	1	0.00	0.24	0.25	0.00	0.25	0.21	0.25	0.00	0.25	1.00	0.45
7	Water body strengthening/ Drinking water bore well drilling		0.00	0.00	0.25	0.20	0.25	0.20	0.25	0.23	0.25	1.00	0.63
8	Drainage		0.25	0.00	0.25	0.39	0.25	0.10	0.25	0.00	0.00	1.00	0.49
9	Government school improvement	1	0.00	0.47	0.25	0.34	0.25	0.17	0.25	0.02	0.25	1.00	1.00
Total			1.50	1.03	3.00	1.12	4.00	0.94	2.50	0.75	2.00	13.00	3.84
Note: At present many projects are under progress towards the ESC spent and the committed allocation will be completed as per the timeline													

Annexure –K

Details of APC measures provided in Steel & CPPII

Annexure -K

Details of Air Pollution Control measures provided in Steel & CPPII

Stack No	Stack attached to	Stack Type	Air Pollution Control Equipment (APC)
1	Sinter Machine (Sinter Plant I)	Process	ESP with stack
2	Cooling System (Sinter Plant I)	Process	Multicyclone with stack
3	Dedusting System (Sinter Plant I)	Non- Process	Bag Filters with stack
4	Dust Extraction System for RMHS (Sinter Plant I)	Non- Process	Bag Filters with stack
5	Hot Stove (Blast Furnace I)	Process	Stack
6	GCP Flare (Blast Furnace I) -Emergency stack	Non- Process, Standby - Emergency Stack	Venturi Scrubber with stack
7	Stock House Dedusting System (Blast Furnace I)	Non- Process	Bag Filters with stack
8	Dust Extraction System for RMHS (Blast Furnace I)	Non- Process	Bag Filters with stack
9	Cast house dedusting system (Blast Furnace I)	Non- Process	Bag Filters with stack
10	Power Plant Boiler 2 Nos. of 25 TPH each	Process	Common Stack
11	Energy Optimizing Furnace (SMS-I)	Process	Venturi Scrubber with stack
12	Ladle Furnaces (SMS-I)	Process	Bag Filters with stack
13	CCM1- Steam Exhaust system stack (SMS-I)	Process	Stack
14	Energy Optimizing Furnace (SMS-II)	Process	Venturi Scrubber with stack
15	Secondary dedusting system of Energy Optimizing Furnace I & II (Common stack)	Non- Process	Bag Filter with stack
16	Secondary dedusting system of Ladle Refining Furnace I to IV (Common Stack)	Non- Process	Bag Filter with stack
17	Ladle Furnaces 2,3,4 (Common Stack)	Process	Bag Filter with stack
18	Vacuum Degasing Unit (Boiler)	Process	Stack
19	CCM2 - Steam Exhaust system stack (2 Nos)	Process	Stack
20	Cut Fumes Exhaust System	Non Process	Stack
21	Reheating Furnace (Furnace -1 No - 1 Chimney) - BLM	Process	Stack
22	Reheating Furnace (Furnace -1 No - 2 Chimney) - BLM	Non Process (Air)	Stack
23	Coke Quenching Tower (Wet type)	Process	Grit Arrester stack
24	Coke Oven Chimney - I -Emergency stack	Process - Standby - Emergency Stack	Stack
25	Coke Oven Chimney - II -Emergency stack	Process - Standby - Emergency Stack	Stack
26	Coke Oven Chimney - III -Emergency stack	Process - Standby - Emergency Stack	Stack
27	Waste Heat Recovery Boiler - I	Process	Stack
28	Waste Heat Recovery Boiler - II	Process	Stack
29	Waste Heat Recovery Boiler - III	Process	Stack

Stack No	Stack attached to	Stack Type	Air Pollution Control Equipment (APC)
30	Waste Heat Recovery Boiler - IV	Process	Stack
31	Waste Heat Recovery Boiler - V	Process	Stack
32	BF Gas Fired Boiler	Process	Stack
33	Limekiln(Not in Operation) - Lime Calcining Plant	Process	Not in operation
34	Re-heating Furnace (Bar & Rod Mill)	Process	Stack
35	Intermediate Furnace (Bar & Rod Mill)	Process	Not in operation
36	Sinter Machine (Sinter Plant II)	Process	ESP with stack
37	Plant De-dusting and Cooling (Sinter Plant II)	Non- Process	ESP with stack
38	Crushing of fuel and Raw materials (Sinter Plant II)	Non- Process	Bag Filters with stack
39	Hot Stove (Blast Furnace II)	Process	Stack
40	GCP Flare (Blast Furnace II) -Emergency stack	Non- Process, Standby - Emergency Stack	Bag Filters with stack
41	Stock House Dedusting & RMHS (Blast Furnace II)	Non- Process	Bag Filters with stack
42	Cast house dedusting system (Blast Furnace II)	Non- Process	Bag Filters with stack
43	Pulverised Coal Injection (Blast Furnace)	Non- Process	Bag Filters with stack
44	625 KVA (DG set)	Non- Process -Emergency stack	Stack
45	625 KVA (DG set)	Non- Process -Emergency stack	Stack
46	625 KVA (DG set)	Non- Process -Emergency stack	Stack
47	Steam Exhaust System (CCM-3)	Process	Stack
48	1250 KVA (DG set)	Non- Process -Emergency stack	Stack
49	Pickling Plant- Acid Fumes exhaust system stack	Non- Process	Wet scrubber with stack
50	Pickling Plant- Acid - Hot water Generator Stack	Process	Stack
51	Pickling Plant- ARP - Hot water Generator Stack	Process	Stack
52	Pickling Plant- MEE – Thermic fluid Heater Stack	Process	Stack
53	Coal fired Boiler (127 TPH)	Process	ESP with stack
54	Coal crusher house	Non- Process	Bag filters with stack
55	Coal screening section	Non- Process	Bag filters with stack
56	Raw material transfer & discharge point	Non- Process	Bag filters with stack
57	Flyash storage silo	Non- Process	Bag filters with stack
58	Bottom ash storage silo	Non- Process	Bag filters with stack
59	DG set 500 KVA	Non- Process -Emergency stack	Stack

Annexure –L

Details of greenbelt development

Annexure -L
Details of Greenbelt Development

Sl.No.	Period	Quantity
1	1997 - 99	30600
2	1999 - 00	15000
3	2000 - 01	20000
4	2001 - 02	4940
5	2002 - 03	10400
6	2003 - 04	13400
7	2004 - 05	100
8	2005 - 06	1100
9	2006 - 07	200
10	2007 - 08	4395
11	2008 - 09	5120
12	01.04.2009 to 30.06.2009	820
13	01.07.2009 to 31.12.2009	2240
14	01.01.2010 to 30.06.2010	5590
15	01.07.2010 to 31.12.2010	9250
16	01.01.2011 to 30.06.2011	4000
17	01.07.2011 to 31.12.2011	4930
18	01.01.2012 to 30.06.2012	3700
19	01.07.2012 to 31.12.2012	5500
20	01.01.2013 to 30.06.2013	2410
21	01.07.2013 to 31.12.2013	3300
22	01.01.2014 to 30.06.2014	6300
23	01.07.2014 to 31.12.2014	7300
23	01.01.2015 to 31.06.2015	9600
24	01.07.2015 to 31.12.2015	10000
25	01.01.2016 to 30.06.2016	1400
26	01.07.2016 to 31.12.2016	4600
27	01.01.2017 to 30.06.2017	700
28	01.07.2017 to 31.12.2017	3250
29	01.01.2018 to 30.06.2018	3650
30	01.07.2018 to 31.12.2018	11385
31	01.01.2019 to 30.06.2019	4490
32	01.07.2019 to 31.12.2019	5864
33	01.01.2020 to 30.06.2020	5660
34	01.07.2020 to 31.12.2020	14466
Total		235660

Annexure –M

Report of CSR activities for the period of
Jul'20 – Dec'20 with cumulative

Annexure -M
Report of CSR activities for the period Jul'20 to Dec'20 with cumulative.

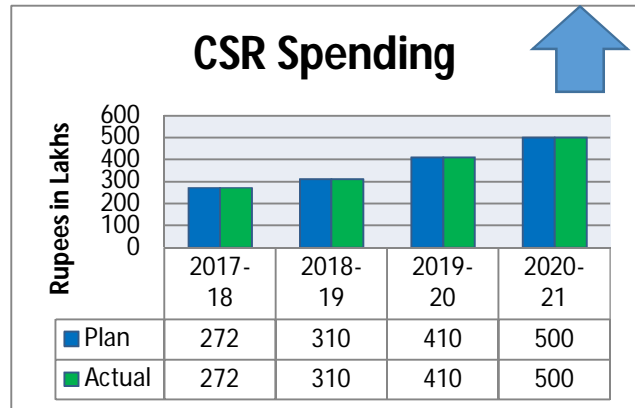
CSR Report

Background

JSW Steel Ltd., Salem Works is committed to improve the quality of life of surrounding community through Corporate Social Responsibility (CSR) programmes. We have a well laid down community development program under CSR. Our focus is on

- Health
- Education
- Environment
- Women Empowerment
- Sports and
- Rural Development.

People in Pottaneri, M.Kalipatti, Kuttapatti, Viruthasampatti and Gonur Panchayats and Mecheri Town are covered under CSR projects. Our CSR spending for the financial year 2020 is Rs. 4.10 crores and financial year 2021 is Rs. 5.00 Crores.



HEALTH

JSW Salem conducts various health camps and hand-washing awareness in villages. Under malnutrition eradication drive, JSW Salem conducts pediatric health camps in 20 government anagawadi centres on a regular basis covering more than 1000 children from the surrounding villages.



The Covid-19 pandemic has brought huge changes for people health. To reduce the risk of outbreaking emergence cases the JSW Steel, Salem CSR donated Rs. 8 Lakhs, eight-seater battery operated car with stretcher to the Government Kumaramangalam Medical College and Hospital, Salem on 30th May 2020. The battery car used for patients' mobility, an emergency from one ward to other ward or any other place.



Covid-19:

1. Awareness Campaigns in surrounding villages- 7479 households/32941 Individuals
2. Basic screening in surrounding villages –3500 Households /15000+ individuals
3. Provided N95 Masks (500) and PPE kits (200) to the GHs.
4. Sanitized with disinfectant spray in surrounding villages.



Covid-19 pandemic has brought life to a standstill all over the world. In India, a nation-wide lockdown has been enforced to control the spread of the disease. It's not startling that, this pandemic have pushed person with differently abled (PWD) are into more vulnerable conditions. And these families are facing acute poor health and inability to afford their meals. Hence in order to meet their day-to-day needs we have distributed 400 grocery kits worth of Rs.8,00,000 to person with disabilities families belong to Pottaner, M.Kallipati, Virudhasampatti, Kuttapatti and Kuinjandioor Panchayats. We have covered through this intervention 5 panchayats and 40 villages. Most importantly through this intervention we could control undernourished among PWD communities.



JSW Salem contributed towards upgradation of surrounding Primary Health Care Center. The Nangavalli PHC is functioning with 30 beds and gives best treatment for more than 11,128 patients per month. 24*7 delivery services are providing, on monthly basis 30 deliveries are done. More than 350 antenatal mothers are visiting for check-up every month and 200 scanning is being done. As requested by the block medical officer of Nangavalli, we have sponsored advanced ultrasonic machine, printer and water purifier considering number of patients accessing the PHC, we have sponsored worth of Rs. 7,00,000/-



Ensuring safe drinking water is one of our major interventions. In fulfillment of our vision we have been providing last six years safe drinking water to surrounding villages through tankers and installing RO plants. In addition to that we have installed seven water purifier worth of Rs.4,13,000/- at block development office (2), surrounding government schools (3), primary health centers (1) and Early Intervention center (1). As the ground water is not potable, we have started to install two Reverse Osmosis (RO) Plants in two panchayats (M.Kalipatti and Virudhasampatti) at a cost of around Rs. 6 lakhs each. Through this intervention every year 10,000 people are getting benefited.



ENVIRONMENT

Greening Initiative: JSW supported ISHA nursery for raising 3,00,000 saplings. 5000 trees were planted in the lands of surrounding villagers on 5th June to mark the "World Environment Day".



Agri-business Promotion through Farmer Producer Companies: Building on the relationship JSW Salem had with the farmers in the surrounding villages, a new project is being implemented in the villages. The farmers in the M.Kalipatti and Kuttapatti panchayats are organized into farmer interest groups and a Farmer Producer Company has been registered. The company will help the farmers to market their produce and get a fair share of profits. So far, 2000 farmers are organized. Soil testing, mushroom & honey bee cultivation, bee keeping, organic farming practices etc., are demonstrated in the villages. One more Farmer Producer Company is being promoted in Gonur panchayat with the watershed farmers.



WOMEN EMPOWERMENT

Talioring: We have trained women groups in tailoring and leather gloves making, taken them to garment industries to give them exposure about the market. We have placed orders on self-help women's groups for stitching safety reflective jackets for use in the plant.



Gonur Watershed Programme

Various Soil and water conservation measures like field bunds, farm ponds, loose rock check dams etc., were implemented in seven villages of Gonur Watershed. We have covered 218 acres of land with 125 new farmers in these villages. Officials from NABARD visited the watershed to give technical recommendations as well as to monitor the ongoing programmes.



Community development

Haqdarshak: Haqdarshak project being implemented in 16 villages. We have facilitated around 300 citizens to avail Govt. Schemes through Haqdarshak under various 35 Government Schemes. And conducted 3 camps in different panchayat locations.

To make available and easy accessible all government schemes, people belong to 4 panchayats (Pottaneri, M.Kalipatti, Virudhasampatti and Kuttapatti), we have taken effort to reach out and support community to avail required documents like widow certificate, aadar, pan cards, insurances, name corrections, old age pension, bank account opening and so forth. Through this community development program we have supported 13,000 needy people in their village itself. Especially through this development program majority people we have covered is elderly people and school students.



CER Report

Mettur ITI Support

Being an enduring sponsor for Govt. ITI, Mettur Dam, we have been providing needed support every year. In order to make the Mettur ITI students to excel in Sports activities and to participate in Zonal level sports meet, we have contributed sportswear to hundreds of students to Mettur ITI worth of Rs. 54, 000



Education sector - School Renovation Work

We have renovated the Government Panchayat Union Primary School (1st to 5th) at Pichaikaranur. At present 40 students have enrolled and pursuing their education. Our intervention would support to increase an enrollment and created safe environment to young children. The school renovated with worth of Rs. 8, 50,000/-



Education Support – Smart Board to School

To ensure interactive learning experience of students, Technology support is necessary. We have offered a smart board with advanced technology worth of Rs. 1, 75, 000 to the Railway School, Salem which can provide them with an enriched learning experience by projecting visual elements during Jan 2020



Health Support – COVID 19

JSW envisioned the prominent need of this Pandemic Situation. To alleviate COVID 19 fatalities, life supporting ventilators are needed. Based on the request from District Administration, we have donated 5 well equipped ventilators total worth of 25 lakhs to the Government Hospital, Salem.



Covid-19 Relief Support – Ration to 400 families

JSW donated relief materials worth of Rs.1100000 to Pottaneri and M Kalipatty panchayat on 18th of May 2020 through which 4000 families benefitted. Each bag consists of 5 Kg rice, Half KG Dhal and Half liter oil.



Health Care – Sponsored Masks & PPE Kits

Covid-19 pandemic has brought life to a standstill all over the world. To control the spread of the disease everyone urged to wear mask. Wearing mask is normal part of being nowadays and found as one among simple precautions to save the lives. Hence we have provided 20,000 woven masks to the Salem district, 500- N95 masks and 600- PPE kits to frontline workers of Government Hospital, Salem worth of 3, 00,000 on Sep 2020.



Health Care Center Support - Advanced Printers Sponsored

We sponsored three advanced printers worth of 60,000/- to Lower-Mettur, Upper-Mettur and Sandhadhanampatti Employees' State Insurance (ESI) hospitals. These hospitals are providing immense services to surrounding people. On an average 350 people are accessing in a day these hospitals; especially huge number of JSW associate employees are frequently visiting those hospitals



Water supply through Tankers during summer & Water supply through Tap

Due to insufficient water supply by Panchayat during Summer, JSW started supplying water through tankers only during summer time. Rs . 6,60,000 spent during Mar to June 20 for this .

Based on the request from Local People, JSW has additionally put two taps along the south side of the compound wall, through which water will be supplied for four hours. The cost for laying of pipe and tap was 4,00,000.



Push Cart and Dust Bins

To effectively manage the waste disposal in community, based on the request from Block Development Officer, Mecheri, JSW donated 20 push carts and 120 dustbins worth of 7,88,000 to all the 18 panchayats.



Support to Sub-Collector and Tahsildar Office

JSW donated advanced printer and projector to Sub-Collector and Tahsildar office at Mettur taluk on (date to be mentioned) worth of 1,20,000/-. Through this intervention we developed good rapport with the government officials of Mettur Taluk and community members whoever is accessing are getting benefits



Steel Racks Sponsored to BEO and Annai Theresa Charitable Trust

Block Educational Officer and Director of Annai Theresa Illam has requested us to provide steel racks to keep of entire block teachers and students records and keep cloths of orphanage children. We have provided steel racks worth of Rs.1,00,000/- to block Educational Office and Annai Theresa Illam. Annai Theresa Charitable Trust is running with 35 orphan children and 9 abandoned old age people. The Block Educational Office is maintaining records of 84 schools of last 40 years.



Community Development – Bus Shelter

JSW sponsored to construct the bus shelter near to our temple gate total worth of 12,60,000/-. Many local people are waiting near temple gate to board the buses after the office hours. This initiatives ensures people's safety while waiting outside of our gate. The same we have received approval from the Salem district collector.



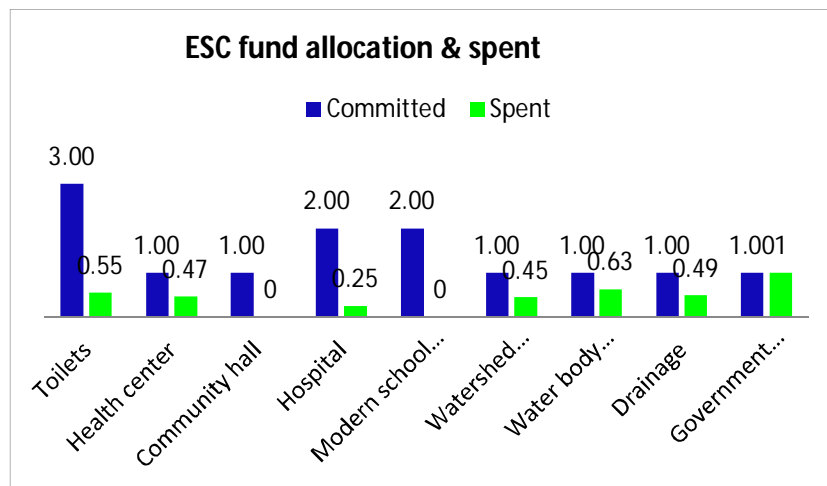
Children's Park at Mettur Taluk

In order to create good fabricated play field to young children of sanitary workers quarters area at Mettur municipality. We have developed a greenery and play field (children's park) with all kinds of play materials at Mettur worth of Rs.10,00,000/-



Rural Development – Street Light

To create safe and comfortable circumstance for community member during night time especially considering women's safety. We have sponsored 120 street lights, poles, luminaries' and electrical boxes to the Pottaneri Panchayat on 29th Oct 2020 Worth of 8,00,000/-



Awareness Creation through Banners:

To create awareness among people in Salem District, JSW printed various awareness creation banners on COVID 19 and displayed in various prominent places of city and villages. Rs.55 ,000 spent for this activity.



Annexure –N

Cost details of capital & recurring cost for pollution control measures for phase –I expansion activities

Annexure -N

Cost details of capital & recurring cost for pollution control measures for phase –I expansion activities

I. Capital cost of pollution control & monitoring measures (From FY18 to 31.12.2020)

ENVIRONMENTAL POLLUTION CONTROL							ENVIRONMENTAL & POLLUTION MONITORING		
Sl.No	Expansion activity	Air pollution Control	Water pollution control	Solid waste Management	Noise Control	Occupational Health	Env't.Survey and sampling	CSR	Green belt
1	COP - Coal storage yard Dust suppression	0.00	0.00	0.00	1.39	0.00	0.00	0.00	0.00
2	COP - Noise control	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Wagon tippler dust suppression systems	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Sinter plant dust suppression systems	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	BF#1 augmentation	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00
6	BF#2 augmentation	12.40	0.50	2.00	0.59	0.00	0.00	0.00	0.00
7	Blast furnace dust suppression systems	2.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	EOF #1 capacity 45 to 65 T	3.82	2.09	0.00	0.00	0.00	0.00	0.00	0.00
9	LRF#1 capacity 45 to 65	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	CCM#3	0.79	4.45	0.00	0.00	0.00	0.00	0.00	0.00
11	Blooming Mill augmentation(0.36 to 0.48)	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00
12	BRM augmentation (0.40 to 0.48 MTPA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Pickling & Annealing plant (0.06 MTPA)	1.61	10.73	0.30	0.00	0.00	0.00	0.00	0.00
14	Peeled and ground (0.04 MTPA)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	CPP-II - Coal storage yard Dust suppression	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	CPP II - Unit # 3	0.00	18.66	0.00	0.02	0.00	0.00	0.00	0.00
17	Civil (concrete road)	5.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	Utility (Sweeping machine)	1.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	Tyre washing unit	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Shredder machine	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
21	Biogas plant	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
22	OHC	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00
23	Env't.Survey and sampling	0.00	0.00	0.00	0.00	0.00	2.75	0.00	0.00
24	Plant STP renovation	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00
25	Rain Water Harvesting pond capacity enhancement	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00
26	CSR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	Greenbelt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60
Total Rs. In Crs		31.01	36.95	2.37	2.46	0.18	2.75	0.00	0.60
Commitment Rs. In Crs (as per EC)		30.0	0.0	10.0	2.0	3.0	5.0	0.0	0.50

II. Recurring cost/annum

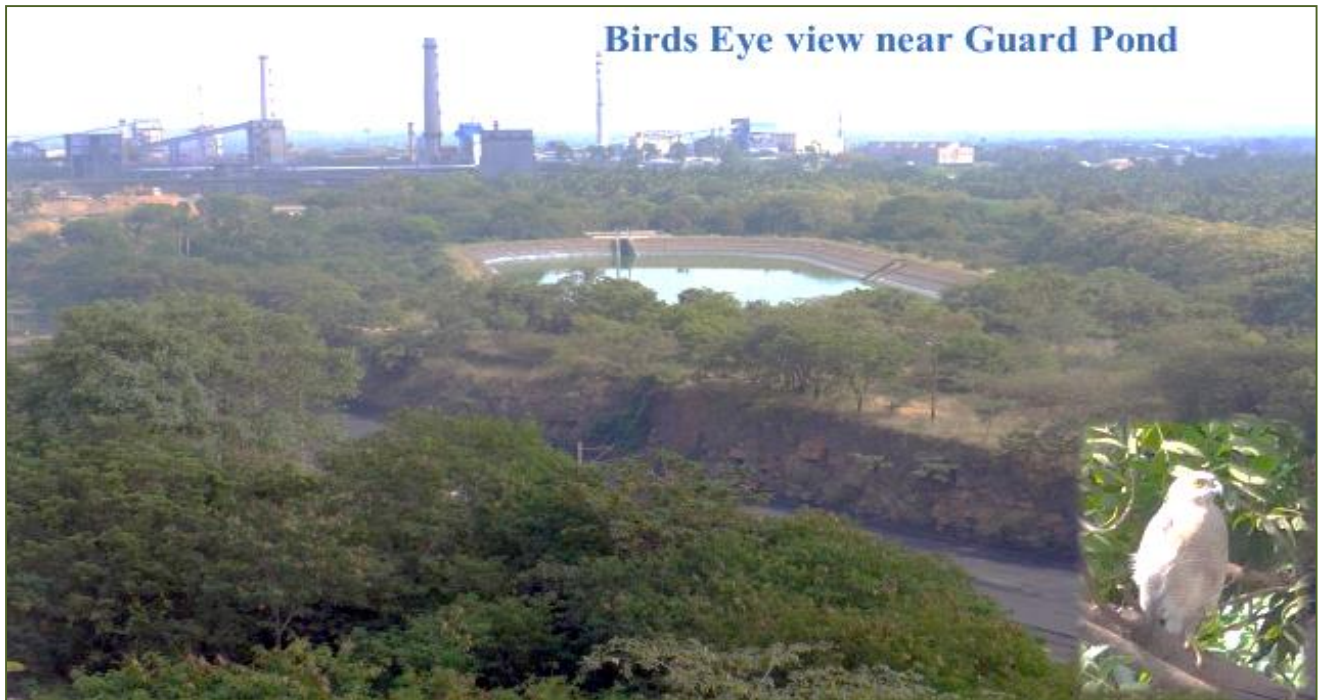
ENVIRONMENTAL POLLUTION CONTROL							ENVIRONMENTAL & POLLUTION MONITORING		
Sl.No	PLANT	Air pollution Control	Water pollution control	Solid waste Management	Noise Control	OHC	Environmental survey & Sampling	Social Corporate Responsibility	Green belt development
1	Coke oven plant	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Sinter plant	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	BF#2	0.82	0.52	0.21	0.005	0.00	0.00	0.00	0.00
4	EOF #1	1.05	0.33	0.11	0.00	0.00	0.00	0.00	0.00
5	LRF#1	0.52	0.15	0.15	0.00	0.00	0.00	0.00	0.00
6	CCM#3	0.15	0.73	0.10	0.00	0.00	0.00	0.00	0.00
7	BRM augmentation	0.03	0.60	0.70	0.005	0.00	0.00	0.00	0.00
8	Blooming Mill augmentation	0.03	0.30	0.79	0.005	0.00	0.00	0.00	0.00
9	Pickling & Annealing plant	0.33	1.90	0.29	0.00	0.00	0.00	0.00	0.00
10	Peeled and ground	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
11	CPP II - Unit # 3	0.00	0.14	0.00	0.005	0.00	0.00	0.00	0.00
12	OHC	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
13	Environmental survey & Sampling	0.00	0.00	0.00	0.00	0.00	1.19	0.00	0.00
14	Corporate Social Responsibility	0.00	0.00	0.00	0.00	0.00	0.00	1.70	0.00
15	Greenbelt development	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75
Total Rs. In Crs		2.93	4.67	2.38	0.02	0.20	1.19	1.70	0.75
Commitment Rs. In Crs (as per EC)		4.00	0.00	1.00	0.20	0.30	0.50	2.00	0.05

Annexure –O

Carbon sequestration report – FY21

CARBON SEQUESTRATION STUDY REPORT

March -2021



for

M/s. **JSW Steel Ltd,**
Salem Works.

Site Location :
Pottaneri P.O., Mecheri, Mettur Taluk,
Salem District-636 453, Tamil Nadu, India

by

Green Global Safety Systems
43/7b, Senthil Nagar, Chinna Kodungaiyur ,
Chennai -600051, Ph: 91-8248885428
A Lead Environmental Pollution Control and Prevention Consultants.

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PART - A

I. Preface

M/s. JSW Steel Ltd, Salem Works, Pottaneri P.O., Mecheri, Mettur Taluk, Salem District- 636 453, Tamil Nadu, India offered an opportunity to M/s. Green Global Safety Systems, Chennai to conduct the Carbon Sequestration Study to evaluate the Contribution of the trees for carbon Sequestration in their Steel Manufacturing facility. Upon the requirement and the Purchase order issued to us, a Comprehensive study was carried out and the final report is submitted.

Disclaimer

We have performed study on Carbon Sequestration by the Existing Green Belt and the report submitted is not deemed to be any undertaking, warranty or certificate.

Place : Chennai

M.MEGANATHAN MIE, DIS, Ph.D Scholar–Safety

Date : 09.04.2021

ME, Environmental Engineering , Lead Auditor –ISO 14001: 2015 , Accredited Safety Auditor by Govt of Tamilnadu & Kerala Chartered Engineer & International PHA Specialists.

II. Introduction

Carbon sequestration

What is Carbon Sequestration :- Carbon sequestration means capturing carbon dioxide (CO₂) from the atmosphere or capturing anthropogenic (human) CO₂ from large-scale stationary sources like power plants before it is released to the atmosphere. As Per CPCB ,India

Once captured, the CO₂ gas (or the carbon portion of the CO₂) is put into long-term storage. CO₂ sequestration has the potential to significantly reduce the level of carbon that occurs in the atmosphere as CO₂ and to reduce the release of CO₂ to the atmosphere from major stationary human sources, including power plants and refineries. There are two major types of CO₂ sequestration: terrestrial and geologic.

Terrestrial

Terrestrial (or biologic) sequestration means using plants to capture CO₂ from the atmosphere and then storing it as carbon in the stems and roots of the plants as well as in the soil.

Geologic

Geologic sequestration is the method of storage that is generally considered for carbon capture and storage (CCS) projects. CCS is the practice of capturing CO₂ at anthropogenic sources before it is released to the atmosphere and then transporting the CO₂ gas to a site where it can be put into long-term storage. (Pacala & Socolow 2004). The rapid urbanization of cities in India has led to over exploitation of natural resources, exponential increase in pollution, and accumulation of greenhouse gases in the atmosphere.

Carbon emission due to deforestation and use of fossil carbon has brought forests to the center-stage of climate change mitigation strategies. As per MoEF (2014), India has a spatial extent of the urban tree cover on 12,790 Km² (16.40 %) out of the total urbanized area of 77,997 Km² as on 2013. The National Forest Policy, 1988 envisions average forest and tree cover of 33 % for the plains and 66.66 % for the hilly areas of the country.

There is an urgent need for the planned development of the urban areas to present the picture of green and clean cities with adequate forest & tree cover, parks, lakes, wetlands, urban biodiversity, nature education centers, etc.

M/s. JSW Steel Ltd, Salem Works, Pottaneri P.O. , Mecheri, Mettur Taluk, Salem District- 636 453, Tamil Nadu, India have organized for the Carbon Sequestration by Plants and conducted by our team of M/s. Green Global Safety Systems, Chennai.

The detailed report of Carbon Sequestration by Plants is presented in this booklet for M/s. JSW Steel Ltd, Salem Works.

III. Study Team Profile

Lead Environmental Expert

1. NAME AND DESIGNATION:

- Name : M.MEGANATHAN. ME.,MIE.,AMIE.,DCT.,DIS.,BOC.,.
- ME –Environmental Engineering
- Designation : Lead Environment Expert
- ISO 14001:2015 Lead Auditor –Environmental Management Systems
- Expert in Environment Dispersion Modeling –Internationally approved Software

2. RELEVANT QUALIFICATIONS:

- ME-Master of Environmental Engineering
- AMIE in Chemical Engineering
Diploma in chemical Technology Diploma in Industrial safety
- Accredited safety auditor – Govt of India and Tamilnadu
- Competent person of Boilers – A CLASS
- Trained HAZOP Leader - Certified by China risk management
- Chartered Engineer by Institution Engineers India

3. WORK EXPERIENCE:

- Total Year of Industrial Experience : 23 years of Industrial Exposure in Various disciplines.

M/S. Madras Chlor-Alkalis Ltd , Chennai.

M/S. Southern Chlor-Alkali industries Ltd, Manali

M/S. Tamil Nadu petro Products Ltd, TIDCO, Manali.

M/S. Dalmia Cement Bharat Ltd , Trichy

M/S. GE – Momentive performance materials India pvt Ltd (MNC)

M/S. Piramal Pharmaceuticals ,Ennore,Chennai -68.

4. RESPONSIBILITIES INCLUDED:

Environmental Studies, EIA ,Quantitative Risk Analysis as per the EIA Notification Guidance , Conducted Safety audits, Risk assessments, Training on Safe Handling Chlorine system, Construction safety system, Behavior Based Safety system a modern approach etc.

As Process Safety Specialist we have conducted PHA (Process Hazard Analysis) for two project- Plant erected and commissioned and running with full rated capacity.

4.1 PLANT SAFETY:

- Having Experience in water quality Analysis, Air quality, Confined Vessel Entry, Explosive atmosphere, Ventilation in Lab Hoods analytical equipments and techniques
- Experienced in Hydraulic testing of Chlorine cylinders and conducting physical and internal inspection of the cylinders and clearance for filling / Rejection.
- Hydraulic testing of Pipelines after erection and report preparation.
- Experienced in operation and maintenance of Belt conveyors, Screw convey, Bucket elevators ,Pipe conveyors and Pneumatic conveyors
- Working experience in Thermic fluid Heaters of make Thermax Ltd
- Experienced in Hydrogen fired Boiler of make Thermax Ltd.
- Having experience in Solvent separation unit in pharmaceuticals and specialty chemical plants
- Working Experience Operation and maintenance of Centrifugal machines

4.2 ENVIRONMENT SAFETY:

- Activities towards Compliance to the Environmental Statutory Requirements like
 1. Consent Order for Existing / Expansion Projects
 2. Environmental Clearance from MoEF&CC, CPCB, TNPCB.
 3. Environmental Impact Assessment (EIA),
 - 3.1 It Involves Prefeasibility study
 - 3.2 Quantitative Environmental Risk assessment
 - 3.3 Environmental report
 - 3.4 Socio Economic conditions
 - 3.5 Air & water quality modeling
 - 3.5.1 Gaussian Model
 - 3.5.2 Noise Level reports and mapping
 - 3.6 Climatic
 - 3.7 Human Interface study
 - 3.8 Evaluation of Env Impacts
 - 3.9 setting an Environment Management Plan
 4. Public Hearing
 5. Participation in MoEF & CC Meetings
 6. Hazardous and Non Hazardous Chemicals Management,
 7. Transportation of hazardous Chlor-Alkali substances
 8. Waste management of Solid, liquid and gaseous materials.
 - 8.1 Disposal methods of Haz waste and procedures
 - 8.2 Compliance requirements

5. SPECIFIC TOOLS AND EQUIPMENT USED:

Toolbox Talk, JSA, HAZOP, ENVID, Incident Investigation System, Gas Testing, PTW-Auditing, SCBA, Scaffolding Appreciation, Safe Journey Management, Safe Defensive Driving, Basic Life Support, Fire Warden on Emergency & Evacuation Drills, Fire Extinguisher, Fire Alarm, Fire Hydrant and Automatic Sprinkler system.

6. SPECIFIC STANDARDS USED:

IS 14489, Fact act -1948, Tamilnadu Factories rules 11950 MOEF, CPCB, TNPCB, OSHAs, EPA, RCRA, CERCLA, BIS. National Building Code, Tariff Advisory committee Etc..

7. PROCESS SAFETY MANAGEMENT RESPONSIBILITIES:

In charge of HSE Dept / Process Commissioning for Chlor alkali Plant, LPG, Benzene, octane, heptane, Methanol, Diesel, and Furnace oil loading and unloading areas, Effluent Treatment Plant, Occupational Health & Training center HSE Achievements. Erection and Commissioning of Automatic Sprinkler system to 100 MT Storage of LPG Bullet (2 Nos) and Fire Hydrant System to petro-chemical and chlor alkali plant at given time schedule on Jan 2002. Basic HSE Induction Training to 2000 Manpower.

8. HSE ACHIEVEMENTS:

- Number accident free man days maintained up to 12 years continuously
- 5 star awards
- national safety awards
- consecutive national safety council awards
- British safety council awards
- ISO-9001 certificate
- ISO-14001 :2015 certificate – Lead Auditor
- Working with ISO 45001: 2018
- No of Internal safety audit conducted is approx 200.

9. HSE CERTIFICATES

- Ist Class Boiler Safety –Insp. Of Boilers-India
- HAZOP Leader – China –RISK MANAGEMENT SOLUTIONS
- DGFASLI – Govt of India Trained Safety auditor
- IRCA accredited LEAD AUDITOR FOR ISO 14001 -2004
- Certified Internal Auditor for ISO 9001
- First aid – St john Ambulance – Cent Govt of India

10. EHS SOFTWARE KNOWLEDGE:

- Process Hazard Analysis : HAZOP ,FMEA,FTA,SOP-Leader Software (ABS USA)
- Environmental Risk Assessments – 3MRA Software – EPA (USA)
- Noise mapping – Custics software –Spain
- Quantitative Risk estimation – ALOHA Software (EPA –USA)
- Piping – Pipe flow Expert Software –UK

11. OTHER CERTIFICATES:

- Safety Training Programme –By Insp.Of. Factories-Tamilnadu-India
- First Aider – St John Ambulance –India
- Ms-Office- 2000 – NIIT – India

12. PROFESSIONAL MEMBERSHIPS

- National Safety Council- Member-India
- Safety Engineers Association – Member-Tamilnadu
- Indian institute of Engineers (India)– Associate – Calcutta
- Safety Auditors Association of India -SAAI – Moderator
- Indian safety Engineers(ISE) – Member
- Chartered Engineer – In progress with IEI-India
- Industrial Waste management Association – Member -2010

Study Team Member ----- 01

- Name : Mr.Kamalakannan - Environmental Specialist
- Designation : Study Team member of Green Global Safety System

Study team member ----- 02

Mr. Vignesh - Environment Assistant

Study Team Member ----- 03

Mr. Sivanesh Mani - Environmental Specialist

Study Team Member ----- - 04

Mr. Designuraja -Environmental Specialist

IV .Executive Summary

- ✓ As part of comprehensive Carbon Sequestration by green belt Study Report, M/s. JSW Steel Ltd, Salem Works located at, Pottaneri P.O., Mecheri, Mettur Taluk, Salem District-636 453, Tamil Nadu, India, have the commitment and attitude towards the Pollution Control and Prevention management system.
- ✓ Total Carbon Sequestration by the Green Belt is 3,776 MT during FY 2020-21. There is an increase in quantity of carbon Sequestration when compared with FY 2019-20 and there is a considerable Contribution in carbon sequestration by Tree Plantations at JSW, Salem plant. However, scope for improvement in planting trees is existed.
- ✓ Total Carbon dioxide emission by the integrated steel plant operation in the year 2020-21 is about 26,37,297 MT (Steel Production 9,49,569.324 MT) .
- ✓ Total quantum Carbon Sequestration by the Existing Green Belt in the Year 2020-21 is 3,776 MT.
- ✓ Proposed green belt to the FY 2021-22 is 15000 Tree saplings.
- ✓ Organization have been continually striving to control and prevent air pollution by effective implementation of Environmental Management Systems and JSW Salem unit is certified for ISO 14001:2015 standard.
- ✓ Plant have controls over Oxides of nitrogen and sulphur and to a much lesser extent fluorides and chlorides release as they are present in the materials being burnt.
- ✓ Plant have Pollution Prevention system even about 99% of the total fumes and dust generated in steel-making process escape as fugitive emissions whereas slags also lead to release of fumes in the form of iron oxide, kish (graphite), soot and silica.
- ✓ Effective Pollution Control over Coke ovens which are another major source of emissions have been taken care by the organization.

- ✓ Two types of cleaning systems, dry and wet cleaning from hard substances are practiced. In dry cleaning the following control systems are used, viz., inertial dust catchers, cyclones, electro-static precipitators and different types of cloth filters.
- ✓ While in wet cleaning scrubbers, wet cyclones and various kinds of venturis are used. Wet method of gas cleaning is used such production where the cleaning is done from gases containing explosive grade substances.
- ✓ Total Tree plantation as reported by JSW is around 2,36,985 trees since inception till March 2021.

TREES PLANTED DETAILS -Cumulative				
S.No.	Year	Opening (Nos.)	Tree planted (Nos.)	Cumulative (Nos.)
1	2004 - 05	94340	100	94440
2	2005 - 06	94440	1100	95540
3	2006 - 07	95540	200	95740
4	2007 - 08	95740	4395	100135
5	2008 - 09	100135	5940	106075
6	2009 - 10	106075	5120	111195
7	2010 -11	111195	14250	125445
8	2011 -12	125445	7535	132980
9	2012 - 13	132980	10120	143100
10	2013 - 14	143100	6645	149745
11	2014-15	149745	19065	168810
12	2015-16	168810	10000	178810
13	2016-17	178810	6050	184860
14	2017-18	184860	5000	189860
15	2018-19	189860	14165	204025
16	2019-20	204025	14830	218855
17	2020-21	218855	18130	236985

- ✓ Total Tree accounted (> 4 feet height) for CO₂ sequestration till March 2021 is 145836 (Ref: **Annexure – I** Comprehensive report)

Criteria for number of trees:

- ✓ Trees having height greater than 4 feet only is considered for sequestration calculation.

Tree Plantation FY 2021 – From April 2020 till March 2021				
S NO	Date	Location	Shadow Trees	Types of Trees
1	26-Apr-20	SINTER PLANT II	10	Pongame oiltree
2	27-Apr-20	MAIN CANTEEN	2	Banana Tree
3	01-May-20	MAIN CANTEEN	15	Papaya
4	05-May-20	MAIN GATE	5	Papaya
5	13-May-20	GIVEN TO SRC	15	Pongame oiltree
6	05-Jun-20	NEW R&D	21	Sapodilla, Mango, Jack tree
7	05-Jun-20	TOWNSHIP RESERVOIR	120	Thoongu vaagai, Kumil, Neem, Pongame oil tree
8	05-Jun-20	BLOOMING MILL	13	Mango, Vila, Jack, Lemon, Sapodilla, Amla, Teak, Almond, Guava
9	05-Jun-20	SINTER PLANT	25	Guava, Pomegranate, Mango, Amla, Vila
10	05-Jun-20	BLAST FURNACE	46	Guava, Pomegranate, Mango, Amla, Vila, Jack, Lemon, Pongame oil tree, Sapodilla
11	05-Jun-20	POWER PLANT I & II	80	Mango, Sapodilla, Lemon, Jack, Guava, Pomegranate, Vila
12	06-Jun-20	MAIN CANTEEN ROAD SIDE	250	Kumil, Pongame oil tree, Neem, Thoongu Vaagi, Malai vembu
13	06-Jun-20	MAIN CANTEEN	23	Mango, Jack
14	06-Jun-20	COKE OVEN	10	Mango, Jack
15	08-Jun-20	NEW LAND	230	Jamun Fruit,Neem, Malai Vembu, Kumil
16	09-Jun-20	NEW LAND	150	Neem, Kumil, Malai Vembu, Thekku
17	09-Jun-20	POWER PLANT II	28	Ashoka, Guava, Jack Fruit, Mango
18	10-Jun-20	RO PLANT	63	Sapota, Guava, Pomegranate, Phyllanthus Acidus
19	11-Jun-20	NEW LAND	140	Neem, Almond, Thoongu Vaagi, Thekku
20	11-Jun-20	AUDITORIUM	2	Mango, Jack Fruit
21	11-Jun-20	R&D TOILET AREA	8	Sapota
22	11-Jun-20	OLD ADMIN GUEST HOUSE	17	Jack Fruit, Sapota
23	12-Jun-20	NEW LAND	150	Thekku, Almond, Neem, Kumil, Malai Vembu
24	12-Jun-20	MAIN CANTEEN	21	Jack Fruit, Guava, Mango, Sapota, Amla, Lemon
25	12-Jun-20	NEAR ANNEALING PLANT	16	Guava, Pomegranate
26	13-Jun-20	TOWNSHIP RESERVOIR	210	Mango, Guava, Thekku, Neem, Almond, Kumil
27	13-Jun-20	TEMPLE	3	Mango
28	13-Jun-20	OLD 100 TON WEIGH BRIDGE	4	Lemon, Oleander
29	13-Jun-20	WAGON TIPPLER	6	Mango
30	15-Jun-20	TOWNSHIP (Refinery)	4	Banana tree
31	16-Jun-20	MAIN GATE	9	Jack Fruit, Mango
32	18-Jun-20	RO PLANT	6	Phyllanthus Emblica, Pomegranate, Guava
33	25-Jun-20	TOWNSHIP	250	Mango, Papaya, Phyllanthus Acidus, Guava, Thekku, Almond
34	26-Jun-20	TOWNSHIP	99	Almond, Thekku, Mango

35	27-Jun-20	TOWNSHIP	140	Almond, custard apple, Phyllanthus Acidus, Pongame oiltree, Malai Vembu, Mango
36	29-Jun-20	TOWNSHIP	72	Mango, Guava, Almond, Phyllanthus Acidus, Pomegranate
37	30-Jun-20	TOWNSHIP	76	Almond, Custard apple, Mango
38	01-Jul-20	MRSS	5	Custard Apple, Papaya
39	02-Jul-20	BF ROAD SIDE	49	Coconut, Mango, Guava, Custard Apple, Vila
40	04-Jul-20	SP II ROAD SIDE	85	Bamboo, Mango, Coconut, Papaya, Mahogany
41	08-Jul-20	COKEOVEN AREA	1	Mango
42	09-Jul-20	WAGON TIPPLER AREA	1	Ashoka
43	09-Jul-20	POWER PLANT II	30	Mango, Guava
44	09-Jul-20	TOWNSHIP AREA	70	Pongame oil tree, Almond, Jack Fruit, Tamarind, Athi, Mahogany
45	10-Jul-20	TOWNSHIP AREA	801	Coconut, Mango, Pongame oil tree, Tamarind, Kumil, Bauhinia variegata, Athi, Jack Fruit, Mahogany, Almond, Thekku, Vagai, Guava
46	10-Jul-20	TEMPLE	8	Papaya, Mango
47	11-Jul-20	TOWNSHIP NEAR RESERVOIR	300	Konna, Thekku, Guava, Almond, Pongame oil tree, Kumil, Neem
48	13-Jul-20	TOWNSHIP AREA	280	Karu Maruthu, Iyal Vgai, Thekku, Athi, Neem, Kumil, Tamarind
49	13-Jul-20	CCM III	1	Bamboo
50	14-Jul-20	ANNEALING	20	Mango, Jack Fruit
51	17-Jul-20	NEAR RO PLANT	11	Mango, Sapota, Pomegranate, Guava, Amla
52	18-Jul-20	WAGON TIPPLER ROAD SIDE AREA	51	Bamboo
53	20-Jul-20	NEAR RO PLANT	1	Yellow Ribbon, Mango
54	20-Jul-20	TOWNSHIP	10	Oleander, papaya
55	21-Jul-20	BRICKS AREA	10	Bougainvillea, Duranta, Mango, Pomegranate
56	23-Jul-20	ANNEALING	15	Duranta, Pine Tree, Casuarina tree
57	23-Jul-20	Sinter Plant-II	70	Casuarina, Pomegranate, Guava
58	23-Jul-20	TOWNSHIP	170	Teak Wood, Pomegranate, Guava, Mango, Bael Tree, Amla
59	24-Jul-20	NEAR RO PLANT	50	Yellow Ribbon, Casuarina Tree
60	25-Jul-20	New RESERVOIR	50	Casuarina Tree
61	27-Jul-20	New Land	170	Casuarina Tree
62	27-Jul-20	New Reservoir	150	Casuarina Tree
63	27-Jul-20	R O Plant, Guard Pond	62	Casuarina and Mango.
64	28-Jul-20	New Land area	330	Casuarina, Kummel, Teak, Turmeric. Goose berry,
65	30-Jul-20	New Land area	175	Casuarina Tree
66	31-Jul-20	New Land area	515	Casuarina, Kummel, Teak, Turmeric. Goose berry,
67	01-Aug-20	New Land area	315	Mango-25, Jack Fruit-50, Thekku-25, Almond-50, Tamarind-25, Neem-40, Ficus Racemosa-25, Guava-25, Kumil-50

68	04-Aug-20	New Land area	415	Yellow Konna-70,Thekku-50,Guava-20,Ficus Racemosa-30,Jack Furit-20,Sandel-30,Vagai-50,Eatti-50,Almond-50,Tamarind-20,Henna-10,Jamun Fruit-15
69	05-Aug-20	Main Canteen	6	Casuarina Tree
70	06-Aug-20	New Land area	245	Jack Fruit-20,Baniam Tree-50,Manthari-50,Sandel-30,Yellow Konna-50,Thekku-30,Guava-15
71	06-Aug-20	CCM III	10	Casuarina Tree
72	07-Aug-20	COP Area Weight bridge	3	Bamboo Tree
73	07-Aug-20	New Land area	305	Jack fruit-25,Baniam-25,Guava-25,Sandel-25,Thekku-25,Yellow Konn-50,Tamarind-50,Siris Tree-25,Henna-25,Jamun Fruit-25,Eatti-5
74	07-Aug-20	SP II	15	Custard apple-3,Jack Fruit-4,Vagai Tree-4,Mango-4
75	08-Aug-20	New Land area	555	Custard apple-50,Jack Fruit-50,Baniam-50,Guava-50,Thekku-50,Tamarind-50,Henna-50,Jamun Fruit-50,Eatti-50,Siris Tree-50,Yellow Konna-50 Sandel-5
76	10-Aug-20	New Land area	1000	Jack Fruit-50,Guaya-50,Baniam-100,Sandei-100,Thekku-150,Yellow Konna-200,Tamarind-60,Vaagai-50,Jamun Fruit-100,Eetti-70,Mgda Kani-95
77	11-Aug-20	New Land area	300	Sandel-50,Baniam-50,Thekku-50,Yellow Konna-50,Maga Kani-50,Vagai-50
78	12-Aug-20	RO Water Back Side	15	Mango-5,Casuarina Tree-9,Nandaa Vatti-1
79	13-Aug-20	Annealing plant Road side	5	Alamanda-22,Mango-5
80	17-Aug-20	Sinter Plant II	20	Custard apple-5,Pungai-5,Jack Fruit-5,Mantharai-5
81	19-Aug-20	Townchip area	300	Jamun Fruit-140,Tamarind-100,Eatti-50,Semmaram-10
82	21-Aug-20	Townchip area	5	Semmaram-2,Sandel-2 Vilvam-2
83	21-Aug-20	Temple Area	1	Semmaram-1
84	24-Aug-20	New Land area	320	Semmaram-15,Juman Fruit-105,Eatti-100,Tamarind-100
85	25-Aug-20	New Land area	320	Semmaram-20,Juman Fruit-100,Eatti-100,Tamarind-100
86	25-Aug-20	Sinter Plant II	25	Tamarind-10,Jamun Fruit-10,Amla-2,Mango-1,Semmaram-2
87	26-Aug-20	COP	20	Alamanda-46,Jamun Fruit-20
88	26-Aug-20	New Land area	20	Jamun Fruit-20
89	01-Sep-20	Kone crane area	5	Yellow Ribbon-300,Yellow Flower-125,Nantha vettai-9,Arali-9,Red Hibiscus-9Jamun Furit-5,
90	01-Sep-20	MRSS	3	Doranda-110Papaya-1,Amla-2
91	02-Sep-20	Townchip cycle stand area	30	Red Hibiscus-15,Aralli-15,Nantha vettai-15,Mango-10,Amla-5,Big Amla-5,Athi-5,Jack Furit-5

92	03-Sep-20	Township area	50	Arali-10,Nantha vettai-10,Red Hibiscus-10,Hyssop-10,Pungan-10,Amla-10,Neem-10,Forst Neem-10,Mango-10
93	05-Sep-20	COP	22	Tippli-25,Arali-15,Nantha vettai-15,Yellow arali-40,Mango-7,Forest Neeam-15
94	09-Sep-20	Wagan Tippler	5	Nantha vettai-1Arali-1,Forest Neeam-5
95	13-Sep-20	SRC	6	Mango
96	15-Sep-20	SINTER PLANT	20	Indian fig tree,sugar-apple,papaya,Mango,sacred fig,pungan tree
97	17-Sep-20	CIVIL OFFICE BACK SIDE	19	Alove vera,Cassandra,Sacred Fig,Nanthiavattam
98	27-Sep-20	BF II AREA	50	Mango, Portia tree, Vaagai, Pappaya, Jack Fruit
99	07-Oct-20	SRC	12	MANGO
100	09-Oct-20	RO PLANT	15	CANNA PLANT,Nerium oleander,pinwheel flower,Cassia fistula
101	13-Oct-20	TOWNSHIP	33	Nanthiavattam,NERIUM OLEANDER,AMLA,MANGO,SACRED TREE
102	19-Oct-20	TOWNSHIP SCHOOL AREA	5	Mango, Jack Tree
103	23-Oct-20	TOWNSHIP AREA	121	Jack, Almond, Sorgam, Pungam, Mango
104	28-Oct-20	SINTER PLANT AREA	20	Mango, Jack Tree, Athi, Pungam
105	30-Oct-20	ANNEALING PLANT AREA	10	Mango
106	09-Nov-20	PTCL ROAD SIDE	60	Casuarina
107	09-Nov-20	CEMENT FACTORY	15	Casuarina
108	09-Nov-20	ANNEALING PLANT	10	Casuarina
109	10-Nov-20	COKE OVEN NEAR LEMS SHED	100	Casuarina
110	11-Nov-20	NEW CANTEEN AREA	7	Casuarina
111	11-Nov-20	PTCL OFFICE	10	Casuarina
112	11-Nov-20	RO PLANT AREA	90	Casuarina
113	12-Nov-20	RO PLANT AREA	65	Casuarina
114	13-Nov-20	CPP II AREA	150	Casuarina
115	17-Nov-20	TREATMENT PLANT AREA	4	Lemon
116	23-Nov-20	CPP III AREA	50	Casuarina
117	23-Nov-20	COKE OVEN AREA	50	Casuarina
118	23-Nov-20	CPP II AREA	100	Casuarina
119	23-Nov-20	BF II AREA	70	Casuarina
120	24-Nov-20	ANNEALING AREA	20	Casuarina
121	24-Nov-20	RO PLANT ROAD SIDE	11	Casuarina
122	26-Nov-20	AUDITOURIUM BACK SIDE	5	Palm Tree
123	28-Nov-20	CPP II AREA	7	Ashoka
124	30-Nov-20	BF II AREA	100	Casuarina
125	30-Nov-20	TEMPLE	200	Casuarina
126	01-Dec-20	BRM AREA	50	Casuarina
127	01-Dec-20	TOWNSHIP AREA	280	Casuarina
128	02-Dec-20	TOWNSHIP AREA	250	Casuarina
129	02-Dec-20	TEMPLE	150	Casuarina
130	02-Dec-20	RO PLANT ROAD SIDE	60	Casuarina

131	03-Dec-20	TOWNSHIP AREA	170	Casuarina
132	03-Dec-20	WAGON TIPPLER	100	Casuarina
133	03-Dec-20	COKE OVEN AREA	50	Casuarina
134	03-Dec-20	ASP ROAD SIDE	30	Casuarina
135	04-Dec-20	COKE OVEN AREA	100	Casuarina
136	04-Dec-20	TOWNSHIP AREA	100	Casuarina
137	04-Dec-20	ASP ROAD SIDE	60	Casuarina
138	04-Dec-20	AUDITORIUM BACK SIDE	5	Mango, Pappaya
139	05-Dec-20	TOWNSHIP AREA	100	Casuarina
140	05-Dec-20	ASP AREA	50	Casuarina
141	07-Dec-20	ASP AREA	70	Casuarina
142	07-Dec-20	TOWNSHIP AREA	150	Casuarina
143	07-Dec-20	PTCL OFFICE	20	Casuarina
144	08-Dec-20	ASP AREA	110	Casuarina
145	08-Dec-20	PTCL OFFICE	150	Casuarina
146	08-Dec-20	HR OFFICE BACK SIDE	20	Casuarina
147	08-Dec-20	#REF!	15	Plam Tree
148	09-Dec-20	SINTER PLANT	200	Casuarina
149	09-Dec-20	BF II	25	Casuarina
150	09-Dec-20	ANNEALING PLANT ROAD SIDE	160	Casuarina
151	09-Dec-20	ASP II AREA ROAD SIDE	120	Casuarina
152	09-Dec-20	TEMPLE AREA COMPUND SIDE	460	Casuarina
153	09-Dec-20	CCM III SCRAP YARD	115	Casuarina
154	10-Dec-20	ANNEALING PLANT ROAD SIDE	100	Casuarina
155	10-Dec-20	PTCL OFFICE	200	Casuarina
156	10-Dec-20	TEMPLE AREA COMPUND SIDE	350	Casuarina
157	11-Dec-20	ASP AREA	306	Casuarina
158	11-Dec-20	PTCL OFFICE	120	Casuarina
159	12-Dec-20	GIVEN TO METTUR	10	Casuarina,Pongam
160	12-Dec-20	PTCL OFFICE	50	Casuarina
161	12-Dec-20	ASP AREA	60	Casuarina
162	12-Dec-20	MAIN GATE AREA	125	Casuarina
163	14-Dec-20	PTCL OFFICE	85	Casuarina
164	14-Dec-20	MAIN GATE AREA	100	Casuarina
165	15-Dec-20	PTCL OFFICE	100	Casuarina
166	16-Dec-20	SINTER PLANT	65	Casuarina
167	17-Dec-20	AUDITORIUM	8	Pappaya, Mull seetha
168	17-Dec-20	OHC AREA	57	Casuarina, Banana
169	17-Dec-20	MAIN GATE ROAD SIDE	42	Casuarina
170	18-Dec-20	MAIN GATE AREA	40	Casuarina
171	18-Dec-20	OHC AREA	1	Pappaya
172	19-Dec-20	MAIN GATE	19	Casuarina
173	21-Dec-20	MAIN GATE AREA	13	Casuarina
174	22-Dec-20	PTCL OFFICE	135	Casuarina

175	23-Dec-20	ANNEALING PLANT ROAD SIDE	4	Banana
176	26-Dec-20	MAIN GATE ROAD SIDE	15	Jamun
177	30-Dec-20	CANTEEN AREA	30	Casuarina
178	05-Jan-21	BF II GROUND OFFER	30	Casuarina
179	06-Jan-21	TOWNSHIP AREA TREATMENT PLANT	10	Mango, Jackfruit
180	07-Jan-21	ASP AREA	100	Casuarina
181	08-Jan-21	ASP AREA	100	Casuarina
182	08-Jan-21	TOWNSHIP RESERVIOIR	100	Casuarina, Almond, Jamun, Pungam, Ashoka
183	09-Jan-21	BF II GROUND OFFER	55	Casuarina
184	13-Jan-21	ANNEALING PLANT	50	Casuarina
185	15-Jan-21	MAIN GATE AREA	130	Casuarina
186	15-Jan-21	OHC BACK SIDE	7	Palm Tree
187	18-Jan-21	TOWNSHIP AREA	10	Banana Tree
188	20-Jan-21	MAIN CANTEEN AREA	15	Banana Tree
189	22-Jan-21	COKEOVEN WEIGH BRIDGE	7	Jack Fruit, Mango
190	22-Jan-21	SINTER PLANT	40	JackFruit, sorgam tree , Jamunfruit
191	04-Feb-21	AUDITORIUM	11	Thula, Maa
192	06-Feb-21	R&D AREA	12	Palm Tree
193	19-Feb-21	ANNEALING PLANT BACK SIDE	12	Plam Tree
194	19-Feb-21	ANNEALING PLANT BACK SIDE	2	Casuarina
195	20-Feb-21	ANNEALING PLANT BACK SIDE	3	Mango
196	20-Feb-21	ANNEALING PLANT BACK SIDE	5	Jamun
197	22-Feb-21	SINTER PLANT II	20	Jamun, Almond
198	26-Feb-21	BRM TOILET AREA	4	Mango, Jackfruit
199	1-Mar-21	HR OFFICE ROAD SIDE	40	Casuarina
200	1-Mar-21	BF-1 AREA & OLD OHC ROAD SIDE	40	Casuarina,Mango, Pemegranate
201	2-Mar-21	HR OFFICE ROAD SIDE	40	Casuarina
202	8-Mar-21	PTCL OFFICE ROAD SIDE	50	Bamboo Tree
203	8-Mar-21	TOWN SHIP AREA	25	Jamun tree
204	8-Mar-21	TOWN SHIP AREA	10	Pongam
205	8-Mar-21	TOWN SHIP AREA	10	pomegranateplant
206	8-Mar-21	TOWN SHIP AREA	25	Sorgam
207	8-Mar-21	TOWN SHIP AREA	25	Pathani
208	8-Mar-21	TOWN SHIP AREA	25	Mango
209	9-Mar-21	PTCL OFFICE ROAD SIDE	155	Bamboo
210	12-Mar-21	HR OFFICE ROAD SIDE	30	Casuarina
211	13-Mar-21	TOWN SHIP AREA COMPOUND	30	Bamboo Tree
212	13-Mar-21	TOWN SHIP AREA COMPOUND	10	Pathani
213	13-Mar-21	TOWN SHIP AREA COMPOUND	10	Jamun

214	17-Mar-21	MAIN GATE ROAD SIDE	15	Bamboo Tree
215	17-Mar-21	MAIN GATE ROAD SIDE	5	Pathani
216	17-Mar-21	BF -II AREA	30	Bamboo Tree
217	23-Mar-21	ADMIN ROAD SIDE	6	Ashoka
218	24-Mar-21	ADMIN ROAD SIDE	21	Ashoka
			18130	

Note :

Out of 18130 saplings about 8370 saplings is having more than 4 feet height have been considered for Carbon sequestration study in the year April 2020 – March 2021.

V. Objective of the Carbon Sequestration by Trees

- To evaluate the amount of carbon sequestered by the green belt in M/s. JSW Steel Ltd, Salem Works located at, Pottaneri P.O., Mecheri, Mettur Taluk, Salem District-636 453, Tamil Nadu, India.
- To carry out a study on Carbon Sequestration by Trees

VI. Scope of the Study

Carbon dioxide (CO₂) is the prime cause of global warming. The levels of CO₂ in the earth's atmosphere are rising ever since the industrial revolution begun. Even today in India, most of the industries rely heavily on coal as their source of energy. Most of us are still concerned only with acquiring energy, irrespective of methodology involved. CO₂ produced in the form of flue-gases is released without appropriate treatment which is adversely affecting the environment. A range of actions that need to be undertaken includes Carbon Dioxide Capture and Sequestration (CCS) Technology. CCS is a process of separation of CO₂ from Large Point Sources (LPSs), transport to a storage location, followed by long-term isolation from atmosphere. A portion of desired depletion can be achieved by improving energy efficiency owing to technological advancements, and the remainder might be achieved by moving on to renewable energy resources. In India, along with population explosion, there is rise in temperature due to global warming and to cope with the levels of CO₂, we need to see what kind of technological options we have to solve the problem. The paper brings about the study of CCS, its advantages, cost effectiveness and related drawbacks in India.

Capturing CO₂ : CO₂ finds its way into the atmosphere in numerous ways. In India, most of it is emitted by large stationary sources and rest by mobile sources in comparatively smaller quantities. These emissions are mainly from the combustion of fossil fuels, dominantly coal, used for power generation, industrial processes, and the other fossil fuels used in transportation, residential and commercial buildings. CO₂ is also emitted during certain industrial processes like cement manufacture or hydrogen production and during combustion of biomass. The main purpose of capturing is to produce a concentrated stream of CO₂, so that it can be transported to storage sites at high pressures.

The reason for concentrating the CO₂ stream is to make it economically feasible. Transportation of CO₂ in dilute form would make it unrealistic and impractical in context of the required capital. The main application of CCS is at the large stationary sources as capturing CO₂ directly from small and mobile sources has so far proven to be very complicated and expensive too. The capture directly from atmosphere would not be discussed in the paper as the concentration is less in ambient air (around 380 ppm) by a factor of 100 times as compared to flue gases. Minimization of emissions from these large point sources can have a drastic impact towards lowering the CO₂ levels. Capture from industrial process streams

- Post-combustion capture
- Pre-combustion capture
- Oxy-fuel combustion capture
 - To conduct the Carbon Sequestration by Plants in the M/s. JSW Steel Ltd, Salem Works located at, Pottaneri P.O., Mecheri, Mettur Taluk, Salem District- 636 453, Tamil Nadu, India and the general List of areas in the factory premises are as follows
 - Boundaries of the plant
 - Wagon tippler
 - Water reservoir area
 - JSW Power Plant
 - R&D Blocks
 - Admin Building
 - Old Gust House Area
 - Canteen area
 - Plant units

- Road sides
- Temple Area
- Non Recovery Type Coke Oven Plant
- Sinter Plant
- Blast Furnace
- Steel Making
- Air Separation Plant
- Steel Refining
- Continuous Casting of Billets and Blooms
- Bar and Rod Mill
- Blooming Mill
- QAD
- Captive Power Plant (3 x 30 MW)
- Utilities – Boilers, Water treatment, ETP, STP, Cooling water, Air compressors etc.
- HR and Admin building
- Purchase and Logistics buildings
- Accounts and Finance building
- Occupational Health Center -building

VII. Methodology

The following sequence of the methodology is adopted to conduct the Carbon Sequestration by Plants

The given study is an amalgamation of the literature review, Site visits, qualitative and Quantitative analysis of the data on spatial coverage of the green cover in the study area and its respective carbon sequestration potential. Based on the above findings, the study recommends percentage achievable area under tree cover through appropriate policies, plans.

1.Pre Study

- 1.1 On the requests from M/s. JSW Steel Ltd, Salem Works located at, Pottaneri P.O., Mecheri, Mettur Taluk, Salem District-636 453, Tamil Nadu, India., Our Study team sent a questionnaire.
- 1.2 Study plan was prepared and sent to the client.

2.Site Visit

- 2.1 Our team conducted a site visit after the opening meeting with the Environmental Department team.
- 2.2 Opening meeting happened in the presence of EHS Head
- 2.3 After the Opening meeting, site Study was conducted by our team at Site
- 2.4 Site Study of Carbon Sequestration by Plants was done as per the scope of work

3.Post Study

- 3.1 Closing meeting were conducted and inputs were taken for further Analysis and Study by our team. Report sent to the management
- This is the final report presented to M/s. JSW Steel Ltd, Salem Works located at Salem.

Methodology- Comprehensive

The rate of carbon sequestration depends on the growth characteristics of the tree species, the conditions for growth where the tree is planted, and the density of the tree's

wood. It is greatest in the younger stages of tree growth, between 20 to 50 years. Further complicating the issue is the fact that far less research has been done on tropical tree species as compared to temperate tree species.

Nevertheless, we can roughly estimate the amount of CO₂ sequestered in a given tree, and if we divide by the tree's age, get a yearly sequestration rate.

We got this process from two educational websites who had conceived it as a learning activity for their students.

This is the process:

1. Determine the total (green) weight of the tree.
2. Determine the dry weight of the tree.
3. Determine the weight of carbon in the tree.
4. Determine the weight of carbon dioxide sequestered in the tree
5. Determine the weight of CO₂ sequestered in the tree per year

Determine the total (green) weight of the tree

Based on tree species, the algorithm to calculate the weight of a tree is:

W = Above-ground weight of the tree in pounds

D = Diameter of the trunk in inches

H = Height of the tree in feet

For trees with $D < 11$:

$$W = 0.25D^2 H$$

For trees with $D \geq 11$:

$$W = 0.15 D^2 H$$

Depending on the species, the coefficient (e.g. 0.25) could change, and the variables D² and H could be raised to exponents just above or below 1. However, these two equations could be seen as an "average" of all the species' equations.

The root system weighs about 20% as much as the above-ground weight of the tree. Therefore, to determine the total green weight of the tree, multiply the above-ground weight of the tree by 120%.

Determine the dry weight of the tree

This is based on an extension publication from the University of Nebraska. This publication has a table with average weights for one cord of wood for different temperate tree species. Taking all species in the table into account, the average tree is 80 % dry matter and 20 % moisture. Therefore, to determine the dry weight of the tree, multiply the weight of the tree by 80%.

Determine the weight of carbon in the tree

The average carbon content is generally 50% of the tree's total volume. Therefore, to determine the weight of carbon in the tree, multiply the dry weight of the tree by 50%.

Determine the weight of carbon dioxide sequestered in the tree

CO₂ is composed of one molecule of Carbon and 2 molecules of Oxygen.

The atomic weight of Carbon is 12.001115.

The atomic weight of Oxygen is 15.9994.

The weight of CO₂ is $C + 2 \times O = 43.999915$.

The ratio of CO₂ to C is $43.999915 / 12.001115 = 3.6663$.

Therefore, to determine the weight of carbon dioxide sequestered in the tree, multiply the weight of carbon in the tree by 3.6663

Determine the weight of CO₂ sequestered in the tree per year

Divide the weight of carbon dioxide sequestered in the tree by the age of the tree.

EXAMPLES

Estimated growth rates and sizes of agroforestry trees were taken from the World Agroforestry Centre's "Agroforestry tree Database"

Let's see how much a *Calliandra calothyrsus* might sequester in a year. A 10-year-old *Calliandra* would probably grow about 15 feet tall with a trunk about 8 inches in diameter.

Therefore:

$$W = 0.25D^2 H = 0.25(8)^2(15) = 240 \text{ lbs. green weight above ground.}$$

$$240 \text{ lbs.} * 120\% = 288 \text{ lbs. green weight (roots included)}$$

$$288 \text{ lbs.} * 80 = 230.4 \text{ lbs. dry weight}$$

$$230.4 \text{ lbs.} * 50\% = 115.2 \text{ lbs. carbon}$$

$$115.2 \text{ lbs} * 3.6663 = 422.4 \text{ lbs. CO}_2 \text{ sequestered}$$

$$422.4 \text{ lbs} / 10 \text{ years} = 42.2 \text{ lbs. CO}_2 \text{ sequestered per year}$$

Or consider a 10-year-old *Grevillia robusta*, 45 feet tall with a trunk 6 inches in diameter.

Using the same calculations as above, the amount of CO₂ sequestered would be 71.3 lbs. per year.

Or a newly-planted *Acacia angustissima*, 2.5 years old, 15 feet tall with a trunk 3 inches in diameter: 23.8lbs. of CO₂ sequestered per year.

Or an *Albizzia lebbek*, 15 years old, 30 feet tall, with a 12 inch trunk: 76.0lbs. of CO₂ sequestered per year.

Note : Reference from the below site

This research and methodology is based on research papers, university publications, and other information freely available on the Internet. As we stated before, it is difficult to calculate the amount of carbon dioxide sequestered per tree per year due to the complexity of the variables involved, as well as the lack of research on tropical tree species. If you have any information that could further refine or enhance our calculations, please let us know at info@treesftf.org.

Other methods

Another way to estimate the amount of CO₂ sequestered by a tree in a year is to estimate the amount sequestered in a hectare per year, and divide that amount by the number of trees per hectare. Scanning around on the Internet, it seems that the number of trees per hectare (in agroforestry and/or industrial plantations) ranges from under 500 to over 2,000. According to Myers and Goreau, tropical tree plantations of pine and eucalyptus can sequester an average of 10 tons of carbon per hectare per year. Therefore, the plantation can sequester an average of $20,000 \text{ lbs} \times 3.6663 = 73,326 \text{ lbs CO}_2/\text{ha}/\text{year}$, or, taking an average of 1,000 trees per hectare, $73.326 \text{ lbs CO}_2/\text{tree}/\text{year}$.

Of course, we heavily discourage the planting of pine and/or eucalyptus in our agroforestry systems. Our trees may not grow as fast or as straight as eucalyptus, but they are not invasive, and they do not destroy the water table and the soil!

Disclaimer

This research and methodology is based on research papers, university publications, and other information freely available on the Internet. As we stated before, it is difficult to calculate the amount of carbon dioxide sequestered per tree per year due to the complexity of the variables involved, as well as the lack of research on tropical tree species.

VIII. Standards

- As per the CPCB Guidelines, Green belt shall be developed in an area equal to 33% of the plant area with a native tree species in accordance with CPCB guidelines. The greenbelt shall inter alia cover the entire periphery of the plant.
- The project proponent shall prepare GHG emissions for the plant and shall submit the programme for the reduction of the same including carbon sequestration including plantation. The guideline is attached as **Annexure –II** of the report.

IX. Industry Profile

Manufacturing Process

1.0 Introduction

JSW Steel Limited, Salem Works is a continuous process industry. The Production capacity of finished products at present is 1.15 million TPA special alloy steel.

Iron complex consist of 2 nos of Blast Furnaces with the production capacity of 1.05 MTPA, 1 no of 2 strand Pig Casting Machines and 2 nos of Sinter Plants with production capacity of 1.235MTPA and Coke Oven Plant of 0.5 MTPA capacity.

Steel Melting shop consisting of 2 nos of Energy Optimizing Furnaces (each 65 T/ladle), 4 nos of Ladle Furnaces (each 65 T/ladle), 2 no of Vacuum Degassing Unit, 2 nos. of 3 strand Continuous Billet Casters, 1 no of 3 strand Continuous Bloom casters. Steel finishing shop consisting of Bar and Rod Mill (BRM) with the capacity of 0.48 MTPA and Blooming Mill capacity of 0.48 MTPA. and wire rod block. BRM has downstream operations of Annealing, pickling and peeled & ground unit. The downstream operations are based on supplier needs.

In addition to the above plants, there are 2 nos of Air Separation Plants, 1 no 7 MW and 3 Nos of 30 MW (97 MW) Captive Power Plants, 1 no Pulverizing Coal Injection Plant, 1 no Lime Calcining Plant and MRSS, utilities are installed as support functions. The main products of the plants are pig iron, steel billets/steel blooms, steel bars rods and coil.

Raw Materials Storage

The raw materials, namely, iron ore, coke, manganese, limestone, dolomite and quartzite will come from different sources such as Bellary-Hospet area, Salem area, Sandur belt of Bellary-Hospet area by rail/road. Some raw materials are imported from Australia and /or china. They will be stacked in the raw material storage yard, transported by conveyor system to the storage bunkers. These materials shall be fed in required proportion for Sinter Making, Iron Making and Steel Making etc.

Wagon tippler

JSW Salem has installed a unique design of Wagon tippler first of its kind in Indian, which has the facility to form empty rake parallel to the loaded rake, with a uniquely designed Traverser which shifts empty wagon from inhaul to outhaul line.

The JSW Wagon tippler is designed by M/s Metso minerals India pvt.ltd. Wagon tippler is designed for handling 140 MT (includes wagon weight) with cycle time of 144 seconds per wagon. The installed capacity can evacuate material up to 1600MT per hour.

Wagon Tippler also has a specially designed side pad with articulated movement by which even the bulged wagons also can be handled.

Non Recovery Type Coke Oven Plant

The Coke Oven Plant will use stamp-charging technique to increase the bulk density of the coal, which will be charged to the oven. This will increase the yield and increase the strength of coke. The Coke Oven operation completely automatic and the process of carbonization of coal being controlled.

Carbonization of coal shall be completed in 65 hrs at temperature range of 1100-1300 C. On completion of the process the coke shall be discharged from the oven into the quenching car which will be quenched in the quenching tower. Subsequently the coke will be cut to the specified size, screened and transferred to Blast Furnace. The fines i.e. coke breeze shall be used in Sinter Plant for Sintering Making. The small amount of solid waste generation from the Coke Oven is being reused in the Sinter Plant. The waste heat of the flue gas will be fully utilized by Waste Heat Recovery Boilers for power generation.

Sinter Plant

The iron ore fines, coke fines, lime stone fines and other raw material fines dusts which cannot be used in the Blast Furnace are processed in the plant at a temperature of about 1200 C, by burning fuel. Sintering is a process of agglomeration of fines by incipient fusion in to porous lumps called Sinter which is an ideal input for Blast Furnace.

The sinter plant is essentially an assembly of pallets with grates moving with the help of sprocket wheel and chain table. The hearth layer passes through an ignition hood where it gets ignited by burning furnace oil/Blast Furnace Gas. Wind boxes are provided below the sinter bed for suction of air to effect uniform burning of sinter bed along the cross section. The suction is maintained by fans. The strand is provided with necessary sealing to prevent air leakage between pallets and the machine.

The hot sinter cakes are broken by a sinter breaker and passed through sinter cooler strand where the hot sinter is subjected to cold air below. This cold sinter is crushed in roll crusher and screened in three stages. The sinter having size less than 5mm is conveyed to the sinter return bin in the stock house of sinter plant. Sinter of size 20-50mm is taken to the stock house of the blast furnace. Sinter of intermediate size of 10-20mm is taken to the sinter machine to serve as a bed layer.

Blast Furnace

In this furnace sintered iron ore, lump iron ore along with fluxes are reduced with metallurgical coke at a temperature of around 1400 C to produce hot metal and slag. The slag gets granulated while tapping. The hot metal tapped is ready for either steel making or making pig iron in a pig casting machine.

The blast is heated up by high-pressure air through hot blast stoves. As the burden descends, the hot gases rise upwards. During the process operation, chemical reactions take place at different levels, specific temperature and gas composition. The reactions are confined mainly to the oxides of iron and carbon wherein deposition begins at 250 C.

The product (hot metal) from the Blast Furnace is then transported to Steel Melting Shop to purification and if any downstream operations down then hot metal will be transferred to pig casting machine. The cold pig iron from the pig casting machine will be sent to the storage yard.

Steel Melting Shop

The Energy Optimizing Furnace (EOF) process is essentially oxygen steel making process in which oxygen is injected into the furnace both above and below the surface of the molten bath.

The oxygen that reacts with the carbon present in the hot metal produces carbon monoxide, which again gets oxidized to carbon dioxide with the liberation of heat by burning with oxygen above the bath. The temperature in the bath will be maintained within 1650 -1700 C. Fuel heating provision is provided in case the bath gets cooled.

The hot metal from Blast Furnace will be transported to EOF in ladle by diesel loco operated hot metal transfer car. The hot metal will be received at the hot metal bay and then poured in the EOF with help of hot metal charging crane.

Processed scrap will be brought from scrap yard to EOF in scrap charging box (15-20 %) and then will be charged to EOF. Other fluxes and additives will be stored in over storage bunkers and will be added in EOF as per the process requirement.

The steel making operation, two other supporting plant facilities will be needed

- (I) Lime Calcimining Plant – for providing burnt lime
- (II) Air Separation Plant – for providing oxygen to the steel making furnace

Air Separation Plant

An air separation plants have been installed to provide oxygen for steel making furnace. The air separation plants have the provision to produce argon and nitrogen required for steel making/refining operation.

Steel Refining

From EOF, liquid steel will be tapped into steel teeming ladle placed on a self-propelled steel transfer car and the liquid steel in the ladle will be placed on steel vessel for processing in LRF.

Crude steel obtained from EOF will be taken to the Ladle Refining Furnace (LRF) for adjustment of steel chemistry by addition of Ferro-alloys. The LF has been provided with water-cooled hood and electric arc heating devices for the adjustment of steel chemistry in the LRF.

An online argon rinsing stand is provided in the secondary refining aisle and it is envisaged that all the plain C-steels (i.e. re-bars etc.) will be burged in the argon rinsing stand and then moved to the Continuous Casting Machine (CCM) for making billets. In the Ladle Furnace necessary secondary metallurgical treatments will be carried out to

take care of proper temperature and composition of steel required for the casting of different grades of steel as per product-mix. The LF has been equipped with a fume extraction system consisting of ducts bag filters, chain conveyor and silo for necessary de-dusting.

Continuous Casting of Billets and Blooms

The refined steel is brought from Ladle Furnace in steel teeming ladle to continuous casting machine to make steel billets and blooms. The casters are provided with three

strand casters with secondary water cooling system, auto-touch cut off unit, bottom bed dummy bar system, cooling bed, tundish, mould, and segment preparation facilities.

Bar and Rod Mill

The billets will be transported to rolling mill billet transfer car/crane to billet storage and conditioning Bay of bar and rod mill. Mild steel billets will be stored and the alloy steel billets will be conditioned (i.e. ground and inspected).

Billets will then be loaded in to billet charging grid of the bar and rod mill. From there, billets will proceed to 2 nos. of 45t/hr. rapid re-heating furnaces. After discharge from the furnace at a temperature of 1200-1300 C, the billets will be descaled in a descaler and will be rolled in a 3-high mill strand. After this, the billets will further rolled in 18-strands of bar mill for production of bars of 13-55mm diameter going to cooling bed and for rods 12-34mm diameter going to garret coilers.

With the help of another 4 strands, rods 5.5 -16 mm diameter will be produced and will be cooled in Eden borne coilers. From cooling bed, the rolled bars will proceed to a cold shear where these will be cut to commercial lengths and then collected for bundling and tying.

From coilers, the rod coils will proceed via flat conveyor and hook conveyor to coil collecting capstan. Finishing facilities like straightening, annealing, bright bar grinding, shot blasting, inspection benches etc. are provided for further treatment of rolled bars.

Blooming Mill

The Reversible Blooming Mill is designed to produce heavy rounds and square in the range of 60 - 180 mm as finished/semi-finished product for re-rolling.

The raw material as input to the mill shall be continuously cast blooms from Steel Melt Shop. The bloom sizes available will be:

- i) 250 x 250 mm
- ii) 340 x 400 mm

Depending on quality requirement of the customer, appropriate size of bloom shall be selected for each size of the product. The manufacturing process flow sheet is enclosed.

Captive Power Plant (1 x 7 MW and 3 x 30 MW)

The heat energy of the fuel on combustion used to generate super heat steam in the boilers. The steam is made to run the steam turbine, which coupled, to turbo generator. The rotation of the shaft of turbo generator, produces the current in the coil of the generator, which drawn out as energy.

As the whole, CPP have energy converting systems in series; starting with heat energy into electrical energy, as final end product and the CPP is for a total power generation capacity of 90 MW; will have five parallel units, each having 30 MW capacity.

The CPP (3x30 MW) have necessary utilities like Cooling Tower, Power house, Compressor, water treatment and transportation systems, transformer bay etc., as common for both the power generation units.

To generate 90 MW power, steam is getting through one number of AFBC boiler (127 TPH) using coal as fuel, Five numbers of WHRB (45 TPH 2 Nos, 31.5 TPH 2 Nos and 25 TPH 1 No) using COP gas (sensible heat) and One number BFG boiler (32 TPH) using BF gas for combustion.

Coal Based boiler

Coal based (AFBC) boiler make use of imported coal for the reasons off low ash and content; If imported coal is not available, happen at times, then the coal is essentially a washed one at the source of mine, namely, beneficiated coal drawn from the mines of JSW, one of the major shareholder of JSW. The beneficiated coal is less in ash and having low sulphur (< 1 %) content.

The major unit operations are:

1. Atmospheric Fluidized Bed Combustion (AFBC) boiler.
2. Coal storage and handling system

The major, specific utility for this coal – based CPP is the coal handling mechanical systems for storage and transportation and closed Mechanical Conveyor systems for coal transfer to prevent fugitive dust emission during coal transfer had been installed.

The Fly ash handling systems are specifically designed for better collection of fly ash from ESP and bottom ash from furnace, to destinations, through dense phase Pneumatic

conveying systems. The ash collection point has been provided with closed mechanical transfer system to load the ash in trucks for transportation.

AFBC Boiler

The atmospheric fluidized bed combustion is state of the art Clean-Coal combustion technology for ensuring the complete combustion of the coal.

The AFBC boiler for CPP has the following processes and characteristics

- a) It is Bubbling Bed type
- b) Gas temperature in the boiler is 820 to 840 deg C
- c) Provision is available to project limestone into the furnace to capture sulphur and remove it as a dry by-product.
- d) Reduces the level of NOx emission by 90-95 %

Steam generation will be 127 TPH at 88 bar atmospheric pressure and at 520 C of super heat temperature and provided with a tall RCC stack for 80m height with ID fan and Electrostatic Precipitator for emission control. Ash collection systems are provided at the bottom of the ESP facility.

Coke Oven Gas/Blast Furnace gas fired boilers

In gas based system the waste heat from coke oven flue gases (COFG) from the Coke Oven Plant and the excess Blast Furnace Gas (BFG) is utilized for power generation. The non-recovery type of coke ovens are environmentally safe and waste heat recovery from these coke oven is inherently uncertain and is not prevalent. In this project activity 243,277 Nm³/hr of coke oven flue gases generated from coke oven batteries at 1050 deg C is utilized for power generation by sensing/recovering the waste heat through the boilers natural circulation single drum Waste Heat Recovery Boilers having a main stream pressure at 94 kg/cm². In this Boiler there are three Economizers which help to recover the waste heat from the flue gas which in turn increase the efficiency of Boilers.

Also the Blast Furnace at Steel Plant, having a hot metal production capacity of 1.05 Million TPA will generate 36000 Nm³/hr of BF gas in excess, after in-house consumption. This excess BF gas which otherwise would have been flared will be utilized for power generation by installing a 32TPH single drum Blast furnace gas fired boiler having a main stream pressure at 94 kg/cm².

The gas is burnt in the furnace of the boiler. The walls of this furnace are water tubes welded to each other. The water circulated through the water wall tubes absorb the heat and converted in to steam. The water – steam mixture goes to the steam drum where the steam is separated. The process of passing through super heater tubes arranged within the furnace leads to the super heating of the steam. This high pressure and high temperature steam is rooted to a steam turbine. The thermal energy is converted in to mechanical energy by expansion of steam (through reduction in its temp & press) in the turbine. This rotational energy is used drive the generator which produces electricity. The combined steam from WHRB (5 nos.) and BF Gas fired boiler are taken through a main steam line and admitted to Steam turbine for power generation. A steam common header is provided (AFBC and other boilers steam is connected) before entering to steam turbines where is a flexibility to utilize steam to at both turbines invariable with steam generation at any boiler. In view of environmental prospective to minimize fossil fuel consumption power is being generated about 70 % through gas based by maximizing the utilization of COP, BF.

X. Study Team Selection

Our Study team is selected in such way that the competency level in hands on expertise in Carbon Sequestration Study of Iron and steel manufacturing operations and presenting suitable recommendations.

Our team comprises of

- | | |
|------------------|---------------------------|
| Mr.M.Meganathan | - Lead Environment Expert |
| Mr. Kamalakannan | - Team member |
| Mr. Vignesh | - Team member |
| Mr. Sivnesh Mani | - Team member |
| Mr. Desingraja | - Team member |

Lead Environmental Specialist have hands on Experience more than 15 years in Various Kinds of Industries in Environmental Pollution control departments .

We are recognized Auditors by the Central Government of India and notified accredited Safety Auditors under the Provisions of Manufacture storage, Import of Hazardous chemicals Rule 2000 (Mother Act - Environmental Protection Act 1986) by the Director of Industrial Health and Safety –Tamilnadu .

PART – B

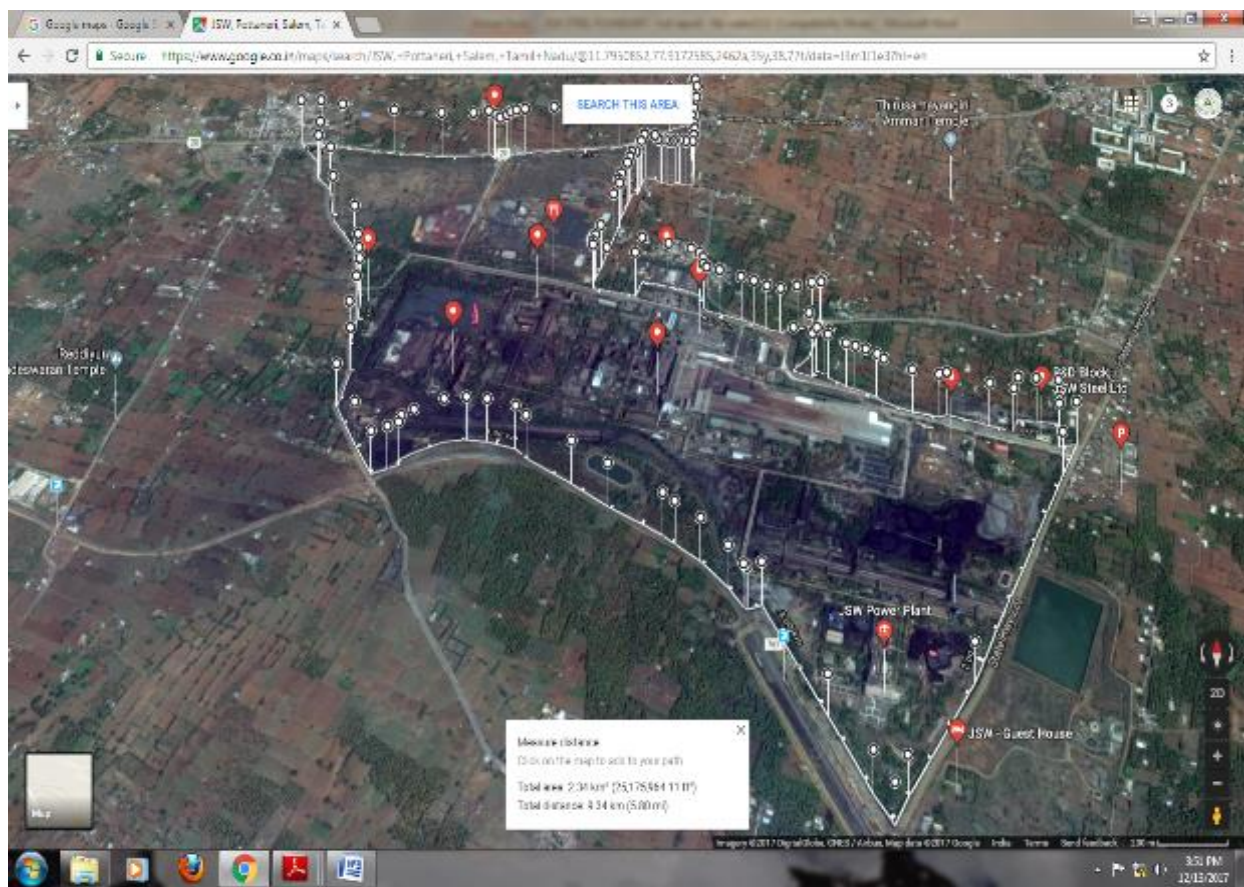
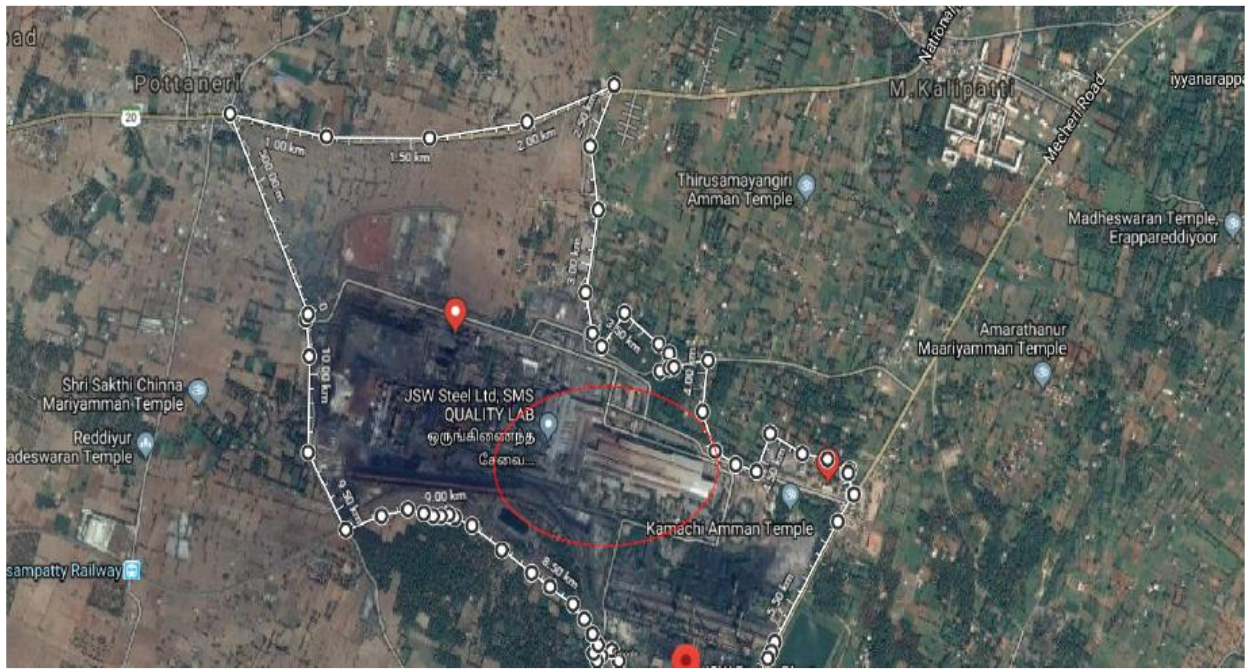
XI. Site Visit

We performed Carbon Sequestration Study for the following areas

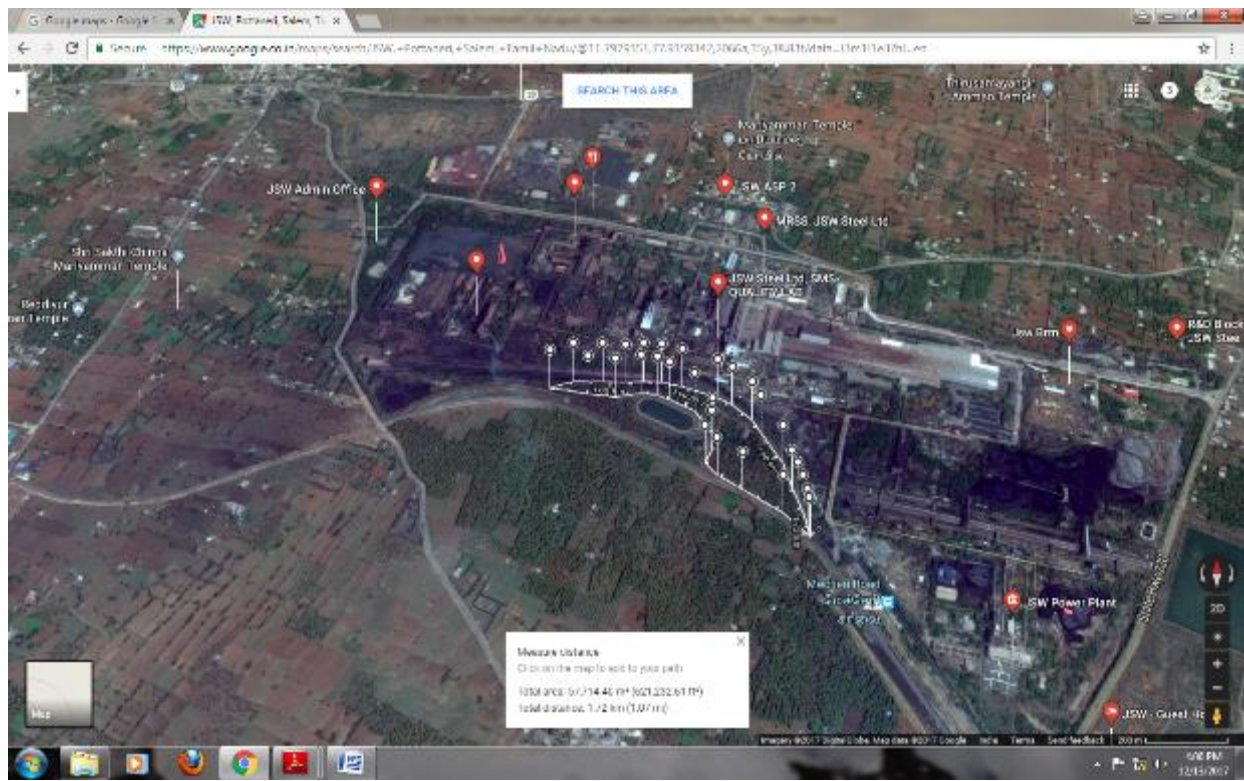
- Boundary's of plant
- Old gust house
- New gust house
- New plant area
- Temple area
- Wagon tippler
- Non Recovery Type Coke Oven Plant
- Sinter Plant
- Blast Furnace
- Steel Making
- Air Separation Plant
- Steel Refining
- Continuous Casting of Billets and Blooms
- Bar and Rod Mill
- Blooming Mill
- QAD
- Captive Power Plant (1 X 7 MW & 3 x 30 MW)
- Utilities – Boilers, Water treatment ,ETP ,STP ,Cooling water , Air compressors Etc.
- HR and Admin
- Purchase and Logistics
- Accounts and Finance office buildings
- Occupational Health Center
- New Land area

XII- GREEN BELT TOPO MAP

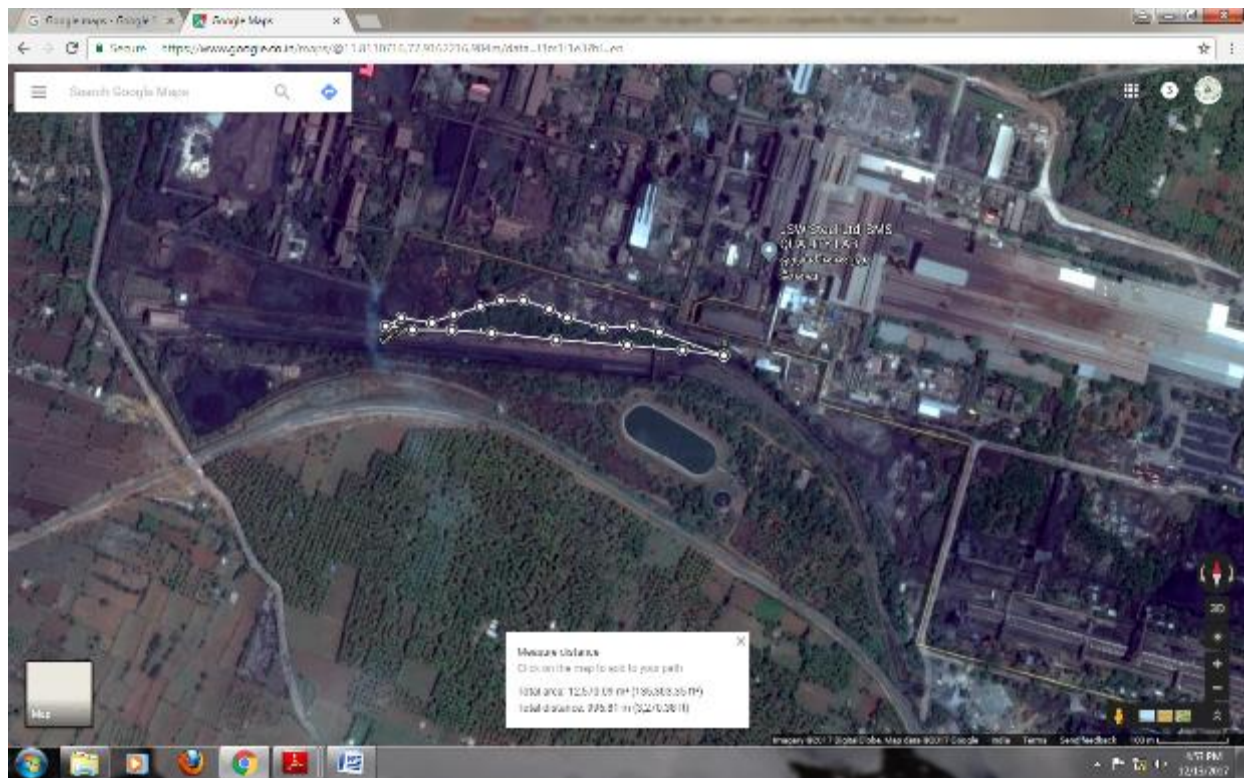
Topo Map:



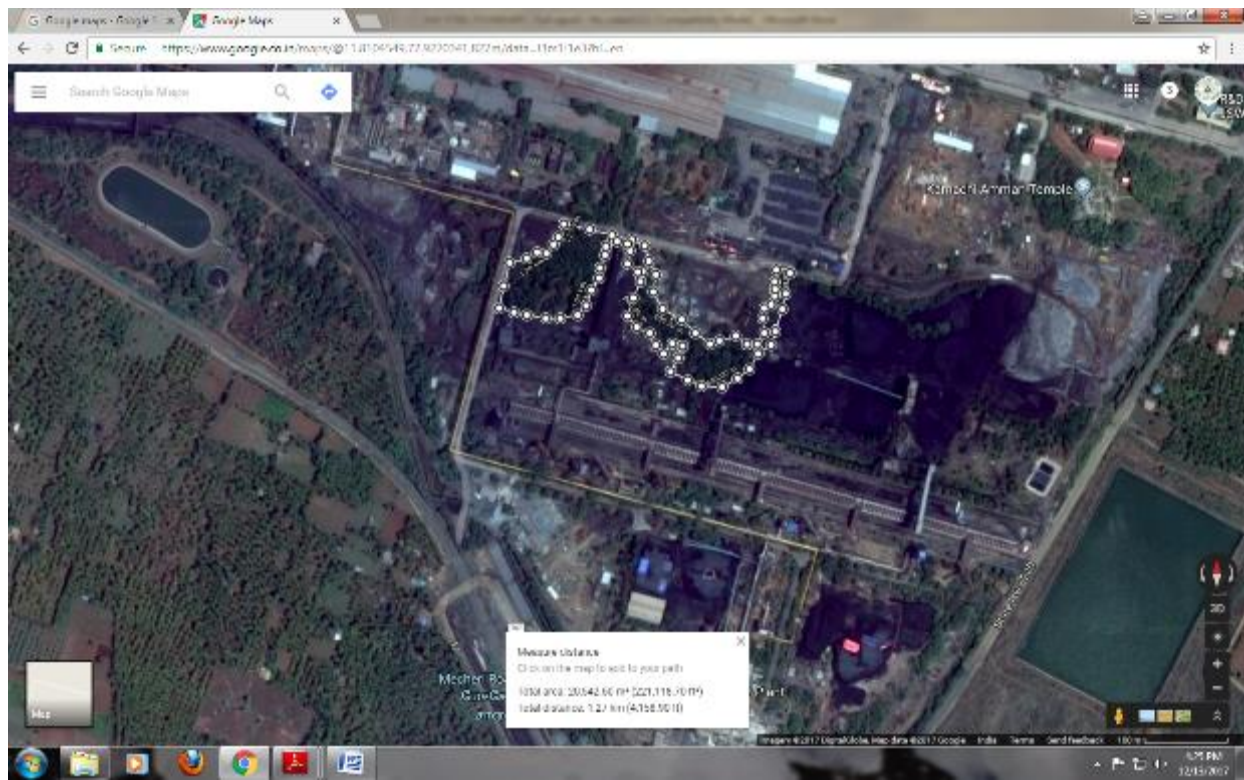
Water Reservoir



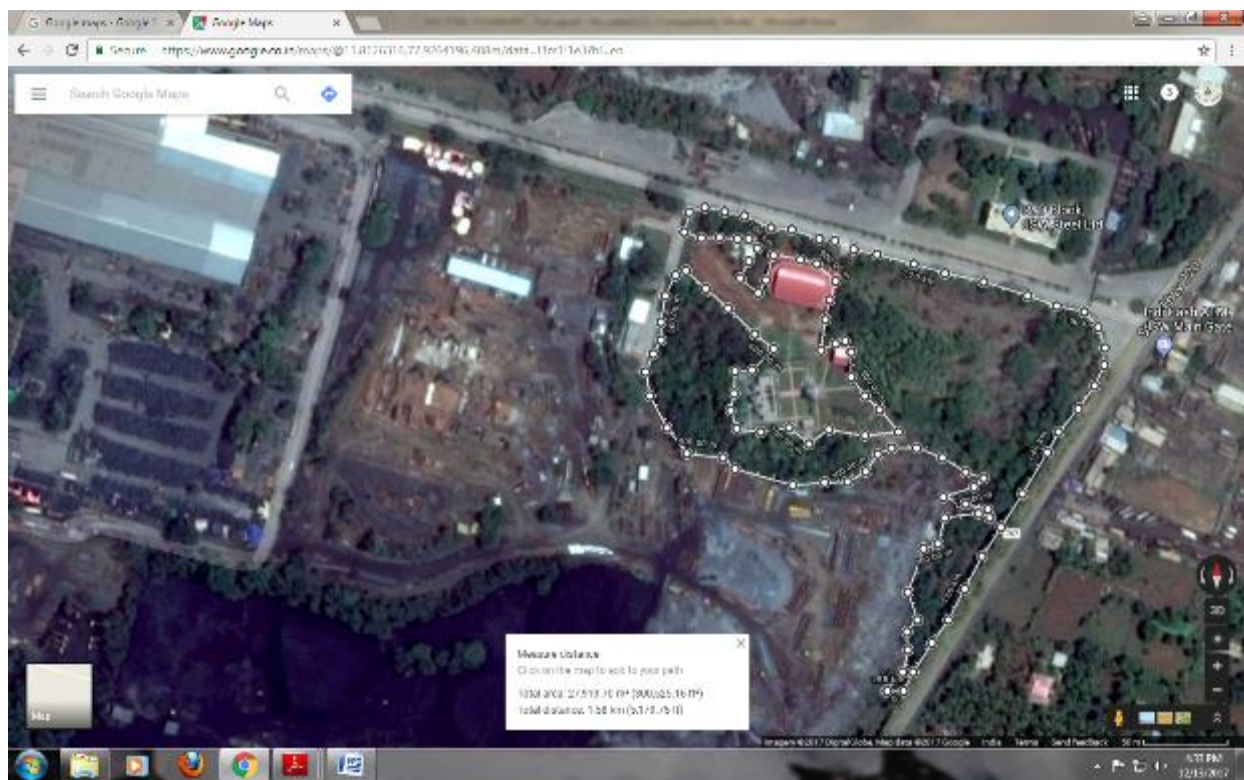
Wagon to near by Water reservoir:



Coke storage area

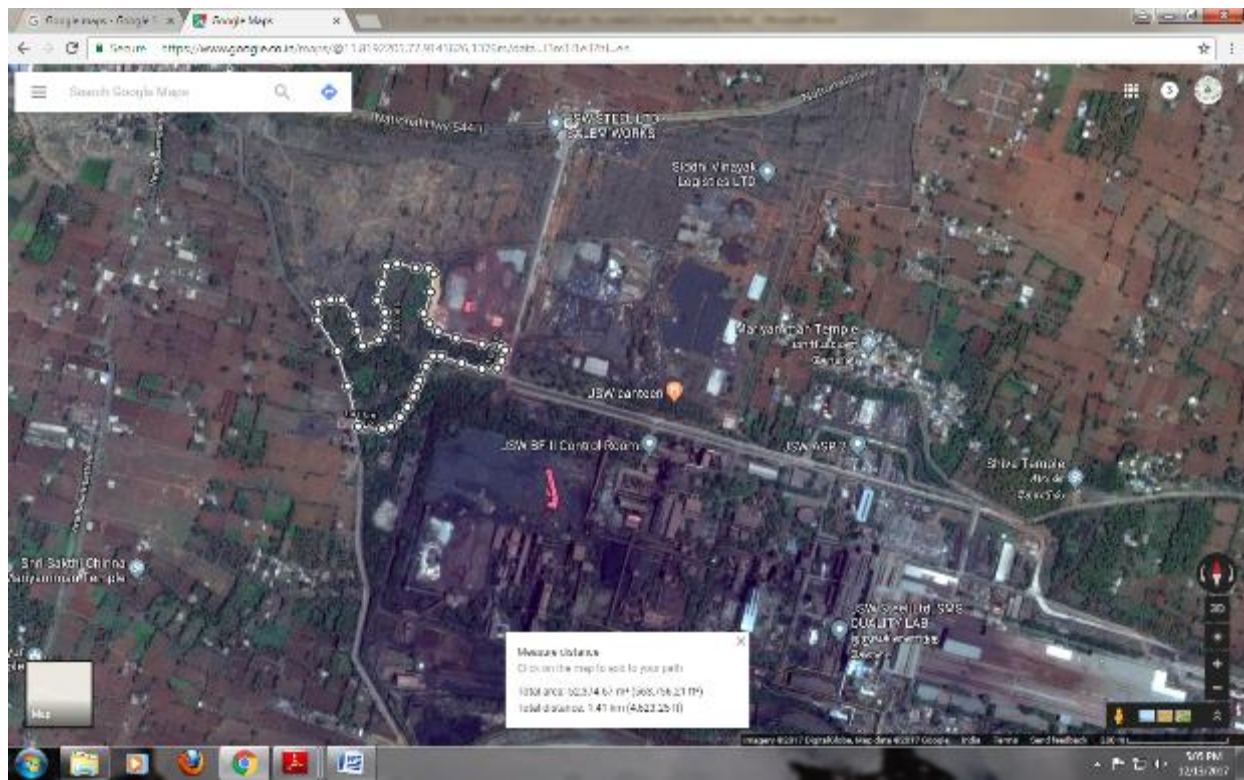


Temple Area:

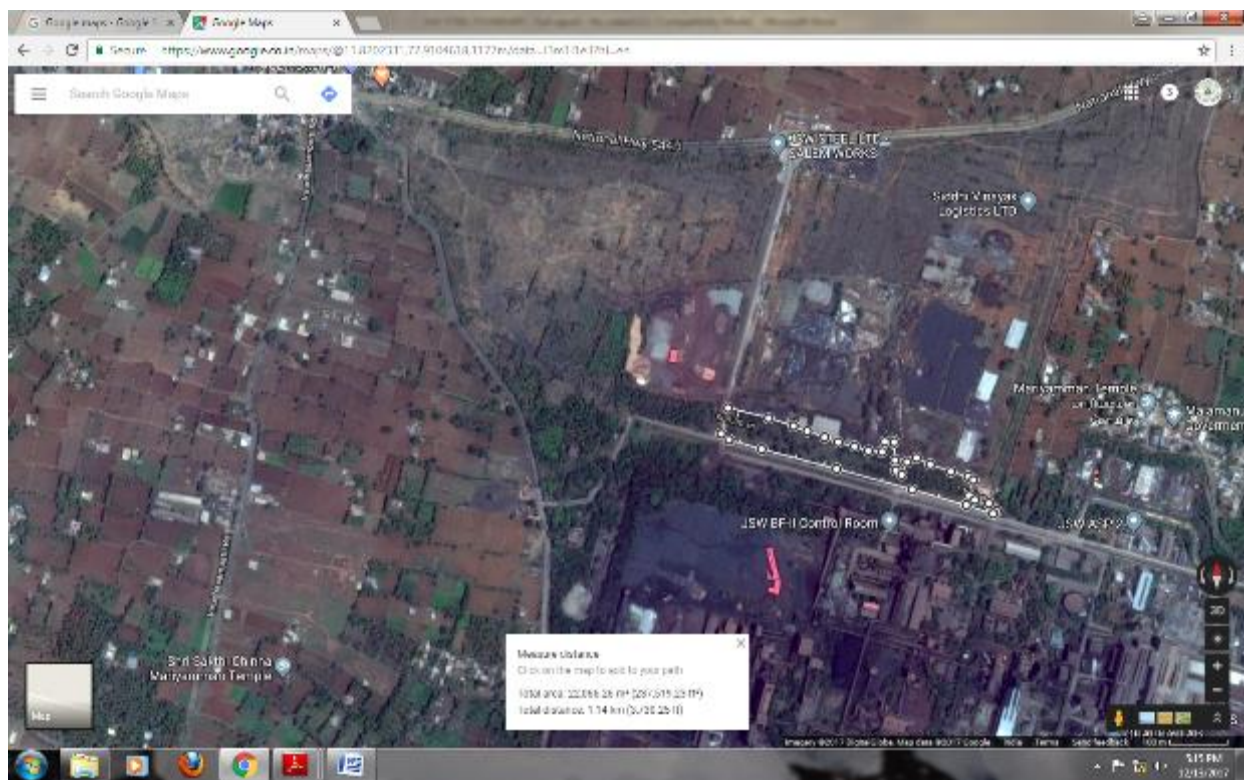


A screenshot of a Google Maps interface showing a satellite view of a campus. A path is highlighted with a dashed line, starting from a point labeled 'Meheri Rana' and ending at a point labeled 'Kamachi Bhamra'. A popup window in the bottom right corner displays the calculated distance: 'total distance: 10.47185 km (7.665214 mi)' and 'total distance: 2.00 km (1.24 mi)'. The interface includes a search bar at the top, a map control panel on the right, and a taskbar at the bottom with various application icons.

Old Guest House Surrounding Area:



JSW Canteen:



Green Belt Development management





XIII. Recommendations:

✓ Scientific Long Term Planning

Plant green and tree cover should form an integral part of the development of the master plans of the plant and its successive long term management. Resource assessment with respect to water availability, soil type, existing tree species, their density & health, growth conditions, etc. should be done to minimize stressful conditions and ensure long term survival of the selected species. Use of modern scientific tool like GIS wherein the given area can be divided into 1 Km² x 1 Km² or 5 Km² x 5 Km² uniform grids for planning of afforestation schemes should be done to attain the uniform results.

✓ Industrial Green Agglomerations

High quality clonal or tissue culture seedlings should be supplied to Gardeners for plantation e.g., Neem (*Azadirachta indica*), *Ardusa* (*Ailanthus* sp.), Mango (*Mangifera indica*), etc. Inclusion of trees in farming systems of inside the plant and periphery landscape can enhance productivity, profitability, diversity, and ecosystem sustainability.

✓ Biodiversity Parks and Tree Tourism

Tree tourism has the potential to attract nature enthusiast and biodiversity lovers to map the biodiversity in the Industrial agglomerations of the plants for their ecological, educational and aesthetics purpose.

✓ Raising of Tall Seedlings

Tall seedlings of ecologically and economically important species should be raised so that plantations grow fast within three years and the success rate of plantation is also improved.

✓ **Tree Plantation Campaign**

- ✓ Green JSW campaign should be undertaken by involving Workers society, schools, colleges, institutions, NGOs, tree lovers, and farmers to create mass movement for tree planting and their subsequent care.
- ✓ **Guidelines for Tree Felling, Looping, and Pruning in the plant Areas**
Tree cutting should be strictly regulated , Prior permission from the top management is mandatory while planning for tree cutting .
- ✓ Land requirement for planting of trees is to be planned and marked in the plant layout as per the CPCB guidelines.
- ✓ **Suggestions** for Air Pollution control and Prevention which will supplement for carbon Sequestration before polluting atmosphere

Operations Control to Prevent Air Pollution

✓ **Transport/Handling of Raw Materials:**

- ✓ Raw material transport by rail, road and water, loading/unloading; belt transport; coal washing.
- ✓ **Suggested Treatment:**
- ✓ If material is received in moist condition, no precaution needed; For dry material, use water curtain or de-dusting by evacuation to a bag filter while unloading; Extensive enclosure of receiving hopper necessary;
- ✓ Minimum height of fall to avoid wind entrainment; Mobile equipment to be avoided, tired vehicle cause (salt and cement) may get contaminated. For proper care use bucket conveyor unloaders with water sprays; Chemical sealing if found suitable.

2. Bedding and Blending of Ore:

- ✓ Large beds for greater homogenization of composition; Blend recovered and placed on belt for storage; it aids in further blending.
- ✓ Suggested Treatment:
- ✓ Binding agent in the water may be necessary; Ensure proper wetting and use detergents, if need be; Large enclosures and evacuation at high rates at transfer points; Bag filters for cleaning gas; Spray installation at transfer points; Recovery of particulate – laden waters for treatment if necessary. Plantation in and around to arrest dust emission.

3. Sintering/Pelletizing of Iron and Steel:

- ✓ Suitability of fine ore in Blast Furnace; Pelletising with binder and rolled in drums/pans, Indurated at high temperature and cooled; for sintering blending of fines with coarser granular ores, flux mixed with coke breeze and heated; sizing.

Important Consideration:

Fines generated –

- (a) Crushing/grinding,
 - (b) Grinding for pelletisation,
 - (c) Cooling/crushing/screening sinter,
 - (d) Cooling and screening pellets;
- ✓ Fugitive dust in pellet plant; Emission of gaseous and liquid fluorine compounds and oil as fuel, SO₂/SO₃; while fumes due to K₂SO₄/Na₂SO₄; Stack emissions may contain upto 1% CO and difficult to remove by incineration; If sintering materials contain lubricants/soluble oils (rolling mill waste), emissions will be visible and may contain hydrocarbon; Large fans create noise.

Suggested Treatment:

- ✓ Fugitive dust (a) Recovery by suction hood installation and bag filters/electrostatic precipitation for dry material only, (b) Wet material requires no such precautions, (c) Energy saving by recycling clean heated air to ignition hood on sinter strand.
- ✓ Stack Emissions:
 - (a) Normally not necessary to treat stack gases than to remove dust,
 - (b) CaO/SiO₂ ratio important. Low ratio may require desulphurisation of gases,
 - (c) CaO/SiO₂ > 2, difficult to apply electrostatic precipitators for fame removal,
 - (d) High SO_x – scrubbing with alkaline liquids (milk of lime). Expensive, fouling and disposal may create environmental problems. SO₂ converted to gypsum (saleable),
 - (e) High fluorine – wet scrubbing or contact with alumina/lime. High basicity leads to low emission,
 - (f) NO_x removal – catalytic converter (expensive),
 - (g) Particulate removal by water scrubbing or electrostatic precipitators,
 - (h) Cyclones for coarse grit removal,

- (i) Alkalies can cause problems with precipitators and tend to clog riddles and other mechanisms,
- (j) Dust to be dumped if recycles not possible,
- (k) Oily scale from rolling mills to be treated and not recycled to sinter plant.

PART C

XIV . Acknowledgments

We thank M/s. JSW Steel Ltd, Salem Works, Pottaneri P.O., Mecheri, Mettur Taluk, Salem District-636 453, Tamil Nadu, India for offering an opportunity to carry out Carbon Sequestration by Plants Study at their facility. We extend our sincere thanks to Managing director / Occupier of the factory , Factory Manager , Dy.Manager- Environment , AM-Environment , Executive Environment ,Environment Assistants , all Employees and all Contract employees who contributed their Support to complete the Carbon Sequestration by Plants Study effectively.

The courtesy and cordiality extended to the carbon Sequestration Study team of Green Global Safety Systems is highly appreciated.

Lead Environment Expert

For Green Global Safety Systems

Date : 09-04-2021

XV – Reference

- Central Pollution control board Guidelines
- State pollution control board Guidelines
- Ministry of Environment and Forest Departmental Guidance
- EPA-US Guidelines
- Environmental Protection act 1986 - for Iron and steel Industries
- Air (Pollution Prevention and Control) 1981
- Water Pollution (Pollution Prevention and Control) 1974
- The Forest Act
- Tropical forest and the greenhouse Effect :A Management response, "Norman Myers and Thomas J. Goreau, Discovery Bay Marine Laboratory, University of the West Indies, Discovery Bay, Jamaica, 1991.
- <http://www.ciesin.columbia.edu/docs/002-163/002-163.html>

XVI. Annexure-I

Comprehensive study Report

M/s. JSW Steels Ltd , Salem Works									
Carbon Sequestration by the Green Belt -April 20-March 2021									
Calculation formula : $0.25 \times (\text{Dia})^2 \times (\text{Height}) \times (1.2 \text{ Wet weight}) \times (0.8 \text{ dry weight}) \times (50\% \text{ carbon content}) \times (3.6663 \text{ Co}_2 \text{ in Carbon}) \times 0.454 \text{ (Pounds to Kg)} / 1000 \text{ (Kg to Ton)}$									
Sl.no	Botanical Name	No of Trees	Location	Diameter in inches	Height in feet	Weight of Carbon in Kg	CO2 Sequestrn in MT	Age Considered for calculation	CO2 Sequestrn in MT per Annum
1	Terminalia Catappa	16	5 S Red zone	8.282	15.4	922.44	3.38	9	0.4
2	Fabaceae	22	5 S Red zone	10.302	15.4	1962.51	7.20	10	0.7
3	Melia azadirachta	15	5 S Red zone	10.302	15.4	1338.08	4.91	10	0.5
4	Fabaceae	82	5 S Red zone	10.807	17.6	9161.64	33.59	10	3.4
5	Bambusa arundinacea	1558	AAQMS-2	3.232	8.0	7064.52	25.90	1	25.9
6	Fabaceae	72	AAQMS-2	8.282	12.7	3413.63	12.52	10	1.3
7	Fabaceae	182	AAQMS-4 North	8.282	13.7	9319.20	34.17	7	4.9
8	Melia azadirachta	168	AAQMS-4 North	10.302	15.4	14986.46	54.94	10	5.5
9	Borassus flabellifer	10	AAQMS-4 North	14.039	44.2	4740.94	17.38	18	1.0
10	Tectona grandis	272	AAQMS-4 North	15.352	28.9	101029.18	370.40	18	20.6
11	Tectona grandis	2250	AAQMS-4 North	16.160	29.9	958496.18	3514.13	18	195.2
12	Tectona grandis	1600	AAQMS-4 North	16.160	31.0	704702.28	2583.65	18	143.5
13	Fabaceae	403	AAQMS-4 West	3.232	8.0	1827.34	6.70	1	6.7
14	Fabaceae	564	Admin Block East	10.302	16.5	53787.17	197.20	10	19.7
15	Fabaceae	180	Admin Block East	13.736	20.8	38499.06	141.15	11	12.8
16	Melia azadirachta	66	Admin Block East	14.039	24.9	17623.23	64.61	18	3.6
17	Eucalyptus	88	Admin Block East	21.836	31.0	70768.47	259.46	18	14.4
18	Pithecellobium dulce	46	Admin Block North	11.312	18.8	6021.59	22.08	10	2.2
19	Pithecellobium dulce	75	Admin Block North	14.039	20.8	16756.78	61.44	18	3.4
20	Saraca asoca	8	Admin Block North	14.039	29.9	2572.10	9.43	18	0.5
21	Eucalyptus	25	Admin Block North	22.866	40.1	28551.95	104.68	18	5.8

22	Fabaceae	31	Admin office Entrance	17.372	27.9	14226.47	52.16	18	2.9
23	Fabaceae	365	Admin office Entrance -East	8.282	9.0	12321.30	45.17	9	5.0
24	Fabaceae	700	Admin office Entrance -North	6.262	9.0	13508.82	49.53	3.5	14.2
25	Saraca asoca	76	Admin office Entrance -North	7.777	25.9	6481.58	23.76	7	3.4
26	Fabaceae	329	Admin office Entrance -North	13.776	14.4	48857.02	179.12	16	11.2
27	Fabaceae	886	Admin office Entrance -South	4.242	10.1	8772.05	32.16	1.5	21.4
28	Fabaceae	746	Admin office Entrance -South	5.151	10.1	10890.51	39.93	2.5	16.0
29	Melia azadirachta	415	Admin office Entrance -South	6.262	10.1	8953.66	32.83	3.5	9.4
30	Fabaceae	367	Admin office Entrance -South	6.262	10.1	7918.05	29.03	3.5	8.3
31	Fabaceae	700	Admin office Entrance -South	8.282	9.0	23629.89	86.63	9	9.6
32	Mangifera indica	158	Admin office Entrance -south	8.282	10.7	6292.45	23.07	9	2.6
33	Acacia nilotica	389	Admin office Entrance -South	8.282	15.7	22869.41	83.85	9	9.3
34	Mangifera indica	146	Admin office Entrance -South	8.282	10.7	5814.55	21.32	10	2.1
35	Melia azadirachta	325	Admin office Entrance -South	8.282	15.7	19106.83	70.05	10	7.0
36	Albizia lebbeck	468	Admin office Entrance -South	8.282	15.7	27513.84	100.87	10	10.1
37	Tectona grandis	45	Admin office Entrance -South	14.039	27.9	13487.17	49.45	18	2.7
38	Fabaceae	38	Admin office Entrance -south	16.160	15.4	8340.90	30.58	18	1.7
39	Casuarina Tree	20	ANNEALING AREA	0.5	5.075	1.410	0.005	1	0.0052
40	Casuarina Tree	10	ANNEALING PLANT	0.5	5.075	0.705	0.003	1	0.0026
41	Casuarina Tree	50	ANNEALING PLANT	0.5	5.075	3.526	0.013	1	0.0129
42	Casuarina Tree	2	ANNEALING PLANT BACK SIDE	0.5	5	0.139	0.001	1	0.0005
43	Casuarina Tree	160	ANNEALING PLANT ROAD SIDE	0.5	5.075	11.282	0.041	1	0.0414
44	Casuarina Tree	100	ANNEALING PLANT ROAD SIDE	0.5	5.075	7.051	0.026	1	0.0259

45	Bambusa arundinacea	188	AQMS North	4.242	10.1	1861.34	6.82	1.5	4.5
46	Bambusa arundinacea	50	AQMS North	4.747	9.0	554.50	2.03	2.5	0.8
47	Fabaceae	221	AQMS South	6.262	8.0	3761.76	13.79	3.5	3.9
48	Fabaceae	35	AQMS South	13.776	10.7	3856.84	14.14	16	0.9
49	Fabaceae	36	AQMS South	16.160	13.3	6810.20	24.97	18	1.4
50	Fabaceae	29	AQMS South	17.372	15.4	7356.04	26.97	18	1.5
51	Casuarina Tree	50	ASP AREA	0.5	5.075	3.526	0.013	1	0.0129
52	Casuarina Tree	70	ASP AREA	0.5	5.075	4.936	0.018	1	0.0181
53	Casuarina Tree	110	ASP AREA	0.5	5.075	7.756	0.028	1	0.0284
54	Casuarina Tree	306	ASP AREA	0.5	5.075	21.576	0.079	1	0.0791
55	Casuarina Tree	60	ASP AREA	0.5	5.075	4.231	0.016	1	0.0155
56	Casuarina Tree	100	ASP AREA	0.5	5.075	7.051	0.026	1	0.0259
57	Casuarina Tree	100	ASP AREA	0.5	5.075	7.051	0.026	1	0.0259
58	Casuarina Tree	120	ASP II AREA ROAD SIDE	0.5	5.075	8.461	0.031	1	0.0310
59	Casuarina Tree	30	ASP ROAD SIDE	0.5	5.075	2.115	0.008	1	0.0078
60	Casuarina Tree	60	ASP ROAD SIDE	0.5	5.075	4.231	0.016	1	0.0155
61	Fabaceae	28	ASP-1	8.282	9.0	945.20	3.47	9	0.4
62	Melia azadirachta	25	ASP-1	8.282	14.7	1374.93	5.04	10	0.5
63	Eucalyptus	8	ASP-1	15.352	16.5	1694.25	6.21	18	0.3
64	Melia azadirachta	15	ASP-1 Back side	9.292	10.7	751.97	2.76	10	0.3
65	Roystonea regia	27	ASP-1 Back side	10.302	9.0	1410.26	5.17	10	0.5
66	Albizia lebbeck	15	ASP-1 Back side	11.312	14.4	1501.86	5.51	10	0.6
67	Terminalia Catappa	20	ASP-1 Entrance	8.282	9.0	675.14	2.48	9	0.3
68	Derris indica	15	ASP-1 Entrance	9.292	16.7	1181.67	4.33	10	0.4
69	Melia azadirachta	10	ASP-1 Entrance	13.585	16.7	1683.74	6.17	11	0.6
70	Fabaceae	5	ASP-1 Entrance	13.776	15.7	813.35	2.98	16	0.2
71	Eucalyptus	4	ASP-1 Entrance	15.352	24.9	1277.20	4.68	18	0.3
72	Melia azadirachta	35	ASP-2 south	8.282	12.7	1659.40	6.08	10	0.6
73	Albizia lebbeck	32	ASP-2 south	9.292	16.7	2520.90	9.24	10	0.9
74	Fabaceae	39	ASP-2 south	10.302	15.7	3547.66	13.01	10	1.3
75	Melia azadirachta	16	ASP-2 south	10.302	15.4	1427.28	5.23	10	0.5
76	Melia azadirachta	30	Assembly point-1	17.372	29.9	14768.83	54.15	18	3.0
77	Tamarindus indica	12	Assembly point-2	14.039	31.0	3988.93	14.62	18	0.8
78	Albizia lebbeck	55	Assembly point-3	14.039	25.9	15285.45	56.04	18	3.1
79	Cocos nucifera	20	Assembly point-4	15.352	34.0	8731.88	32.01	18	1.8
80	Borassus flabellifer	10	Assembly point-5	12.575	33.0	2841.63	10.42	10	1.0
81	Fabaceae	355	ASV-2 North	4.747	11.2	4865.89	17.84	2.5	7.1
82	Fabaceae	255	ASV-2 North	4.747	9.0	2827.95	10.37	2.5	4.1
83	Fabaceae	250	ASV-2 North	6.262	9.0	4824.58	17.69	3.5	5.1
84	Fabaceae	102	ASV-2 North	6.262	10.1	2200.66	8.07	3.5	2.3

85	Fabaceae	120	ASV-2 North	9.292	10.7	6015.78	22.06	10	2.2
86	Albizia lebbeck	15	Bar and rod mill entrance-east	7.777	19.8	978.26	3.59	7	0.5
87	Derris indica	55	Bar and rod mill entrance-east	16.160	28.9	22635.67	82.99	18	4.6
88	Derris indica	55	Bar and rod mill entrance-South	4.747	9.0	609.95	2.24	2.5	0.9
89	Fabaceae	10	Bar and rod mill entrance-South	8.282	12.7	474.11	1.74	9	0.2
90	Melia azadirachta	10	Bar and rod mill entrance-South	8.282	13.7	512.04	1.88	9	0.2
91	Albizia lebbeck	17	Bar and rod mill entrance-South	8.282	15.7	999.43	3.66	10	0.4
92	Fabaceae	15	Bar and rod mill entrance-South	9.292	14.7	1038.44	3.81	10	0.4
93	Derris indica	15	Bar and rod mill entrance-South	9.292	16.7	1181.67	4.33	10	0.4
94	Albizia lebbeck	10	Bar and rod mill entrance-South	10.302	15.4	892.05	3.27	10	0.3
95	Casuarina Tree	25	BF II	0.5	5.075	1.763	0.006	1	0.0065
96	Casuarina Tree	70	BF II AREA	0.5	5.075	4.936	0.018	1	0.0181
97	Casuarina Tree	100	BF II AREA	0.5	5.075	7.051	0.026	1	0.0259
98	Casuarina Tree	30	BF II GROUND OFFER	0.5	5.075	2.115	0.008	1	0.0078
99	Casuarina Tree	55	BF II GROUND OFFER	0.5	5.075	3.878	0.014	1	0.0142
100	Musa paradisiaca	100	BF North	4.242	5.8	572.15	2.10	1.5	1.4
101	Albizia lebbeck	44	BF North	7.777	16.5	2391.30	8.77	7	1.3
102	Melia azadirachta	242	BF North	8.282	15.7	14227.24	52.16	10	5.2
103	Albizia lebbeck	15	BF North	10.302	15.4	1338.08	4.91	10	0.5
104	Roystonea regia	22	BF North	14.039	19.8	4675.55	17.14	18	1.0
105	Cocos nucifera	12	BF North	14.039	31.0	3988.93	14.62	18	0.8
106	Fabaceae	25	BF-1 Pump house	5.151	11.2	403.48	1.48	2.5	0.6
107	Terminalia Catappa	55	BF-1 Pump house	6.262	8.0	936.18	3.43	3.5	1.0
108	Roystonea regia	55	Blast Furnace -1	4.747	9.0	609.95	2.24	2.5	0.9
109	Terminalia Catappa	50	Blast Furnace -1	6.262	10.1	1078.75	3.96	3.5	1.1
110	Melia azedarach	10	Blast Furnace -1	8.282	13.7	512.04	1.88	9	0.2
111	Fabaceae	20	Blast Furnace -1	8.282	14.7	1099.95	4.03	10	0.4
112	Melia azadirachta	50	Blast Furnace -1	10.302	17.6	5076.48	18.61	10	1.9
113	Fabaceae	15	Blast Furnace Near to AIR compr	4.747	9.0	166.35	0.61	2.5	0.2
114	Terminalia Catappa	15	Blast Furnace Near to AIR compr	6.262	9.0	289.47	1.06	3.5	0.3
115	Melia azadirachta	15	Blast Furnace Near to AIR compr	8.282	14.4	805.05	2.95	9	0.3

116	Fabaceae	80	BLM North	8.282	9.0	2700.56	9.90	9	1.1
117	Fabaceae	173	BLM North	8.282	15.7	10170.71	37.29	10	3.7
118	Swietenia Mahagoni	42	BLM North	9.292	14.7	2907.63	10.66	10	1.1
119	Fabaceae	15	BRM	8.282	13.7	768.07	2.82	9	0.3
120	Melia azadirachta	15	BRM	10.302	16.5	1430.51	5.24	10	0.5
121	Casuarina Tree	50	BRM AREA	0.5	5.075	3.526	0.013	1	0.0129
122	Fabaceae	255	BRM Charge West	8.282	13.7	13057.12	47.87	9	5.3
123	Albizia lebbeck	15	BRM Pump house entrance East	10.807	17.6	1675.91	6.14	10	0.6
124	Derris indica	25	BRM Pump house entrance North	6.262	10.1	539.38	1.98	3.5	0.6
125	Couroupita Guianensis	15	BRM Pump house entrance North	10.807	17.6	1675.91	6.14	10	0.6
126	Albizia lebbeck	10	BRM Pump house entrance North	13.736	18.8	1930.17	7.08	11	0.6
127	Cocos nucifera	10	BRM Pump house entrance North	14.039	44.2	4740.94	17.38	18	1.0
128	Fabaceae	10	BRM Pump house entrance West	8.282	13.7	512.04	1.88	9	0.2
129	Casuarina Tree	30	CANTEEN AREA	0.5	5.075	2.115	0.008	1	0.0078
130	Melia azadirachta	50	Canteen road view	8.282	15.4	2882.62	10.57	9	1.2
131	Fabaceae	20	Canteen road view	12.575	25.9	4459.18	16.35	10	1.6
132	Fabaceae	15	CC-1	8.282	12.7	711.17	2.61	7	0.4
133	Casuarina Tree	10	CCM III	0.5	5.075	0.705	0.003	1	0.0026
134	Casuarina Tree	115	CCM III SCRAP YARD	0.5	5.075	8.109	0.030	1	0.0297
135	Casuarina Tree	15	CEMENT FACTORY	0.5	5.075	1.058	0.004	1	0.0039
136	Pithecellobium dulce	15	Center plant 1 Assembly point	6.262	10.1	323.63	1.19	3.5	0.3
137	Fabaceae	20	Center plant 1 Assembly point	7.777	15.4	1016.72	3.73	7	0.5
138	Terminalia Catappa	10	Center plant 1 Assembly point	8.282	13.7	512.04	1.88	9	0.2
139	Melia azadirachta	15	Center plant 1 Assembly point	10.302	17.6	1522.94	5.58	10	0.6
140	Cocos nucifera	10	Center plant 1 Assembly point	13.756	43.1	4447.22	16.30	16	1.0
141	Tectona grandis	17	Center plant 1 Assembly point	16.160	29.9	7241.97	26.55	18	1.5
142	Fabaceae	146	Chimney area	6.262	9.0	2817.55	10.33	3.5	3.0

143	Fabaceae	5500	Chimney area	1.212	5.6	2457.16	9.01	4.5	2.0
144	Melia azadirachta	230	Chimney area	7.777	16.5	12499.96	45.83	7	6.5
145	Cocos nucifera	56	Chimney area	14.039	28.9	17394.36	63.77	18	3.5
146	Cocos nucifera	240	Chimney area	14.039	31.0	79778.63	292.49	18	16.2
147	Tamarindus indica	50	Chimney area	18.746	31.0	29632.73	108.64	18	6.0
148	Cocos nucifera	10	Coal yard East	14.039	40.1	4304.99	15.78	18	0.9
149	Fabaceae	280	Coal yard north	6.262	9.0	5403.53	19.81	3.5	5.7
150	Fabaceae	260	Coil yard north	4.747	6.9	2203.05	8.08	2.5	3.2
151	Fabaceae	258	Coil yard north	5.151	10.1	3766.42	13.81	2.5	5.5
152	Fabaceae	82	Coil yard north	6.262	9.0	1582.46	5.80	3.5	1.7
153	Melia azadirachta	11	Coil yard north	8.282	15.7	646.69	2.37	9	0.3
154	Melia azadirachta	11	Coil yard north	10.302	15.4	981.26	3.60	10	0.4
155	Ficus religiosa	6	Coil yard north	14.039	20.8	1340.54	4.91	18	0.3
156	Casuarina Tree	50	COKE OVEN AREA	0.5	5.075	3.526	0.013	1	0.0129
157	Casuarina Tree	50	COKE OVEN AREA	0.5	5.075	3.526	0.013	1	0.0129
158	Casuarina Tree	100	COKE OVEN AREA	0.5	5.075	7.051	0.026	1	0.0259
159	Casuarina Tree	100	COKE OVEN NEAR LEMS SHED	0.5	5.075	7.051	0.026	1	0.0259
160	Fabaceae	900	cook oven hopper	5.151	11.2	14525.18	53.25	2.5	21.3
161	Fabaceae	300	cook oven hopper	5.151	11.2	4841.73	17.75	2.5	7.1
162	Fabaceae	98	cook oven hopper	8.282	10.7	3902.91	14.31	9	1.6
163	Melia azadirachta	32	cook oven hopper	8.282	9.0	1080.22	3.96	10	0.4
164	Melia azadirachta	88	cook oven hopper	8.282	10.7	3504.66	12.85	10	1.3
165	Albizia lebbeck	30	cook oven plant East	4.747	10.1	371.95	1.36	2.5	0.5
166	Fabaceae	168	cook oven plant East	4.747	8.0	1643.31	6.02	2.5	2.4
167	Fabaceae	290	cook oven plant East	5.151	10.1	4233.58	15.52	2.5	6.2
168	Fabaceae	100	cook oven plant East	5.151	11.2	1613.91	5.92	2.5	2.4
169	Bambusa arundinacea	1150	cook oven plant East	5.151	11.2	18559.95	68.05	2.5	27.2
170	Bambusa arundinacea	360	cook oven plant East	6.262	10.1	7767.03	28.48	3.5	8.1
171	Melia azadirachta	150	cook oven plant East	6.262	10.1	3236.26	11.87	3.5	3.4
172	Fabaceae	144	cook oven plant East	6.262	10.1	3106.81	11.39	3.5	3.3

173	Tamarindus indica	14	cook oven plant East	8.282	9.0	472.60	1.73	9	0.2
174	Albizia lebbbeck	16	cook oven plant East	8.282	15.7	940.64	3.45	9	0.4
175	Fabaceae	15	cook oven plant East	9.292	14.7	1038.44	3.81	10	0.4
176	Cassia tora	26	cook oven plant East	9.292	16.7	2048.23	7.51	10	0.8
177	Borassus flabellifer	12	cook oven plant East	12.575	43.1	4459.18	16.35	10	1.6
178	Fabaceae	55	cook oven plant East	13.585	16.7	9260.56	33.95	11	3.1
179	Melia azadirachta	48	cook oven plant East	13.776	10.7	5289.38	19.39	16	1.2
180	Bambusa arundinacea	720	cook oven plant West	4.747	10.1	8926.83	32.73	2.5	13.1
181	Bambusa arundinacea	662	cook oven plant West	6.262	8.0	11268.26	41.31	3.5	11.8
182	Fabaceae	290	cook oven plant West	6.262	9.0	5596.51	20.52	3.5	5.9
183	Bambusa arundinacea	660	cook oven plant West	6.262	10.1	14239.55	52.21	3.5	14.9
184	Derris indica	88	cook oven plant West	8.282	8.0	2620.15	9.61	9	1.1
185	Fabaceae	388	cook oven plant West	8.282	9.0	13097.71	48.02	9	5.3
186	Fabaceae	262	cook oven plant West	8.282	9.0	8844.33	32.43	10	3.2
187	Fabaceae	22	cook oven plant West	9.292	8.0	824.54	3.02	10	0.3
188	Bauhinia purpurea	18	cook oven plant West	9.292	14.7	1246.13	4.57	10	0.5
189	Melia azadirachta	22	cook oven plant West	10.302	14.7	1872.13	6.86	10	0.7
190	Melia azadirachta	38	cook oven plant West	10.302	16.7	3679.71	13.49	10	1.3
191	Melia azadirachta	150	cook oven plant West	10.807	17.6	16759.10	61.44	10	6.1
192	Couroupita Guianensis	20	cook oven plant West	13.756	9.0	1862.60	6.83	16	0.4
193	Melia azadirachta	28	cook oven plant West	13.756	9.0	2607.64	9.56	16	0.6
194	Derris indica	30	cook oven plant West	13.776	10.7	3305.87	12.12	16	0.8
195	Tectona grandis	66	cook oven plant West	14.039	28.9	20500.49	75.16	18	4.2
196	Fabaceae	25	cookoven north	8.282	15.4	1441.31	5.28	9	0.6
197	Fabaceae	155	CPP 2 & AAQMS	6.262	10.1	3344.14	12.26	3.5	3.5
198	Fabaceae	27	CPP 2 & AAQMS	7.272	11.2	868.50	3.18	5	0.6
199	Fabaceae	73	CPP 2 & AAQMS	9.292	14.7	5053.73	18.53	10	1.9
200	Fabaceae	24	CPP 2 & AAQMS	17.372	15.4	6087.76	22.32	18	1.2
201	Fabaceae	26	CPP 2 & AAQMS	20.806	18.8	11513.98	42.21	18	2.3

202	Casuarina Tree	150	CPP II AREA	0.5	5.075	10.577	0.039	1	0.0388
203	Casuarina Tree	100	CPP II AREA	0.5	5.075	7.051	0.026	1	0.0259
204	Casuarina Tree	50	CPP III AREA	0.5	5.075	3.526	0.013	1	0.0129
205	Melia azadirachta	21	CPP New	8.282	9.0	708.90	2.60	9	0.3
206	Melia azadirachta	12	CPP New	9.292	12.7	716.16	2.63	10	0.3
207	Melia azadirachta	18	CPP New	13.585	16.7	3030.73	11.11	11	1.0
208	Melia azadirachta	16	CPP New	16.160	18.8	4274.42	15.67	18	0.9
209	Terminalia Catappa	25	CPP-1 Entrance east	6.262	9.0	482.46	1.77	3.5	0.5
210	Derris indica	15	CPP-1 Entrance east	8.282	14.4	805.05	2.95	10	0.3
211	Melia azadirachta	25	CPP-1 Entrance east	10.302	17.6	2538.24	9.31	10	0.9
212	Eucalyptus	4	CPP-1 Entrance east	14.039	20.8	893.70	3.28	18	0.2
213	Terminalia Catappa	100	CPP-1 Entrance North	6.262	10.1	2157.51	7.91	3.5	2.3
214	Eucalyptus	2	CPP-1 Entrance North	13.585	16.5	331.65	1.22	11	0.1
215	Fabaceae	3	CPP-1 Entrance North	13.585	18.8	566.35	2.08	11	0.2
216	Tectona grandis	56	CPP-1 Entrance North	14.039	46.2	27769.94	101.81	18	5.7
217	Tectona grandis	102	CPP-1 Entrance North	16.160	44.2	64073.03	234.91	18	13.1
218	Albizia lebbeck	60	CPP-1 Entrance North	17.372	15.4	15219.40	55.80	18	3.1
219	Fabaceae	125	CPP2 Transformer	4.242	10.1	1237.59	4.54	1.5	3.0
220	Fabaceae	18	CPP2 Transformer	8.282	12.7	853.41	3.13	9	0.3
221	Melia azadirachta	12	CPP2 Transformer	8.282	10.7	477.91	1.75	10	0.2
222	Melia azadirachta	38	CPP2 Transformer - North	8.282	12.7	1801.64	6.61	9	0.7
223	Fabaceae	20	CPP2 Transformer - North	8.282	12.7	948.23	3.48	10	0.3
224	Fabaceae	65	CPP2 Transformer - North	8.282	14.7	3574.83	13.11	10	1.3
225	Melia azadirachta	28	CPP2 Transformer - North	13.776	14.4	4158.04	15.24	16	1.0
226	Melia azadirachta	22	CPP2 Transformer - North	15.352	16.5	4659.18	17.08	18	0.9
227	Roystonea regia	50	CPP2 Transformer - North	15.352	40.1	25739.50	94.37	18	5.2

228	Fabaceae	122	Crusher way Bridge area	9.292	13.7	7863.49	28.83	10	2.9
229	Melia azadirachta	39	Crusher way Bridge area	9.292	16.7	3072.35	11.26	10	1.1
230	Terminalia Catappa	15	DM plant entrance	4.747	9.0	166.35	0.61	2.5	0.2
231	Melia azadirachta	25	DM plant entrance	11.312	16.7	2918.81	10.70	10	1.1
232	Ficus religiosa	10	DM plant entrance	16.160	22.8	3249.14	11.91	18	0.7
233	Albizia lebbeck	70	Entrance Gate Right side	5.151	9.0	914.06	3.35	2.5	1.3
234	Bambusa arundinacea	55	Entrance Gate Right side	5.151	10.1	802.92	2.94	2.5	1.2
235	Carica Papaya	15	Entrance Gate Right side	7.272	10.7	460.57	1.69	5	0.3
236	Albizia lebbeck	10	Entrance Gate Right side	8.282	10.7	398.26	1.46	9	0.2
237	Melia azadirachta	115	Entrance Gate Right side	8.282	15.7	6760.88	24.79	10	2.5
238	Albizia lebbeck	20	Entrance Gate Right side	9.292	14.7	1384.58	5.08	10	0.5
239	Albizia lebbeck	15	Entrance Gate Right side	10.302	15.4	1338.08	4.91	10	0.5
240	Albizia lebbeck	486	Entrance Gate Right side	10.302	22.8	64174.87	235.2 8	10	23.5
241	Melia azadirachta	50	Entrance Gate Right side	10.807	17.6	5586.37	20.48	10	2.0
242	Borassus flabellifer	25	Entrance Gate Right side	14.039	43.1	11579.89	42.46	18	2.4
243	Borassus flabellifer	78	Entrance Gate Right side	15.352	33.0	33037.79	121.1 3	18	6.7
244	Derris indica	20	EOF - 1	7.777	16.5	1086.95	3.99	7	0.6
245	Terminalia Catappa	15	EOF - 1	8.282	15.7	881.85	3.23	9	0.4
246	Roystonea regia	28	EOF - 1	10.302	22.8	3697.32	13.56	10	1.4
247	Melia azadirachta	10	EOF - 1	14.039	18.8	2016.26	7.39	18	0.4
248	Eucalyptus	25	EOF - 1	15.352	34.0	10914.85	40.02	18	2.2
249	Terminalia Catappa	15	EOF - 2 & MCC-5 entrance	5.151	11.2	242.09	0.89	2.5	0.4
250	Melia azadirachta	15	EOF - 2 & MCC-5 entrance	8.282	10.7	597.38	2.19	10	0.2
251	Roystonea regia	15	EOF - 2 & MCC-5 entrance	9.292	12.7	895.21	3.28	10	0.3
252	Fabaceae	16	EOF - 2 & MCC-5 entrance	10.302	16.7	1549.35	5.68	10	0.6
253	Eucalyptus	3	EOF - 2 & MCC-5 entrance	13.585	18.8	566.35	2.08	11	0.2
254	Melia azadirachta	10	Fuel/Flux west	8.282	10.7	398.26	1.46	9	0.2
255	Thespesia populnea	19	Fuel/Flux west	8.282	13.7	972.88	3.57	9	0.4

256	Fabaceae	490	Fuel/Flux west	8.282	14.4	26298.21	96.42	10	9.6
257	Terminalia Catappa	15	Furnace oil storage tank	7.272	11.2	482.50	1.77	5	0.4
258	Fabaceae	15	Furnace oil storage tank	8.282	10.7	597.38	2.19	10	0.2
259	Fabaceae	22	Furnace oil storage tank	9.292	14.7	1523.04	5.58	10	0.6
260	Albizia lebbeck	180	Generator North	7.777	19.8	11739.09	43.04	7	6.1
261	Saraca asoca	10	Generator North	7.777	25.9	852.84	3.13	7	0.4
262	Melia azadirachta	45	Generator North	8.282	19.8	3328.29	12.20	10	1.2
263	Ficus Religiosa	25	Generator North	10.302	16.5	2384.18	8.74	10	0.9
264	Albizia lebbeck	40	Generator North	10.302	22.8	5281.88	19.36	10	1.9
265	Albizia lebbeck	64	Generator North	13.736	24.9	16359.49	59.98	12	5.0
266	Albizia lebbeck	40	Generator North	14.039	25.9	11116.69	40.76	18	2.3
267	Eucalyptus	82	Generator North	14.039	28.9	25470.31	93.38	18	5.2
268	Fabaceae	10	Generator North	17.372	27.9	4589.18	16.83	18	0.9
269	Pithecellobium dulce	88	Generator North	20.806	33.0	68461.49	251.00	18	13.9
270	Casuarina Tree	10	GIVEN TO METTUR	0.5	5.075	0.705	0.003	1	0.0026
271	Casuarina Tree	20	HR OFFICE BACK SIDE	0.5	5.075	1.410	0.005	1	0.0052
272	Carica Papaya	84	Jsw Canteen to gate compound boundry	3.232	8.0	380.89	1.40	1	1.4
273	Acacia nilotica	50	Jsw Canteen to gate compound boundry	3.232	8.0	226.72	0.83	1	0.8
274	Musa paradisiaca	156	Jsw Canteen to gate compound boundry	4.242	8.0	1218.54	4.47	1.5	3.0
275	Bambusa arundinacea	1920	Jsw Canteen to gate compound boundry	4.242	8.0	14997.38	54.98	1.5	36.7
276	Albizia lebbeck	20	Jsw Canteen to gate compound boundry	5.151	10.1	291.97	1.07	2.5	0.4
277	Melia azadirachta	358	Jsw Canteen to gate compound boundry	7.272	10.7	10992.16	40.30	5	8.1
278	Melia azadirachta	318	Jsw Canteen to gate compound boundry	7.777	15.4	16165.83	59.27	7	8.5
279	Melia azadirachta	650	Jsw Canteen to gate compound boundry	7.777	15.4	33043.37	121.15	7	17.3
280	Albizia lebbeck	45	Jsw Canteen to gate compound boundry	8.282	12.7	2133.52	7.82	7	1.1

281	Albizia lebbeck	347	Jsw Canteen to gate compound boundry	8.282	10.7	13819.50	50.67	9	5.6
282	Fabaceae	270	Jsw Canteen to gate compound boundry	8.282	10.7	10752.93	39.42	9	4.4
283	Fabaceae	83	Jsw Canteen to gate compound boundry	8.282	10.7	3305.53	12.12	9	1.3
284	Melia azadirachta	360	Jsw Canteen to gate compound boundry	8.282	15.7	21164.49	77.60	9	8.6
285	Syzygium cumini	44	Jsw Canteen to gate compound boundry	8.282	15.7	2586.77	9.48	9	1.1
286	Melia azadirachta	122	Jsw Canteen to gate compound boundry	8.282	15.4	7033.59	25.79	9	2.9
287	Albizia lebbeck	600	Jsw Canteen to gate compound boundry	8.282	9.0	20254.19	74.26	10	7.4
288	Albizia lebbeck	290	Jsw Canteen to gate compound boundry	8.282	12.7	13749.33	50.41	10	5.0
289	Albizia lebbeck	154	Jsw Canteen to gate compound boundry	8.282	12.7	7301.37	26.77	10	2.7
290	Albizia lebbeck	65	Jsw Canteen to gate compound boundry	8.282	14.4	3488.54	12.79	10	1.3
291	Melia azadirachta	275	Jsw Canteen to gate compound boundry	9.292	16.7	21663.98	79.43	10	7.9
292	Melia azadirachta	450	Jsw Canteen to gate compound boundry	10.302	15.4	40142.31	147.17	10	14.7
293	Fabaceae	263	Jsw Canteen to gate compound boundry	10.302	15.4	23460.95	86.01	10	8.6
294	Fabaceae	144	Jsw Canteen to gate compound boundry	10.302	16.5	13732.89	50.35	10	5.0
295	Melia azadirachta	670	Jsw Canteen to gate compound boundry	10.807	16.5	70313.97	257.79	10	25.8
296	Borassus flabellifer	98	Jsw Canteen to gate compound boundry	12.575	40.1	33846.03	124.09	10	12.4
297	Borassus flabellifer	390	Jsw Canteen to gate compound boundry	13.756	43.1	173441.75	635.89	16	39.7

298	Cocos nucifera	70	Jsw Canteen to gate compound boundry	14.039	43.1	32423.69	118.87	18	6.6
299	Borassus flabellifer	115	Jsw Canteen to gate compound boundry	14.039	43.1	53267.49	195.29	18	10.8
300	Borassus flabellifer	95	Jsw Canteen to gate compound boundry	14.039	44.2	45038.96	165.13	18	9.2
301	Cocos nucifera	83	Jsw Canteen to gate compound boundry	14.039	44.2	39349.83	144.27	18	8.0
302	Borassus flabellifer	72	Jsw Canteen to gate compound boundry	16.160	43.1	44188.30	162.01	18	9.0
303	Ficus benghalensis	99	Jsw Canteen to gate compound boundry	16.160	24.9	35025.72	128.41	18	7.1
304	Cocos nucifera	86	Jsw Canteen to gate compound boundry	16.160	43.1	52780.47	193.51	18	10.8
305	Tectona grandis	86	Jsw Canteen to gate compound boundry	16.160	44.2	54022.36	198.06	18	11.0
306	Tamarindus indica	1500	Jsw Canteen to gate compound boundry	17.372	18.8	463090.39	1697.83	18	94.3
307	Fabaceae	591	JSW Power Plant East Boundry	4.747	9.0	6554.19	24.03	2.5	9.6
308	Albizia lebbeck	154	JSW Power Plant East Boundry	7.777	15.4	7828.74	28.70	5	5.7
309	Derris indica	156	JSW Power Plant East Boundry	8.282	12.7	7396.19	27.12	9	3.0
310	Melia azadirachta	423	JSW Power Plant East Boundry	8.282	13.7	21659.47	79.41	9	8.8
311	Fabaceae	10	JSW Power Plant East Boundry	8.282	9.0	337.57	1.24	10	0.1
312	Melia azadirachta	10	JSW Power Plant East Boundry	10.302	16.7	968.35	3.55	10	0.4
313	Saraca asoca	48	JSW Power Plant East Boundry	12.575	27.9	11541.40	42.31	10	4.2
314	Borassus flabellifer	28	JSW Power Plant East Boundry	12.575	37.0	8935.84	32.76	10	3.3
315	Tectona grandis	260	JSW Power Plant East Boundry	14.039	29.9	83593.18	306.48	18	17.0
316	Tectona grandis	256	JSW Power Plant East Boundry	14.039	31.0	85097.20	311.99	18	17.3
317	Eccoliptics	36	JSW Power Plant East Boundry	15.352	24.9	11494.81	42.14	18	2.3
318	Bambusa arundinacea	4208	JSW Power Plant South Boundry	3.232	8.0	19080.57	69.96	1	70.0

319	Bambusa arundinacea	500	JSW Power Plant South Boundry	3.232	5.8	1660.67	6.09	1	6.1
320	Fabaceae	621	JSW Power Plant South Boundry	4.242	10.1	6148.36	22.54	1.5	15.0
321	Bambusa arundinacea	9500	JSW Power Plant South Boundry	4.747	9.0	105355.02	386.26	2.5	154.5
322	Melia azadirachta	650	JSW Power Plant South Boundry	6.262	9.0	12543.90	45.99	3.5	13.1
323	Melia azadirachta	253	JSW Power Plant South Boundry	6.262	10.1	5458.49	20.01	3.5	5.7
324	Fabaceae	600	JSW Power Plant South Boundry	8.282	10.7	23895.39	87.61	9	9.7
325	Albizia lebbeck	600	JSW Power Plant South Boundry	8.282	12.7	28446.89	104.29	9	11.6
326	Melia azadirachta	198	JSW Power Plant South Boundry	8.282	15.7	11640.47	42.68	10	4.3
327	Pithecellobium dulce	269	JSW Power Plant South Boundry	9.292	15.7	19906.99	72.98	10	7.3
328	Pithecellobium dulce	126	JSW Power Plant South Boundry	10.302	14.4	10463.41	38.36	10	3.8
329	Albizia lebbeck	243	JSW Power Plant South Boundry	10.302	14.4	20179.43	73.98	10	7.4
330	Saraca asoca	126	JSW Power Plant South Boundry	10.302	22.8	16637.93	61.00	10	6.1
331	Ficus religiosa	186	JSW Power Plant South Boundry	11.312	18.8	24348.19	89.27	10	8.9
332	Tectona grandis	256	JSW Power Plant South Boundry	12.575	27.9	61554.14	225.68	10	22.6
333	Fabaceae	384	JSW Power Plant South Boundry	13.585	16.5	63675.89	233.45	11	21.2
334	Cocos nucifera	158	JSW Power Plant South Boundry	14.039	29.9	50798.93	186.24	18	10.3
335	Tectona grandis	156	JSW Power Plant South Boundry	14.039	33.0	55256.51	202.59	18	11.3
336	Fabaceae	10	Lime Storage sheed south	8.282	9.0	337.57	1.24	9	0.1
337	Eucalyptus	10	Lime Storage sheed south	14.039	31.0	3324.11	12.19	18	0.7
338	Terminalia Catappa	100	load center substation-4	3.232	5.8	332.13	1.22	1	1.2
339	Pongamia pinnata	150	load center substation-4	4.747	6.9	1270.99	4.66	2.5	1.9
340	Eucalyptus	12	load center substation-4	13.776	10.7	1322.35	4.85	16	0.3
341	Pithecellobium dulce	27	load center substation-4	22.866	19.8	15222.89	55.81	18	3.1
342	Casuarina Tree	6	Main Canteen	0.5	5.075	0.423	0.002	1	0.0016
343	Casuarina Tree	19	MAIN GATE	0.5	5.075	1.340	0.005	1	0.0049

344	Casuarina Tree	125	MAIN GATE AREA	0.5	5.075	8.814	0.032	1	0.0323
345	Casuarina Tree	100	MAIN GATE AREA	0.5	5.075	7.051	0.026	1	0.0259
346	Casuarina Tree	40	MAIN GATE AREA	0.5	5.075	2.820	0.010	1	0.0103
347	Casuarina Tree	13	MAIN GATE AREA	0.5	5.075	0.917	0.003	1	0.0034
348	Casuarina Tree	130	MAIN GATE AREA	0.5	5.075	9.166	0.034	1	0.0336
349	Casuarina Tree	42	MAIN GATE ROAD SIDE	0.5	5.075	2.961	0.011	1	0.0109
350	Fabaceae	456	MRSS EAST	5.151	11.2	7359.42	26.98	2.5	10.8
351	Fabaceae	146	MRSS EAST	6.262	8.0	2485.15	9.11	3.5	2.6
352	Fabaceae	28	MRSS EAST	8.282	10.7	1115.12	4.09	9	0.5
353	Melia azadirachta	45	MRSS EAST	9.292	12.7	2685.62	9.85	10	1.0
354	Cocos nucifera	8	MRSS EAST	14.039	39.1	3356.81	12.31	18	0.7
355	Casuarina Tree	7	NEW CANTEEN AREA	0.5	5.075	0.494	0.002	1	0.0018
356	Casuarina Tree	170	New Land	0.5	5.075	11.987	0.044	1	0.0439
357	Casuarina Tree	330	New Land area	0.5	5.075	23.269	0.085	1	0.0853
358	Casuarina Tree	175	New Land area	0.5	5.075	12.339	0.045	1	0.0452
359	Casuarina Tree	515	New Land area	0.5	5.075	36.313	0.133	1	0.1331
360	Melia azadirachta	1500	New land deep inside	2.222	7.1	2866.69	10.51	1	10.5
361	Fabaceae	900	New land deep inside	2.222	6.9	1670.87	6.13	1	6.1
362	Fabaceae	4500	New land deep inside	1.212	6.9	2485.59	9.11	2	4.6
363	Acacia nilotica	158	New land deep inside	4.747	8.0	1545.50	5.67	2.5	2.3
364	Musa paradisiaca	36	New land deep inside	6.262	9.0	694.74	2.55	3.5	0.7
365	Bambusa arundinacea	64	New land deep inside	8.282	9.0	2160.45	7.92	9	0.9
366	Albizia lebbeck	142	New land deep inside	8.282	15.7	8348.22	30.61	9	3.4
367	Melia azadirachta	66	New land deep inside	8.282	15.7	3880.16	14.23	9	1.6
368	Melia azadirachta	42	New land deep inside	8.282	15.4	2421.40	8.88	9	1.0
369	Albizia lebbeck	15	New land deep inside	9.292	14.7	1038.44	3.81	10	0.4
370	Melia azadirachta	88	New land deep inside	10.302	15.4	7850.05	28.78	10	2.9
371	neam	3148	New land deep inside	0.707	6.6	565.57	2.07	9	0.2
372	Melia azadirachta	123	New land deep inside	10.302	15.4	10972.23	40.23	10	4.0
373	Cocos nucifera	15	New land deep inside	12.575	27.9	3606.69	13.22	10	1.3

374	Cocos nucifera	16	New land deep inside	13.736	28.9	4757.61	17.44	14	1.2
375	Cocos nucifera	33	New land deep inside	14.039	34.0	12048.53	44.17	18	2.5
376	Ficus benghalensis	18	New land deep inside	16.160	20.8	5328.59	19.54	18	1.1
377	Cocos nucifera	80	New land deep inside	16.160	34.0	38700.86	141.89	18	7.9
378	Fabaceae	56	New R&D entrance	5.151	10.1	817.52	3.00	2.5	1.2
379	Fabaceae	18	New R&D entrance	8.282	10.7	716.86	2.63	10	0.3
380	Derris indica	19	New R&D entrance	9.292	10.7	952.50	3.49	10	0.3
381	Melia azadirachta	17	New R&D entrance	11.312	15.4	1828.41	6.70	10	0.7
382	Roystonea regia	160	New R&D entrance	13.585	8.0	12816.81	46.99	10	4.7
383	Fabaceae	177	New R&D North	4.747	9.0	1962.93	7.20	2.5	2.9
384	Derris indica	82	New R&D North	8.282	10.7	3265.70	11.97	10	1.2
385	Melia azadirachta	94	New R&D North	10.302	14.4	7806.04	28.62	10	2.9
386	Cocos nucifera	16	New R&D North	15.352	43.1	8862.21	32.49	18	1.8
387	Tectona grandis	63	New R&D North	16.160	43.1	38664.76	141.76	18	7.9
388	Casuarina Tree	50	New RESERVOIR	0.5	5.075	3.526	0.013	1	0.0129
389	Casuarina Tree	150	New Reservoir	0.5	5.075	10.577	0.039	1	0.0388
390	Fabaceae	125	Newland opposite	4.242	9.0	1106.99	4.06	1.5	2.7
391	Albizia lebbeck	142	Newland opposite	8.282	16.5	8752.16	32.09	9	3.6
392	Borassus flabellifer	62	Newland opposite	13.736	31.0	19729.46	72.33	15	4.8
393	Albizia lebbeck	560	Newland opposite	13.776	16.5	95502.78	350.14	18	19.5
394	Melia azadirachta	95	Newland opposite	14.039	18.8	19154.50	70.23	18	3.9
395	Borassus flabellifer	92	Newland opposite	14.039	29.9	29579.13	108.45	18	6.0
396	Casuarina Tree	57	OHC AREA	0.5	5.075	4.019	0.015	1	0.0147
397	Terminalia Catappa	15	OHC Entrance	10.302	14.4	1245.64	4.57	10	0.5
398	Fabaceae	10	OHC Entrance	13.736	19.8	2034.50	7.46	11	0.7
399	Saraca asoca	15	OHC Entrance	15.352	43.1	8308.32	30.46	18	1.7
400	Melia azadirachta	5	OHC Entrance south	15.352	20.8	1335.85	4.90	18	0.3
401	Fabaceae	2	OHC Entrance south	17.372	29.9	984.59	3.61	18	0.2
402	Saraca asoca	16	Old guest house	12.575	43.1	5945.57	21.80	10	2.2
403	Saraca asoca	10	Old guest house	13.756	44.2	4551.86	16.69	16	1.0
404	Cocos nucifera	36	Old guest house	14.039	34.0	13143.86	48.19	18	2.7
405	Fabaceae	1066	Old gust house East	4.747	8.0	10427.22	38.23	2.5	15.3

406	Melia azadirachta	162	Old gust house East	8.282	12.7	7680.66	28.16	9	3.1
407	Saraca asoca	66	Old gust house East	10.807	19.8	8311.74	30.47	10	3.0
408	Eucalyptus	45	Old gust house East	12.575	27.9	10820.06	39.67	10	4.0
409	Carica Papaya	26	Old gust house Front	6.262	17.6	975.32	3.58	3.5	1.0
410	Mangifera indica	600	Old gust house Front	7.777	29.9	59197.12	217.03	7	31.0
411	Melia azadirachta	150	Old gust house Front	10.302	25.9	22448.00	82.30	10	8.2
412	Saraca asoca	150	Old gust house Front	10.302	39.1	33892.08	124.26	10	12.4
413	Saraca asoca	45	Old gust house Front	10.807	17.6	5027.73	18.43	10	1.8
414	Saraca asoca	34	Old gust house Front	13.756	33.0	11562.78	42.39	15	2.8
415	Fabaceae	47	Old gust house Front	14.039	20.8	10500.92	38.50	18	2.1
416	Cocos nucifera	72	Old gust house Front	14.039	37.0	28641.84	105.01	18	5.8
417	Fabaceae	3500	Old gust house North	3.232	5.8	11624.70	42.62	1	42.6
418	Fabaceae	2388	Old gust house North	4.747	8.0	23358.53	85.64	2.5	34.3
419	Derris indica	155	Old gust house North	4.747	8.0	1516.15	5.56	2.5	2.2
420	Albizia lebbeck	1500	Old gust house North	8.282	14.7	82495.99	302.46	10	30.2
421	Tamarindus indica	150	Old gust house North	9.292	13.7	9668.22	35.45	10	3.5
422	Fabaceae	176	Old gust house North	11.312	16.7	20548.43	75.34	10	7.5
423	Cocos nucifera	40	Old gust house North	13.736	29.9	12311.35	45.14	14	3.2
424	Saraca asoca	94	Old gust house North	13.736	33.0	31873.88	116.86	15	7.8
425	Melia azadirachta	158	Old gust house North	13.776	10.7	17410.89	63.83	16	4.0
426	Fabaceae	1728	Old gust house West Boundry line	4.747	8.0	16902.66	61.97	2.5	24.8
427	Albizia lebbeck	612	Old gust house West Boundry line	8.282	12.7	29015.83	106.38	9	11.8
428	Fabaceae	420	Old gust house West Boundry line	8.282	14.7	23098.88	84.69	10	8.5
429	Melia azadirachta	183	Old gust house West Boundry line	9.292	14.7	12668.95	46.45	10	4.6

430	Ficus religiosa	12	Old gust house West Boundry line	10.302	16.7	1162.01	4.26	10	0.4
431	Cocos nucifera	84	Old gust house West Boundry line	14.039	29.9	27007.03	99.02	18	5.5
432	Roystonea regia	25	P 2 belt conveyor west	8.282	12.7	1185.29	4.35	10	0.4
433	Fabaceae	86	PCTL Entrance	5.151	10.1	1255.47	4.60	2.5	1.8
434	Melia azadirachta	17	PCTL Entrance	6.262	9.0	328.07	1.20	3.5	0.3
435	Fabaceae	280	PCTL Entrance	6.262	10.7	6374.95	23.37	3.5	6.7
436	Fabaceae	15	PF -1 East	8.282	10.7	597.38	2.19	9	0.2
437	Melia azadirachta	25	PF -1 East	10.302	16.7	2420.86	8.88	10	0.9
438	Tectona grandis	50	PF -1 East	16.160	34.0	24188.04	88.68	18	4.9
439	Tectona grandis	15	PF -1 south	15.352	33.0	6353.42	23.29	18	1.3
440	Ficus religiosa	1	PF -1 south	24.927	13.3	450.10	1.65	18	0.1
441	Fabaceae	380	PF -1 West	4.747	6.9	3219.84	11.80	2.5	4.7
442	Fabaceae	81	PF -1 West	8.282	10.7	3225.88	11.83	10	1.2
443	Melia azadirachta	44	PF -1 West	9.292	16.7	3466.24	12.71	10	1.3
444	Casuarina	205	PF 2 ground hopper	3.232	5.8	680.88	2.50	1	2.5
445	Fabaceae	150	PF 2 ground hopper	5.151	10.1	2189.78	8.03	2.5	3.2
446	Fabaceae	432	PF 2 ground hopper	7.272	10.7	13264.29	48.63	5	9.7
447	Melia azadirachta	25	PF 2 ground hopper	7.777	15.4	1270.90	4.66	7	0.7
448	Fabaceae	100	PF 2 hopper east	4.242	8.0	781.11	2.86	1.5	1.9
449	Pithecellobium dulce	250	PF 2 hopper east	4.747	8.0	2445.41	8.97	2.5	3.6
450	Fabaceae	52	PF 2 hopper east	5.151	10.1	759.12	2.78	2.5	1.1
451	Saraca asoca	20	PF 2 hopper east	10.807	37.0	4714.51	17.28	10	1.7
452	Fabaceae	2252	plant south side compount	4.747	9.0	24974.68	91.56	2.5	36.6
453	Ficus benghalensis	1	plant south side compount	35.229	34.0	2299.02	8.43	18	0.5
454	Fabaceae	21	PM - 2 Hopper south	8.282	13.7	1075.29	3.94	9	0.4
455	Pithecellobium dulce	33	PM - 2 Hopper south	8.282	14.7	1814.91	6.65	10	0.7
456	Fabaceae	17	PM - 2 Hopper south	8.282	14.4	912.39	3.35	10	0.3
457	Saraca asoca	16	PM - 2 Hopper south	15.352	28.9	5942.89	21.79	18	1.2
458	Fabaceae	380	PTCL Office	4.242	8.0	2968.23	10.88	1.5	7.3
459	Manilkara Zapota	26	PTCL Office	4.747	8.0	254.32	0.93	2.5	0.4
460	Terminalia Catappa	54	PTCL Office	4.747	8.0	528.21	1.94	2.5	0.8
461	Terminalia Catappa	18	PTCL Office	5.151	9.0	235.04	0.86	2.5	0.3
462	Albizia lebbeck	400	PTCL Office	5.151	9.0	5223.19	19.15	2.5	7.7
463	Fabaceae	350	PTCL Office	5.151	10.1	5109.49	18.73	2.5	7.5
464	Albizia lebbeck	600	PTCL Office	7.272	10.7	18422.62	67.54	5	13.5

465	Fabaceae	459	PTCL Office	7.272	10.7	14093.31	51.67	5	10.3
466	Fabaceae	350	PTCL Office	7.272	10.7	10746.53	39.40	5	7.9
467	Melia azadirachta	50	PTCL Office	7.777	15.4	2541.80	9.32	7	1.3
468	Melia azadirachta	255	PTCL Office	8.282	13.7	13057.12	47.87	9	5.3
469	Melia azadirachta	66	PTCL Office	8.282	13.7	3379.49	12.39	9	1.4
470	Albizia lebbeck	68	PTCL Office	8.282	9.0	2295.47	8.42	9	0.9
471	Fabaceae	358	PTCL Office	8.282	14.7	19689.04	72.19	9	8.0
472	Albizia lebbeck	400	PTCL Office	8.282	14.7	21998.93	80.65	9	9.0
473	Albizia lebbeck	30	PTCL Office	8.282	15.7	1763.71	6.47	9	0.7
474	Albizia lebbeck	200	PTCL Office	8.282	14.7	10999.47	40.33	10	4.0
475	Melia azadirachta	383	PTCL Office	10.302	15.4	34165.56	125.26	10	12.5
476	Tectona grandis	50	PTCL Office	10.302	16.5	4768.37	17.48	10	1.7
477	Albizia lebbeck	28	PTCL Office	10.302	16.5	2670.29	9.79	10	1.0
478	Fabaceae	251	PTCL Office	10.807	27.9	44577.93	163.44	10	16.3
479	Cocos nucifera	489	PTCL Office	14.039	33.0	173207.91	635.03	18	35.3
480	Cocos nucifera	680	PTCL Office	14.039	33.0	240861.71	883.07	18	49.1
481	Ficus benghalensis	19	PTCL Office	16.160	24.9	6722.11	24.65	18	1.4
482	Ficus benghalensis	100	PTCL Office	17.372	25.9	42554.25	156.02	18	8.7
483	Casuarina Tree	10	PTCL OFFICE	0.5	5.075	0.705	0.003	1	0.0026
484	Casuarina Tree	20	PTCL OFFICE	0.5	5.075	1.410	0.005	1	0.0052
485	Casuarina Tree	150	PTCL OFFICE	0.5	5.075	10.577	0.039	1	0.0388
486	Casuarina Tree	200	PTCL OFFICE	0.5	5.075	14.102	0.052	1	0.0517
487	Casuarina Tree	120	PTCL OFFICE	0.5	5.075	8.461	0.031	1	0.0310
488	Casuarina Tree	50	PTCL OFFICE	0.5	5.075	3.526	0.013	1	0.0129
489	Casuarina Tree	85	PTCL OFFICE	0.5	5.075	5.993	0.022	1	0.0220
490	Casuarina Tree	100	PTCL OFFICE	0.5	5.075	7.051	0.026	1	0.0259
491	Casuarina Tree	135	PTCL OFFICE	0.5	5.075	9.519	0.035	1	0.0349
492	Casuarina Tree	60	PTCL ROAD SIDE	0.5	5.075	4.231	0.016	1	0.0155
493	Fabaceae	382	QAD south	4.747	8.0	3736.58	13.70	2.5	5.5
494	Fabaceae	28	QAD West	8.282	13.7	1433.72	5.26	9	0.6
495	Melia azadirachta	10	QAD West	10.302	15.4	892.05	3.27	10	0.3
496	Casuarina Tree	62	R O Plant, Guard Pond	0.5	5.075	4.372	0.016	1	0.0160
497	Terminalia Catappa	15	Railway gate opposite site	7.272	10.7	460.57	1.69	5	0.3
498	Albizia lebbeck	55	Railway gate opposite site	8.282	14.7	3024.85	11.09	9	1.2
499	Pithecellobium dulce	42	Railway gate opposite site	8.282	14.7	2309.89	8.47	9	0.9
500	Albizia lebbeck	15	Railway gate opposite site	8.282	15.7	881.85	3.23	9	0.4
501	Albizia lebbeck	21	Railway gate opposite site	10.302	16.7	2033.52	7.46	10	0.7

502	Saraca asoca	15	Railway gate opposite site	10.302	40.1	3477.24	12.75	10	1.3
503	Melia azadirachta	10	Railway gate opposite site	10.807	17.6	1117.27	4.10	10	0.4
504	Cocos nucifera	15	Railway gate opposite site	13.736	31.0	4773.26	17.50	14	1.3
505	Cocos nucifera	10	Railway gate opposite site	14.039	34.0	3651.07	13.39	18	0.7
506	Cocos nucifera	15	Railway gate opposite site	14.039	37.0	5967.05	21.88	18	1.2
507	Tamarindus indica	50	Railway gate opposite site	16.160	18.8	13357.57	48.97	18	2.7
508	Ficus benghalensis	10	Railway gate opposite site	16.160	24.9	3537.95	12.97	18	0.7
509	Tectona grandis	110	Railway gate opposite site	16.160	29.9	46859.81	171.80	18	9.5
510	Tectona grandis	50	Railway gate opposite site	16.160	29.9	21299.92	78.09	18	4.3
511	Tamarindus indica	30	Railway gate opposite site	17.372	18.8	9261.81	33.96	18	1.9
512	Fabaceae	496	Raw Material Yard North	4.242	10.1	4910.77	18.00	1.5	12.0
513	Melia azadirachta	600	Raw Material Yard North	8.282	13.7	30722.65	112.64	9	12.5
514	Albizia lebbeck	287	Raw Material Yard North	9.292	14.7	19868.79	72.84	10	7.3
515	Saraca asoca	185	Raw Material Yard North	13.736	25.9	49219.32	180.45	12	15.0
516	Tectona grandis	176	Raw Material Yard North	14.039	33.0	62340.68	228.56	18	12.7
517	Eucalyptus	146	Raw Material Yard North	15.352	29.9	56131.67	205.80	18	11.4
518	Fabaceae	890	Raw Material Yard South	4.242	10.1	8811.66	32.31	1.5	21.5
519	Pithecellobium dulce	416	Raw Material Yard South	4.242	10.1	4118.71	15.10	1.5	10.1
520	Fabaceae	676	Raw Material Yard South	4.747	8.0	6612.38	24.24	2.5	9.7
521	Derris indica	266	Raw Material Yard South	5.151	10.1	3883.21	14.24	2.5	5.7
522	Terminalia Catappa	220	Raw Material Yard South	6.262	8.0	3744.74	13.73	3.5	3.9
523	Melia azadirachta	459	Raw Material Yard South	6.262	10.1	9902.96	36.31	3.5	10.4
524	Melia azadirachta	480	Raw Material Yard South	6.262	10.1	10356.04	37.97	3.5	10.8
525	Ficus religiosa	186	Raw Material Yard South	8.282	15.7	10934.99	40.09	9	4.5

526	Saraca asoca	56	Raw Material Yard South	11.312	22.8	8915.64	32.69	10	3.3
527	Cocos nucifera	88	Raw Material Yard South	13.736	27.9	25248.70	92.57	12	7.7
528	Tectona grandis	120	Raw Material Yard South	14.039	27.9	35965.78	131.86	18	7.3
529	Saraca asoca	87	Raw Material Yard West	8.282	19.8	6434.69	23.59	10	2.4
530	Fabaceae	498	Raw Material Yard West	9.292	12.7	29720.83	108.97	10	10.9
531	Tectona grandis	22	Raw Material Yard West	10.302	25.9	3292.37	12.07	10	1.2
532	Saraca asoca	56	Raw Material Yard West	10.302	25.9	8380.59	30.73	10	3.1
533	Melia azadirachta	329	Raw Material Yard West	13.776	13.7	46612.70	170.90	16	10.7
534	Tectona grandis	45	Raw Material Yard West	14.039	28.9	13977.61	51.25	18	2.8
535	Casuarina Tree	90	RO PLANT AREA	0.5	5.075	6.346	0.023	1	0.0233
536	Casuarina Tree	65	RO PLANT AREA	0.5	5.075	4.583	0.017	1	0.0168
537	Casuarina Tree	11	RO PLANT ROAD SIDE	0.5	5.075	0.776	0.003	1	0.0028
538	Casuarina Tree	60	RO PLANT ROAD SIDE	0.5	5.075	4.231	0.016	1	0.0155
539	Fabaceae	12	Safety & environment entrance	8.282	10.7	477.91	1.75	9	0.2
540	Mangifera indica	15	Safety & environment entrance	9.292	16.7	1181.67	4.33	10	0.4
541	Tectona grandis	16	Safety & environment entrance	13.776	18.8	3106.46	11.39	18	0.6
542	Cocos nucifera	7	Safety & environment entrance	14.039	34.0	2555.75	9.37	18	0.5
543	Terminalia Catappa	10	Safety & environment south	6.262	10.1	215.75	0.79	3.5	0.2
544	Fabaceae	25	Safety & environment south	8.282	12.7	1185.29	4.35	9	0.5
545	Fabaceae	15	Safety & environment south	10.302	15.4	1338.08	4.91	10	0.5
546	Melia azadirachta	20	Safety & environment south	10.807	17.6	2234.55	8.19	10	0.8
547	Roystonea regia	50	Safety & environment south	13.585	10.7	5357.35	19.64	10	2.0

548	Melia azadirachta	6	Safety & environment south	13.585	18.8	1132.70	4.15	11	0.4
549	Fabaceae	14	Safety & environment south	14.039	20.8	3127.93	11.47	18	0.6
550	Tectona grandis	8	Safety & environment south	14.039	34.0	2920.86	10.71	18	0.6
551	Cocos nucifera	10	Safety & environment south	14.039	44.2	4740.94	17.38	18	1.0
552	Terminalia Catappa	20	Scrap yard cooling tower	8.282	11.2	834.44	3.06	7	0.4
553	Albizia lebbeck	7	Scrap yard cooling tower	13.585	16.5	1160.76	4.26	11	0.4
554	Albizia lebbeck	8	Scrap yard cooling tower	14.039	20.8	1787.39	6.55	18	0.4
555	Terminalia Catappa	28	sinter Machine North	8.282	13.7	1433.72	5.26	9	0.6
556	Melia azadirachta	10	sinter Machine North	8.282	15.7	587.90	2.16	9	0.2
557	Fabaceae	26	sinter Machine North	8.282	14.4	1395.41	5.12	10	0.5
558	Fabaceae	30	sinter Machine North	10.302	15.4	2676.15	9.81	10	1.0
559	Fabaceae	41	Sinter Machine plant 2 North	6.262	10.1	884.58	3.24	3.5	0.9
560	Melia azadirachta	15	Sinter Machine plant 2 North	7.777	15.4	762.54	2.80	5	0.6
561	Fabaceae	43	Sinter Machine plant 2 south	13.776	15.7	6994.79	25.65	16	1.6
562	Terminalia Catappa	15	Sinter plant	8.282	15.4	864.79	3.17	9	0.4
563	Fabaceae	25	Sinter plant	8.282	15.7	1469.76	5.39	10	0.5
564	Casuarina Tree	200	SINTER PLANT	0.5	5.075	14.102	0.052	1	0.0517
565	Casuarina Tree	65	SINTER PLANT	0.5	5.075	4.583	0.017	1	0.0168
566	Casuarina Tree	70	Sinter Plant-II	0.5	5.075	4.936	0.018	1	0.0
567	Bambusa arundinacea	720	Slag Crushing mining plant	3.232	4.8	1954.68	7.17	1	7.2
568	Fabaceae	15	Slag Crushing mining plant	10.302	16.7	1452.52	5.33	10	0.5
569	Melia azadirachta	15	Slag Crushing mining plant	11.312	15.4	1613.31	5.91	10	0.6
570	Fabaceae	18	SP East	9.292	16.7	1418.01	5.20	10	0.5
571	Fabaceae	31	SP south	10.302	16.5	2956.39	10.84	10	1.1
572	Melia azadirachta	15	SP south	10.302	15.4	1338.08	4.91	10	0.5
573	Casuarina Tree	200	TEMPLE	0.5	5.075	14.102	0.052	1	0.0517
574	Casuarina Tree	150	TEMPLE	0.5	5.075	10.577	0.039	1	0.0388
575	Casuarina Tree	460	TEMPLE AREA COMPUND SIDE	0.5	5.075	32.435	0.119	1	0.1189

576	Casuarina Tree	350	TEMPLE AREA COMPUND SIDE	0.5	5.075	24.679	0.090	1	0.0905
577	Fabaceae	426	Temple East	4.747	11.2	5839.07	21.41	2.5	8.6
578	Fabaceae	385	Temple East	6.262	9.0	7429.85	27.24	3.5	7.8
579	Terminalia Catappa	342	Temple East	6.262	10.1	7378.68	27.05	3.5	7.7
580	Melia azadirachta	294	Temple East	8.282	11.2	12266.30	44.97	7	6.4
581	Bauhinia purpurea	15	Temple East	8.282	9.0	506.35	1.86	9	0.2
582	Tectona grandis	45	Temple East	8.282	13.7	2304.20	8.45	9	0.9
583	Albizia lebbeck	152	Temple East	8.282	12.7	7206.55	26.42	10	2.6
584	Melia azadirachta	182	Temple East	8.282	12.7	8628.89	31.64	10	3.2
585	Pithecellobium dulce	51	Temple East	9.292	14.7	3530.69	12.94	10	1.3
586	Fabaceae	159	Temple East	9.292	16.7	12525.72	45.92	10	4.6
587	Albizia lebbeck	142	Temple East	9.292	16.7	11186.49	41.01	10	4.1
588	Tectona grandis	90	Temple East	10.302	27.9	14525.18	53.25	10	5.3
589	Tectona grandis	88	Temple East	10.807	33.0	18470.54	67.72	10	6.8
590	Melia azadirachta	275	Temple East	11.312	16.7	32106.91	117.7 1	10	11.8
591	Saraca asoca	289	Temple East	13.736	28.9	85934.27	315.0 6	12	26.3
592	Tectona grandis	600	Temple East	13.756	37.0	229162.85	840.1 8	15	56.0
593	Ficus religiosa	28	Temple East	13.776	18.8	5436.31	19.93	18	1.1
594	Cocos nucifera	162	Temple East	14.039	33.0	57381.76	210.3 8	18	11.7
595	Tectona grandis	305	Temple East	16.160	40.1	173973.38	637.8 4	18	35.4
596	Fabaceae	457	Temple South	3.232	6.9	1795.03	6.58	1	6.6
597	Fabaceae	369	Temple South	4.747	11.2	5057.79	18.54	2.5	7.4
598	Terminalia Catappa	136	Temple South	4.747	6.9	1152.36	4.22	2.5	1.7
599	Derris indica	194	Temple South	4.747	6.9	1643.81	6.03	2.5	2.4
600	Roystonea regia	74	Temple South	4.747	9.0	820.66	3.01	2.5	1.2
601	Tectona grandis	240	Temple South	4.747	9.0	2661.60	9.76	2.5	3.9
602	Fabaceae	481	Temple South	8.282	12.7	22804.93	83.61	9	9.3
603	Melia azadirachta	395	Temple South	8.282	12.7	18727.54	68.66	9	7.6
604	Albizia lebbeck	200	Temple South	8.282	12.7	9482.30	34.76	9	3.9
605	Bauhinia purpurea	46	Temple South	8.282	12.7	2180.93	8.00	10	0.8
606	Melia azadirachta	282	Temple South	11.312	16.5	32425.33	118.8 8	10	11.9
607	Albizia lebbeck	45	Temple South	13.585	18.8	8495.22	31.15	11	2.8
608	Tectona grandis	116	Temple South	13.736	27.9	33282.38	122.0 2	12	10.2
609	Eucalyptus	48	Temple South	14.039	31.0	15955.73	58.50	18	3.2
610	Tectona grandis	39	Temple South	15.352	34.0	17027.17	62.43	18	3.5
611	Ficus religiosa	15	Temple South	18.746	40.1	11513.04	42.21	18	2.3
612	Casuarina Tree	280	TOWNSHIP AREA	0.5	5.075	19.743	0.072	1	0.0724
613	Casuarina Tree	250	TOWNSHIP AREA	0.5	5.075	17.628	0.065	1	0.0646

614	Casuarina Tree	170	TOWNSHIP AREA	0.5	5.075	11.987	0.044	1	0.0439
615	Casuarina Tree	100	TOWNSHIP AREA	0.5	5.075	7.051	0.026	1	0.0259
616	Casuarina Tree	100	TOWNSHIP AREA	0.5	5.075	7.051	0.026	1	0.0259
617	Casuarina Tree	150	TOWNSHIP AREA	0.5	5.075	10.577	0.039	1	0.0388
618	Casuarina Tree	100	TOWNSHIP RESERVIOR	0.5	5.075	7.051	0.026	1	0.0259
619	Terminalia Catappa	100	wagon loco office	4.747	8.0	978.16	3.59	2.5	1.4
620	Fabaceae	15	wagon loco office	9.292	16.7	1181.67	4.33	10	0.4
621	Albizia lebbeck	22	wagon loco office	10.302	15.4	1962.51	7.20	10	0.7
622	Melia azadirachta	25	wagon loco office	11.312	10.7	1857.42	6.81	10	0.7
623	Fabaceae	25	wagon loco office	13.585	16.7	4209.34	15.43	11	1.4
624	Cocos nucifera	10	wagon loco office	13.736	29.9	3077.84	11.28	14	0.8
625	Roystonea regia	12	wagon loco office	13.776	9.0	1120.85	4.11	16	0.3
626	Albizia lebbeck	18	wagon loco office	13.776	16.5	3069.73	11.25	18	0.6
627	Casuarina Tree	100	WAGON TIPPLER	0.5	5.075	7.051	0.026	1	0.0259
628	Fabaceae	346	Water Reservoir south Boundary	4.242	8.0	2702.65	9.91	1.5	6.6
629	Bambusa arundinacea	3500	Water Reservoir south Boundary	4.747	6.9	29656.41	108.73	2.5	43.5
630	Fabaceae	900	Water Reservoir south Boundary	4.747	9.0	9981.00	36.59	2.5	14.6
631	Fabaceae	526	Water Reservoir south Boundary	4.747	9.0	5833.34	21.39	2.5	8.6
632	Fabaceae	416	Water Reservoir south Boundary	5.151	11.2	6713.86	24.62	2.5	9.8
633	Fabaceae	246	Water Reservoir south Boundary	7.272	10.7	7553.27	27.69	5	5.5
634	Fabaceae	3000	Water Reservoir south Boundary	7.272	10.7	92113.11	337.71	5	67.5
635	Fabaceae	782	Water Reservoir south Boundary	8.282	9.0	26397.96	96.78	9	10.8
636	Fabaceae	692	Water Reservoir south Boundary	8.282	12.7	32808.75	120.29	9	13.4
637	Fabaceae	150	Water Reservoir south Boundary	8.282	14.7	8249.60	30.25	9	3.4
638	Cassia fistula	15	Water Reservoir south Boundary	8.282	14.7	824.96	3.02	9	0.3

639	Fabaceae	250	Water Reservoir south Boundary	8.282	14.4	13417.45	49.19	9	5.5
640	Melia azadirachta	189	Water Reservoir south Boundary	8.282	14.7	10394.50	38.11	10	3.8
641	Melia azadirachta	75	Water Reservoir south Boundary	9.292	16.7	5908.36	21.66	10	2.2
642	Melia azadirachta	150	Water Reservoir south Boundary	10.302	15.4	13380.77	49.06	10	4.9
643	Fabaceae	246	Water Reservoir south Boundary	10.302	15.4	21944.46	80.45	10	8.0
644	Melia azadirachta	188	Water Reservoir south Boundary	10.302	15.4	16770.56	61.49	10	6.1
645	Fabaceae	308	Water Reservoir south Boundary	10.302	16.7	29825.03	109.35	10	10.9
646	Melia azadirachta	152	Water Reservoir south Boundary	10.302	16.7	14718.85	53.96	10	5.4
647	Melia azadirachta	285	Water Reservoir south Boundary	10.302	14.4	23667.24	86.77	10	8.7
648	Melia azadirachta	43	Water Reservoir south Boundary	10.302	15.4	3835.82	14.06	10	1.4
649	Neolamarckia cadamba	43	Water Reservoir south Boundary	10.302	15.4	3835.82	14.06	10	1.4
650	Tamarindus indica	89	Water Reservoir south Boundary	13.736	24.9	22749.92	83.41	12	7.0
651	Fabaceae	251	Water Reservoir south Boundary	13.736	28.9	74634.96	273.63	14	19.5
652	Saraca asoca	56	Water Reservoir south Boundary	13.756	37.0	21388.53	78.42	15	5.2
653	Borassus flabellifer	40	Water Reservoir south Boundary	13.756	40.1	16533.21	60.62	16	3.8
654	Borassus flabellifer	25	Water Reservoir south Boundary	13.756	43.1	11118.06	40.76	16	2.5
655	Borassus flabellifer	33	Water Reservoir south Boundary	13.756	43.1	14675.84	53.81	16	3.4
656	Tectona grandis	286	Water Reservoir south Boundary	14.039	37.0	113771.74	417.12	18	23.2
657	Cocos nucifera	26	Water Reservoir south Boundary	14.039	40.1	11192.99	41.04	18	2.3
658	Borassus flabellifer	7	Water Reservoir south Boundary	14.039	44.2	3318.66	12.17	18	0.7
659	Saraca asoca	84	Water Reservoir south Boundary	14.039	44.2	39823.92	146.01	18	8.1
660	Cocos nucifera	46	Water Reservoir south Boundary	14.039	44.2	21808.34	79.96	18	4.4
661	Cocos nucifera	330	Water Reservoir south Boundary	15.352	39.1	165579.94	607.07	18	33.7
662	Tectona grandis	240	Water Reservoir south Boundary	15.352	39.1	120421.78	441.50	18	24.5

663	Tectona grandis	85	Water Reservoir south Boundary	15.352	40.1	43757.16	160.43	18	8.9
664	Ficus religiosa	78	Water Reservoir south Boundary	16.160	24.9	27596.03	101.18	18	5.6
665	Tectona grandis	120	Water Reservoir south Boundary	17.372	27.9	55070.21	201.90	18	11.2
666	Tectona grandis	690	Water Reservoir south Boundary	17.372	40.1	454829.86	1667.54	18	92.6
667	Tectona grandis	580	Water Reservoir south Boundary	17.372	29.9	285530.69	1046.84	18	58.2
		145836		Total Carbon Sequestered per annum					3776

Annexure- II

CPCB guidelines for Green Belt development

VII. Green Belt

- i. Green belt shall be developed in an area equal to 33% of the plant area with a native tree species in accordance with CPCB guidelines. The greenbelt shall inter alia cover the entire periphery of the plant
- ii. The project proponent shall prepare GHG emissions inventory for the plant and shall submit the programme for reduction of the same including carbon sequestration including plantation.

Ref : Annexure II III and IV.

F. No. 22-34/2018-IA.III
Government of India
Ministry of Environment, Forest and Climate Change
(Impact Assessment Division)

Annexure- III

Environment Celebration Activities by M/s.JSW

Tree Sapling by TNPCB officials



Tree Sapling by Plant Head



Tree Sapling by Head (Operation)





Tree Sapling at Sinter plant





Annexure-IV

List of Recommended species for further improvement **

1. Acacia albida
2. Acacia aunculiformis
3. Acacta catechu
4. Acacia holosericea
5. Acacia nilottca
6. Acacia senegal
7. Albizia amara
8. Albizra lebbeck
9. Azadirachta rndtca
- 10.Oalberg1a SISSOO
- 11.Eucalyptus hybrid
- 12.Erythrina vanegata
- 13.Gliricidia sepium
- 14.Grewia tenax
- 15.Hardwickia binata
- 16.Leucaena latisiliqua
- 17.Pithecellobium dulce
- 18.Ztzyphus nummulan

**** Ref :** PAOBES/75/1999-2000

CENTRAL POLLUTION CONTROL BOARD

(Ministry of Environment & Forests, Govt. of India) Parivesh Bhawan, East Arjun Nagar
Delhi -110 032,India.

**Copy of the Environmental Clearance
dated.10.02.2020**

F. No. J-11011/281/2006-IA. II(I)
Government of India
Ministry of Environment, Forest and Climate Change
(Impact Assessment Division)

Indira Paryavaran Bhawan
Jor Bagh Road, Aliganj,
New Delhi – 110003

E-mail: dirind-moefcc@gov.in
Tel: 011-24695368

Dated: 10th February, 2020

To

Shri. BNS. Prakash Rao,
Senior Vice President,
M/s. JSW Steel Limited,
Pottaneri, Mecheri Salem Works,
Mettur, Salem,
Tamil Nadu - 636453
Tel: 04298-272272; E-mail: d.ravichandar@jsw.in

Subject: Installation of 0.8 MTPA slag grinding unit and new facilities related to value addition and technological upgradation within the existing 1.3 MTPA Integrated Steel Plant premises by **M/s JSW Steel Limited** located at village Pottaneri & M.Kalipatti, Mecheri, Taluk Mettur, District Salem, **Tamil Nadu – Environmental Clearance under para 7(ii) of the EIA Notification, 2006** - regarding.

Sir,

1. This refers to the online application of **M/s JSW Steel Limited** made vide proposal no. IA/TN/IND/104947/2019 dated 11/11/2019 along with copy of EIA/EMP report and Form – 2 seeking Environmental Clearance (EC) under the provisions of para 7(ii) of EIA Notification, 2006 for the project mentioned above. The proposed project activity is listed at Sl. No. 3(a) Metallurgical Industries (Ferrous and Non-ferrous) under Category “A” EIA Notification, 2006 and the project is appraised at the Central level.
2. The aforesaid proposal was considered in the 13th meeting of the Reconstituted Expert Appraisal Committee meeting held during 27-29th November, 2019. The EAC proceedings of the proposal is given as below:

Details submitted by the project proponent

3. The project of M/s. JSW Steel Works located in M. Kallipatti and Pottaneri Village, Mettur Tehsil, Salem District, Tamil Nadu was granted environment clearance for the expansion of crude steel capacity from 1.0 to 1.3 MTPA. and additional captive power plant of 1 x 30 MW vide letter No. J-11011/281/2006-IA. II (I) dated 07.07.2017. The Expansion project activities are scheduled in phased manner. At present Phase-I activities of the project are completed and CTO obtained on 25.06.19 for 1.15 MTPA steel production and 97 MW Captive power generation. Balance expansion activities are scheduled in phase II.

Environmental Clearance for the project titled “Installation of 0.8 MTPA slag grinding unit and new facilities related to value addition and technological upgradation within the existing 1.3 MTPA Integrated Steel Plant premises by M/s JSW Steel Limited located at Mecheri, Taluk Mettur, District Salem, Tamil Nadu”.

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4. The implementation status of 1.3 MTPA existing EC are given in the table below:

S. No	Manufacturing Units	Capacity at 1.0 MTPA	Proposed Expansion 1.0 to 1.3 MTPA	Total Capacity after Expansion	Implementation Status
1	Coke Oven Plant -1(Non-Recovery Type)	0.50	-	0.5	In operation
2	Sinter Plant - 1 (20 Square Meter)	0.175	-	0	In operation
3	Sinter Plant - 2 (90 Square Meter)	1.06	-	1.06	In operation
4	Sinter Plant - 3 (90 Square Meter)	-	1.06	1.06	Yet to be installed
5	Blast Furnace - 1 (402 to 650 Cubic Meter)	0.367	0.316	0.683	Yet to be installed
6	Blast Furnace - 2 (550 to 650 Cubic Meter)	0.578	0.105	0.683	In operation
7	Energy Optimizing Furnace - 1	0.41	0.23	0.64	In operation
8	Energy Optimizing Furnace - 2	0.62	-	0.62	In operation
9	Ladle Furnace-1 with Common VD	45 T/heat	20 T/heat	65 T/heat	In operation
10	Ladle Furnace -2	65	-	65 T/heat	In operation
11	Ladle Furnace- 3 common VD	65 T/heat	-	65 T/heat	In operation
12	Ladle Furnace- 4	65	-	65 T/heat	In operation
13	Continuous Casting Machine-1	0.35	-	0.35	In operation
14	Continuous Casting Machine - 2	0.50	-	0.50	In operation
15	Continuous Casting Machine - 3	-	0.45	0.45	In operation
16	Bar & Rod Mill Augmentation	0.4	0.08	0.48	In operation
17	Blooming Mill	0.36	0.12	0.48	In operation
18	Pickling and Annealing Steel unit	-	0.06	0.06	Annealing unit is in operation. Pickling plant
19	Peeled and ground	-	0.04	0.04	0.01 MTPA in operation. 0.03 MTPA installation under
20	Air Separation Plant 1	150 T/day	-	150 T/day	In operation
21	Air Separation Plant 2	390 T/day	-	390 T/day	In operation

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S. No	Manufacturing Units	Capacity at 1.0 MTPA	Proposed Expansion 1.0 to 1.3 MTPA	Total Capacity after Expansion	Implementation Status
22	Air Separation Plant 3	-	250 T/day	250 T/day	Yet to be installed
23	Captive Power Plant 1	7 MW	-	7 MW	In operation
24	Captive Power Plant - 2	2 x 30 MW	-	2 x 30 MW	In operation
25	Captive Power Plant - 3	0	1 x 30 MW	1 x 30 MW	In operation

5. An amendment in the existing environmental clearance (EC) of 1.3 MTPA was requested for installation of 0.8 MTPA slag grinding unit and other few technological upgradation of existing facilities. The proposal was appraised in the 36th meeting of the reconstituted EAC (Industry-I) held on 9/10/2018 and ToR was prescribed on 09.11.2018. Thereafter, amendment to the ToR was requested to include few balancing and modification facilities in the existing ToR. The proposal was considered in the 6th meeting of the reconstituted EAC (Industry-I) held during on 30/04/2019 and MoEF&CC issued amendment to the existing ToR to include the proposed facilities vide letter dated 27/06/2019. Further, the Committee also recommended that the decision to consider the instant proposal under para 7(ii) (a) will be based on findings of the EIA report to be submitted to the Ministry by the project proponent. Thereafter, EAC will consider the proposal in its meeting exercising due diligence, inter-alia, and also ascertain the need for conduct of a fresh public consultation by the project proponent.
6. Based on the ToRs prescribed for the project, JSWSL has submitted an application for grant of environmental clearance under clause 7 (ii) of the EIA notification 2006 to the Ministry vide online application no. IA/TN/IND/104947/2019 dated 11.11.2019.
7. The proposed project is for value addition, modification in the existing facilities for emission reduction and balancing facilities without increasing the production capacity of 1.3 MTPA steel.
8. The modification envisaged in the existing EC dated 7/7/2017 and the details of the value added facilities envisaged are given as below:

Modifications envisaged in the existing EC dated 7/7/2017

Manufacturing Facilities	Existing Capacity	Proposed Expansion for which EC has been issued	Total Capacity after Expansion	Modification
Coke Oven Plant -1 (Non – Recovery Type)	0.50	-	0.5	The existing weakened 80m RCC chimney of Battery 1, is being replaced with

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Manufacturing Facilities	Existing Capacity	Proposed Expansion for which EC has been issued	Total Capacity after Expansion	Modification
				two nos. of MS refractory lined chimney of 75m height.
Sinter Plant – 2 (90 Square Meter)	1.06	-	1.06	Waste heat utilization: About 6,00,000 m ³ /hr of hot air (275°C) planned to be diverted from sinter cooler of SP 2 & 3 to GGBS grinding unit to recover the sensible heat which is presently vented into atmosphere.
Sinter Plant – 3 (90 SquareMeter)	-	1.06	1.06	Emission reduction: At present, Sinter machine-2 waste gas stack is operating at an average of 110 mg/Nm ³ of SPM as against the norm of 150 mg/Nm ³ , which is planned to be revamped to meet 50 mg/Nm ³ as an voluntary APC measures.
Blast Furnace – 1 (402 to 650 Cubic Meter) – Hot Metal	0.367	0.316	0.683	It is proposed to install 0.8 MTPA slag grinding unit to produce Ground Granulated Blast furnace Slag (GGBS) as a value added facility.
Blast Furnace – 2 (550 to 650 Cubic Meter) – Hot Metal	0.578	0.105	0.683	
Ladle Furnace - 1 with Common VD (45 T to 65 T)	45 T/heat	20 T/heat	65 T/heat	The existing primary de-dusting system of LRF 1 (38000 m ³ /hr) has been taken to common secondary

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Manufacturing Facilities	Existing Capacity	Proposed Expansion for which EC has been issued	Total Capacity after Expansion	Modification
				de-dusting system of LRF's which is having designed capacity of 5,50,000 m ³ /hr but working at 4,00,000 m ³ /hr. The existing LRF-1 primary de-dusting stack of 30m height became redundant and planned to be used for CCM-3 billet grinding (surface preparation) fume extraction.
Ladle Furnace – 5 (65 T with VD)	-	-	65 T/heat (New)	Additional facility planned now. Since JSW Salem is producing special steels, the per heat process time increased from 30 min to 105 min due to vacuum degassing. Hence, additional LRF-5 is envisaged.
Continuous Casting Machine – 1	0.35	-	0.35	Additional stacks Since, CCM-2 is provided with auto cutter fume extraction system with stack, it is planned to provide the same facility to CCM-1 & 3 APC measures. The height of the chimney will be 20m. In addition, grinding fume extraction facility will be provided with bag filters for CCM 1 to 3 with stack height of 30m.
Continuous Casting Machine – 2	0.5	-	0.5	
Continuous Casting Machine – 3	-	0.45	0.45	
Pickling and Annealing Steel	-	0.06	0.06	A wet scrubber is envisaged to scrub the

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Manufacturing Facilities	Existing Capacity	Proposed Expansion for which EC has been issued	Total Capacity after Expansion	Modification
unit				acid fumes generated from the acid bath as APC measures. Three hot water generators are envisaged to meet the following process requirement to minimize fresh acid consumption and to ensure ZLD in the proposed ETP. To maintain the acid temperature of 55° in the pickling bath. To maintain the treated spent acid temp. of 55° for reuse. To supply hot water to thermal fluidic system of evaporator for ETP to ensure ZLD
Captive Power Plant 2 (2 x 30 MW)	2X30 MW	-	2X30 MW	One coal-based boiler installed in the year 2006 with a capacity of 127 TPH is operating at emission concentration of SPM, SO ₂ & NO _x with 70, 1000 and 600 mg/Nm ³ respectively. This unit has been planned to be upgraded, to meet the revised emission standard as per CPCB letter dated 16.04.2018 of 50, 600 and 300 mg/Nm ³ respectively.
Captive Power Plant 3 (1 x 30)	-	30 MW	30 MW	The total capacity of 30MW remains unaltered. Since, COP capacity remains same there is no additional waste gas is expected.

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Manufacturing Facilities	Existing Capacity	Proposed Expansion for which EC has been issued	Total Capacity after Expansion	Modification
				The additional BF gas as expected due to expansion is planned to be diverted to SMS (VD Boilers) and various shops.
DG sets	3x625 KVA	1x1250 KVA	3x625 KVA and 1x1250 KVA	2x1250 KVA 1x1750 KVA 3x275 KVA 1x650 KVA 1x400 KVA The above DG sets are envisaged to meet the emergency conditions of plant black out requirements.

Installation of value added facilities

S.No.	Name of the unit	Production capacity envisaged	Purpose
i.	Paver block making facility	25000 Nos. of paver block/day	<p>The utilization of the steel slag has been a major challenge in all integrated steel plants. Our R&D has successfully developed a technology for using steel slag in the manufacture of paver blocks. The study has established successful production paver blocks at 30% lower costs than with natural aggregates with lower use of cement and use of steel slag.</p> <p>It is proposed to install a paver block making facility for 25000 Nos. of paver block/day for demonstration purposes. It is intended with its installation, entrepreneurs will utilize this to supply good quality pavers for use in</p>

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S.No.	Name of the unit	Production capacity envisaged	Purpose
			construction purposes.
ii.	Etching Lab	Nil	PP is receiving requests from their customers of special steels for the results of macro structure of steel products to assess its internal soundness. In order to carry out this test, the test samples of 25 mm thick will be collected from 160 to 310 mm round, 130 to 340/400 square and rectangle of bar products. The samples are to be immersed in hydrochloric acid in a tank of 100-liter volume for preparing the sample for further testing. It is proposed to install an acid fume extraction system to improve the work area for the laboratory personnel.
iii.	SMS slag crushing plant	Crushing unit of 50 TPH capacity	It is proposed to install a crushing unit of 50 TPH Capacity with suitable air pollution control facilities for crushing and separation of iron bearing material from slag.
iv.	Batching plant	Batching plant of 30 m ³ /hr capacity	The construction activity for the expansion units in the 1.3 MTPA steel plant expansion is under progress. For this purpose, it is proposed to install a batching plant within the steel works with suitable air pollution control facilities for catering to the ready mix

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S.No.	Name of the unit	Production capacity envisaged	Purpose
			concrete for construction
v.	Coke oven plant	Installation of bag filter with associated equipment to capture the coke dust emission	Existing Coke oven, fugitive emissions are observed while transporting coke in the conveyors (width: 1200mm) whenever it is in operation. In order to control this visible emission, it is proposed to install a bag filter with associated equipment to capture the coke dust emission
vi.	Coke Oven Plant	Coke Oven Stack 2A (COP)	Coke Oven battery # 2 existing 80m RCC chimney is found weakened, will be replaced with two nos. of MS refractory lined chimney of 75m height.
vii.	Coke Oven Plant	Coke Oven Stack 2B (COP)	
viii.	Coke Oven Plant	Coke oven # III chimney	To maintain and control draft at ovens the existing stack height of 38m will be increased to 65m.
ix.	Coke Oven Plant	Waste Heat Recovery Boiler# III	It is envisaged that additional sensible heat source from COP battery # 3 and to meet the requirement the existing stack dia and height will be modified to 1.8m and 35m respectively.
x.	SMS – CCM# 3	Steam Exhaust System stack #2	To maintain draft in the casting area an additional steam exhaust stack will be provided with the height of 26m
xi.	Pickling plant ETP	Hot water generator to ATFD	It is anticipated that Agitated Thin Film Drier (ATFD) will be installed after evaporator of ETP. To supply heat source to ATFD a Hot water generator (HSD based) will be installed

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S.No.	Name of the unit	Production capacity envisaged	Purpose
xii.	Pickling plant ETP	ETP plant ATFD vent	It is anticipated that there is a vent stack to release water vapor from ATFD.
xiii.	CPP II	ETP plant ATFD vent	It is proposed to install a ETP (ZLD) plant in CPP II and steam will be used for heating application. It is anticipated that there is a vent stack to release water vapor from ATFD.

9. The certified compliance report for the existing environmental clearance was obtained from Regional office, Chennai vide letter No. EP/12.1/2016-17/20/TN/1687 dated 18.10.2019 wherein the conditions related to installation of solar panel, implementation of ESC related activities are yet to be complied. In this regard, project proponent has submitted action taken report for the conditions which are partially completed vide letter JSWSL/ENVT/MoEF&CC/ROC/2019-20/112 dated 01.11.2019.
10. The total land available including township is 268.08 ha. The plant site is 237.28 ha and township area is 30.80 ha. The land has been classified as Industrial Land use. The land required for the proposed changes/facilities is about 5.36 ha and the same exists within the plant premises. Hence, no additional land is required for the proposed changes. The greenery is about 33.5% of the total land area. Geographically, the proposed plant is located at 11°49'30.00" N & 77°54'22.34" E to 11°48'44.80" N to 77°55'37.51" E. The entire area falls in Survey of India topo sheet nos. C43F13, C43F14 & C44A1, C44A2.
11. There are No National parks, Wildlife sanctuaries, Biosphere reserves, Tigers/Elephant reserves, Wildlife corridors etc. within 10 km from the project site. There is no water body passing through project site.
12. The raw materials used in the plant are Iron ore lumps and fines, Coking/Non-coking and thermal coals, Dolomite Quartzite, Dunite, Anthracite and lime stone. The requirement of raw materials remains the same as noted in the existing EC of 1.3 MTPA except the addition of 0.04 MTPA of lime stone for SO₂ control in coal based boiler.
13. An agreement already exists between PWD and JSW to utilize 5 MGD (22730 KLD) of raw water from downstream of Mettur dam. The total estimated water requirement after the modification and installation of value added facilities will be about 17727 KLD (3.9 MGD) against the existing consumption of 17007 KLD (3.74 MGD). The additional water requirement 0.16 MGD is mainly for the proposed LRF# 5. As per existing EC dated 7/7/2017, the estimated fresh water consumption is 4.45 MGD (20245 KLD). Due to the RO plant installation and Air Cooled Condenser installation in CPP II (Unit # 3), about 2500 KLD of fresh water consumption was reduced per day.

14. The power requirement of the proposed project is estimated as 11.5 MW. The existing Captive power plant of the industry have power generation capacity of 97 MW and power purchase agreement with TNEB is about 34 MW. After the proposed changes the total power requirement would be 101.5 MW which will be cater through CPP and TNEB grid.
15. Baseline Environmental Studies were conducted during winter season from December 1st 2018 to 28th February 2019. Ambient Air Quality Monitoring (AAQM) was carried out at eight (8) locations during December 2018 to February 2019 and the baseline data indicates the ranges of concentrations as PM₁₀ – 54.71 to 70.98 µg/m³; SO₂ – 9.55 to 14.68 µg/m³; NO₂ – 19.63 to 27.53 µg/m³. AAQ modelling study emissions indicates that the maximum incremental GLCs after the proposed amendment is 4.17 µg/m³ with respect to PM₁₀, 0.62 µg/m³ with respect to SO₂, 0.38 µg/m³ with respect to NO₂. The proposed technological upgradation and other facilities will lead to reduction in pollution load – SPM by 11.8%, SO₂ by 4.33% & NO_x by 8.14 %.
16. Ground water quality has been monitored at eight locations in the study area and analyzed. pH: 7.14 - 7.69, Total Hardness: 116.7 – 357.2 mg/l, Chlorides: 38.7 to 560.8 mg/l. Heavy metals are within the limits. Surface water samples were analyzed from 8 locations. Surface water samples were analyzed from 5 locations: pH: 6.52 – 7.56, Total Hardness: 126.0 – 216.2 mg/l, Chlorides: 32.4 to 85.3 mg/l. Heavy metals are within the limits.
17. Noise levels are in the range of 49.6 to 55.2 dB(A) for day time and 38.7 to 51.4 dB(A) for night time.
18. With the installation of the proposed facilities, there will be an additional waste generation from pollution control facilities viz dust about 3 TPD and will be reused in sinter plant. From pickling plant Phosphate Sludge about 0.27 TPD will be generated and the same will be used as fertilizer and also disposed to TSDF. Chemical Sludge/salt from the waste water treatment will be generated about 2.06 TPD and the same will be disposed to TSDF.
19. The Public hearing for the existing EC was held on 12.08.2016 as per the provisions laid down in the EIA Notification, 2006.
20. Total cost of the proposed modification and value addition facility is INR 234.2 crores. An allocation of Rs.13 Crores has been earmarked towards the implementation of CER related activities. The additional employment generation from the proposed project is about 50 nos.
21. Green belt is established in an area of 79.52 ha (33.50%) and further the green belt around the project will be developed (10000 saplings for the FY 2019-2020). Local and native tree species such as Mango, Neem, Eucalyptus, Ficus, Mahogany, Vagai, Teak, Puvarasu, Banyan, etc. are planted.
22. The resource requirement, pollution load comparison for the proposed modification vis-à-vis with existing EC dated 7/7/2017 is given as below.

S.No.	Description	UoM	At 1.3 MTPA as per Earlier EC	Installation of facilities proposed / modification	After EC modification and value added facilities	Remarks
1	Land Requirement					
a.	Total land	Ha	268.08	0	268.08	No change
2	Raw materials Requirement					
a.	Iron ore fines	MTPA	1.47	0	1.47	No change
b.	Iron Ore Pellets	MTPA	0.5	0	0.5	
c.	Lump ore	MTPA	0.705	0	0.705	
d.	Coking/Non-coking coal	MTPA	0.947	0	0.947	
e.	Power plant coal	MTPA	0.172	0	0.172	
f.	Coke breeze for SP	MTPA	0.023	0	0.023	
g.	Dolomite	MTPA	0.147	0	0.147	
h.	Quartzite	MTPA	0.039	0	0.039	
i.	Dunite	MTPA	0.039	0	0.039	
j.	Lime powder	MTPA	0.0945	0	0.0945	
k.	Mill scale	MTPA	0.158	0	0.158	
l.	Purchase coke	MTPA	0.156	0	0.156	
m.	Anthracite	MTPA	0.095	0	0.095	
n.	Limestone	MTPA	0.135	0.04	0.175	To control SO ₂ in CPP II coal based boiler
	Total	MTPA	4.6805	0.04	4.7205	
3	Power Requirement					
a.	Power Requirement	MW	90	11.5	101.5	LRF #5, Slag grinding unit
b.	Captive Power generation	MW	97	0	97	
c.	From grid	MW	34	0	34	
	Total power availability	MW	131	0	131	
4	Fuel Requirement					

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S.No.	Description	UoM	At 1.3 MTPA as per Earlier EC	Installation of facilities proposed / modification	After EC modification and value added facilities	Remarks
a.	High Speed Diesel	KLD	1.7	1.6	3.3	Pickling plant and DG sets - emergency operations
b.	Liquid Petroleum Gas	TPD	1.0	0.015	1.015	
5	Water Requirement					
a.	Approved water allocation	MGD (m ³ /day)	5.0 (22730)	0	5.0 (22730)	No Change
b.	Make up water consumption	MGD (m ³ /day)	4.45 (20245)	0.16 (720)	3.90 (17727)	LRF #5 with VD, Slag grinding unit. Water reduction due to installation of RO plant and Air Cooled Condenser in CPPII - unit III
6	Man power Requirement					
a.	Man power Requirement	Numbers	5341	50	5391	For slag grinding unit
5	Waste water generation	m ³ /day	3040	235	3275	Additional effluent from RO 200 KLD, LRF#5 - 15 KLD and CPP II - unit III - 20 KLD. Zero waste water discharge by reuse in steel plant
6	Pollution load					
	PM ₁₀	kg/hr	341.31	-40.34	300.97	Reduction in pollution due to Technological Modification.
	SO ₂	kg/hr	280.53	-12.16	268.37	
	NO _x	kg/hr	207.01	-16.86	190.15	

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S.No.	Description	UoM	At 1.3 MTPA as per Earlier EC	Installation of facilities proposed / modification	After EC modification and value added facilities	Remarks
7	Waste generation					
	Non Hazardous					
	BF Slag	TPD	1350	0	1350	No change
	SMS slag	TPD	720	0	720	No change
	Dust, Sludge	TPD	197	2.66	199.66	Additional dust generation from dedusting systems which is proposed for modification. The same will be reused in sinter plant
	Hazardous	TPD	0.41	2.33	2.74	Additional generation from pickling unit-Phosphate sludge 0.27 TPD will be used as fertilizer and salt from ZLD ETP 2.06 TPD will be disposed to TSDF.

23. The proponent has mentioned that there is no court case or violation under EIA Notification to the project or related activity.

24. Name of the consultant: Vimta Labs Limited [Sr. No. 160, List of Accredited Consultant Organizations (Alphabetically) Rev. 81, Nov., 2019].

Observations of the Committee

25. The Committee noted that as per the findings of the EIA report, there is no change in land requirement and there is reduction in water requirement and pollution load due to the technological modification. Besides, the Committee also noted that the installation of value added facilities such as slag grinding unit and its allied facilities are environment friendly. Further, there will be no increase in the production capacity of 1.3 MTPA steel. Therefore, the Committee consider the instant proposal under para 7(ii) (a) of the EIA Notification, 2006 and dispense with the requirement of conducting fresh public consultation.

Recommendations of the Committee

26. In view of the foregoing and after detailed deliberations, the committee recommended the project for grant of Environmental Clearance under para 7(ii) of EIA Notification, 2006 subject to the following specific conditions in addition to the applicable general conditions as per the Ministry's Office Memorandum No. 22-34/2018-III dated 9/8/2018 for integrated steel plants.
- Particulate emission from the rod mill of slag grinding unit shall be less than 10 mg/Nm³.
 - Green belt shall be developed in an area of 85 ha (210 acres) in and around the plant in a time frame of two years.

Decision of MoEF&CC

27. The Ministry of Environment, Forest and Climate Change (MoEF&CC) has considered the application based on the recommendations of the Expert Appraisal Committee (Industry-I) and hereby decided to accord environmental clearance for project cited above under para 7(ii) of the EIA Notification, 2006 subject to the following specific and applicable general conditions prescribed in the Ministry's Office Memorandum No. 22-34/2018-III dated 9/8/2018 for Integrated Steel Plants.

A. Specific Conditions

- Particulate emission from the rod mill of slag grinding unit shall be less than 10 mg/Nm³.
- Green belt shall be developed in an area of 85 ha (210 acres) in and around the plant in a time frame of two years.

B. General conditions

I. Statutory compliance:

- The project proponent shall obtain Consent to Establish / Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from the concerned State Pollution Control Board/ Committee.
- The project proponent shall obtain the necessary permission from the Central Ground Water Authority, in case of drawl of ground water / from the competent authority concerned in case of drawl of surface water required for the project.
- The project proponent shall obtain authorization under the Hazardous and other Waste Management Rules, 2016 as amended from time to time.

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II. Air quality monitoring and preservation

- i. The project proponent shall install 24x7 continuous emission monitoring system at process stacks to monitor stack emission with respect to standards prescribed in Environment (Protection) Rules 1986 vide G.S.R 277 (E) dated 31st March 2012(Integrated iron & Steel); G.S.R 414 (E) dated 30th May 2008 (Sponge Iron) as amended from time to time; S.O. 3305 (E) dated 7th December 2015 (Thermal Power Plants)as amended from time to time and connected to SPCB and CPCB online servers and calibrate these system from time to time according to equipment supplier specification through labs recognised under Environment (Protection) Act, 1986 or NABL accredited laboratories.
- ii. The project proponent shall monitor fugitive emissions in the plant premises at least once in every quarter through labs recognised under Environment (Protection) Act, 1986.
- iii. The project proponent shall install system to carryout Continuous Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM10 and PM2.5 in reference to PM emission, and SO2 and NOx in reference to SO2 and NOx emissions) within and outside the plant area at least at four locations (one within and three outside the plant area at an angle of 120°each), covering upwind and downwind directions.
- iv. The cameras shall be installed at suitable locations for 24X7 recording of battery emissions on the both sides of coke oven batteries and videos shall be preserved for at least one-month recordings.
- v. Sampling facility at process stacks and at quenching towers shall be provided as per CPCB guidelines for manual monitoring of emissions.
- vi. The project proponent shall submit monthly summary report of continuous stack emission and air quality monitoring and results of manual stack monitoring and manual monitoring of air quality /fugitive emissions to Regional Office of MoEF&CC, Zonal office of CPCB and Regional Office of SPCB along with six-monthly monitoring report.
- vii. Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed stack emission and fugitive emission standards.
- viii. The project proponent shall provide leakage detection and mechanised bag cleaning facilities for better maintenance of bags.
- ix. Secondary emission control system shall be provided at SMS Converters.
- x. Pollution control system in the steel plant shall be provided as per the CREP Guidelines of CPCB.
- xi. Sufficient number of mobile or stationery vacuum cleaners shall be provided to clean plant roads, shop floors, roofs, regularly.

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- xii. Recycle and reuse iron ore fines, coal and coke fines, lime fines and such other fines collected in the pollution control devices and vacuum cleaning devices in the process after briquetting/ agglomeration.
- xiii. The project proponent use leak proof trucks/dumpers carrying coal and other raw materials and cover them with tarpaulin.
- xiv. Facilities for spillage collection shall be provided for coal and coke on wharf of coke oven batteries (Chain conveyors, land based industrial vacuum cleaning facility).
- xv. Land-based APC system shall be installed to control coke pushing emissions.
- xvi. Monitor CO, HC and O₂ in flue gases of the coke oven battery to detect combustion efficiency and cross leakages in the combustion chamber.
- xvii. Vapour absorption system shall be provided in place of vapour compression system for cooling of coke oven gas in case of recovery type coke ovens.
- xviii. In case concentrated ammonia liquor is incinerated, adopt high temperature incineration to destroy Dioxins and Furans. Suitable NO_x control facility shall be provided to meet the prescribed standards.
- xix. The coke oven gas shall be subjected to desulphurization if the sulphur content in the coal exceeds 1%.
- xx. Wind shelter fence and chemical spraying shall be provided on the raw material stock piles.
- xxi. Design the ventilation system for adequate air changes as per ACGIH document for all tunnels, motor houses, Oil Cellars.
- xxii. The project proponent shall install Dry Gas Cleaning Plant with bag filter for Blast Furnace and SMS converter.
- xxiii. Dry quenching (CDQ) system shall be installed along with power generation facility from waste heat recovery from hot coke

III. Water quality monitoring and preservation

- i. The project proponent shall install 24x7 continuous effluent monitoring system with respect to standards prescribed in Environment (Protection) Rules 1986 vide G.S.R 277 (E) dated 31st March 2012 (Integrated iron & Steel); G.S.R 414 (E) dated 30th May 2008 (Sponge Iron) as amended from time to time; S.O. 3305 (E) dated 7th December 2015 (Thermal Power Plants) as amended from time to time and connected to SPCB and CPCB online servers and calibrate these system from time to time according to equipment supplier specification through labs recognised under Environment (Protection) Act, 1986 or NABL accredited laboratories. The project proponent shall monitor

Environmental Clearance for the project titled "Installation of 0.8 MTPA slag grinding unit and new facilities related to value addition and technological upgradation within the existing 1.3 MTPA Integrated Steel Plant premises by M/s JSW Steel Limited located at Mecheri, Taluk Mettur, District Salem, Tamil Nadu".

regularly ground water quality at least twice a year (pre and post monsoon) at sufficient numbers of piezometers/sampling wells in the plant and adjacent areas through labs recognised under Environment (Protection) Act, 1986 and NABL accredited laboratories.

- ii. The project proponent shall submit monthly summary report of continuous effluent monitoring and results of manual effluent testing and manual monitoring of ground water quality to Regional Office of MoEF&CC, Zonal office of CPCB and Regional Office of SPCB along with six-monthly monitoring report.
- iii. The project proponent shall provide the ETP for coke oven and by-product to meet the standards prescribed in G.S.R 277 (E) dated 31st March 2012 (Integrated iron & Steel); G.S.R 414 (E) dated 30th May 2008 (Sponge Iron) as amended from time to time; S.O. 3305 (E) dated 7th December 2015 (Thermal Power Plants) as amended from time to time as amended from time to time.
- iv. Adhere to 'Zero Liquid Discharge'.
- v. Sewage Treatment Plant shall be provided for treatment of domestic wastewater to meet the prescribed standards.
- vi. Garland drains and collection pits shall be provided for each stock pile to arrest the run-off in the event of heavy rains and to check the water pollution due to surface run off.
- vii. Tyre washing facilities shall be provided at the entrance of the plant gates.
- viii. CO₂ injection shall be provided in GCP of SMS to reduce pH in circulating water to ensure optimal recycling of treated water for converter gas cleaning.
- ix. The project proponent shall practice rainwater harvesting to maximum possible extent.
- x. Treated water from ETP of COBP shall not be used for coke quenching.
- xi. Water meters shall be provided at the inlet to all unit processes in the steel plants.
- xii. The project proponent shall make efforts to minimize water consumption in the steel plant complex by segregation of used water, practicing cascade use and by recycling treated water.

IV. Noise monitoring and prevention

- i. Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Officer of the Ministry as a part of six-monthly compliance report.

- ii. The ambient noise levels should conform to the standards prescribed under E(P)A Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.

V. Energy Conservation measures

- i. The project proponent shall provide TRTs to recover energy from top gases of Blast Furnaces.
- ii. Coke Dry Quenching (CDQ) shall be provided for coke quenching for both recovery and non-recovery type coke ovens.
- iii. Waste heat shall be recovered from Sinter Plants coolers and Sinter Machines.
- iv. Use torpedo ladle for hot metal transfer as far as possible. If ladles not used, provide covers for open top ladles.
- v. Use hot charging of slabs and billets/blooms as far as possible.
- vi. Waste heat recovery systems shall be provided in all units where the flue gas or process gas exceeds 300°C.
- vii. Explore feasibility to install WHRS at Waste Gases from BF stoves; Sinter Machine; Sinter Cooler, and all reheating furnaces and if feasible shall be installed.
- viii. Restrict Gas flaring to < 1%.
- ix. Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly;
- x. Provide LED lights in their offices and residential areas.
- xi. Ensure installation of regenerative type burners on all reheating furnaces.

VI. Waste management

- i. An attrition grinding unit to improve the bulk density of BF granulated slag from 1.0 to 1.5 Kg/l shall be installed to use slag as river sand in construction industry.
- ii. In case of Non-Recovery coke ovens, the gas main carrying hot flue gases to the boiler, shall be insulated to conserve heat and to maximise heat recovery.
- iii. Tar Sludge and waste oil shall be blended with coal charged in coke ovens (applicable only to recovery type coke ovens).
- iv. Carbon recovery plant to recover the elemental carbon present in GCP slurries for use in Sinter plant shall be installed.

- v. Waste recycling Plant shall be installed to recover scrap, metallic and flux for recycling to sinter plant and SMS.
- vi. Used refractories shall be recycled as far as possible.
- vii. SMS slag after metal recovery in waste recycling facility shall be conditioned and used for road making, railway track ballast and other applications. The project proponent shall install a waste recycling facility to recover metallic and flux for recycle to sinter plant. The project proponent shall establish linkage for 100% reuse of rejects from Waste Recycling Plant.
- viii. 100% utilization of fly ash shall be ensured. All the fly ash shall be provided to cement and brick manufacturers for further utilization and Memorandum of Understanding in this regard shall be submitted to the Ministry's Regional Office.
- ix. Oil Collection pits shall be provided in oil cellars to collect and reuse/recycle spilled oil. Oil collection trays shall be provided under coils on saddles in cold rolled coil storage area.
- x. The waste oil, grease and other hazardous waste like acidic sludge from pickling, galvanising, chrome plating mills etc. shall be disposed of as per the Hazardous & Other waste (Management & Transboundary Movement) Rules, 2016. Coal tar sludge / decanter shall be recycled to coke ovens.
- xi. Kitchen waste shall be composted or converted to biogas for further use.

VII. Green Belt

- i. Green belt shall be developed in an area equal to 33% of the plant area with a native tree species in accordance with CPCB guidelines. The greenbelt shall inter alia cover the entire periphery of the plant
- ii. The project proponent shall prepare GHG emissions inventory for the plant and shall submit the programme for reduction of the same including carbon sequestration including plantation.

VIII. Public hearing and Human health issues

- i. Emergency preparedness plan based on the Hazard identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented.
- ii. The project proponent shall carry out heat stress analysis for the workmen who work in high temperature work zone and provide Personal Protection Equipment (PPE) as per the norms of Factory Act.
- iii. 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.

- iv. Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.

IX. Corporate Environment Responsibility

- i. The project proponent shall comply with the provisions contained in this Ministry's OM vide F.No. 22-65/2017-IA.III dated 1st May 2018, as applicable, regarding Corporate Environment Responsibility.
- ii. The company shall have a well laid down environmental policy duly approve by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental / forest / wildlife norms / conditions. The company shall have defined system of reporting infringements / deviation / violation of the environmental / forest / wildlife norms / conditions and / or shareholders' / stake holders. The copy of the board resolution in this regard shall be submitted to the MoEF&CC as a part of six-monthly report.
- iii. A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly to the head of the organization.
- iv. Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.
- v. Self-environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.
- vi. All the recommendations made in the Charter on Corporate Responsibility for Environment Protection (CREP) for the Iron and Steel plants shall be implemented.

X. Miscellaneous

- i. The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.
- ii. The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.

Environmental Clearance for the project titled "Installation of 0.8 MTPA slag grinding unit and new facilities related to value addition and technological upgradation within the existing 1.3 MTPA Integrated Steel Plant premises by M/s JSW Steel Limited located at Mecheri, Taluk Mettur, District Salem, Tamil Nadu".

- iii. The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.
- iv. The project proponent shall monitor the criteria pollutants level namely; PM₁₀, SO₂, NO_x (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.
- v. The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal.
- vi. The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.
- vii. The project proponent 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, commencing the land development work and start of production operation by the project.
- viii. The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.
- ix. The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.
- x. No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).
- xi. Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.
- xii. The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.
- xiii. The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.

- xiv. The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/monitoring reports.
- xv. The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.
- xvi. Any appeal against this EC shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.
28. The project proponent shall obtain fresh environmental clearance in case of change in scope of the project if any.
29. This issues with the approval of Competent Authority.

Yours faithfully,


(A.K. Agrawal)
Director

Copy to:-

- i. The Secretary, Department of Environment, Government of Tamil Nadu Secretariat, Chennai.
- ii. The Dy. Director General (C), Ministry of Environment, Forest and Climate Change, Regional Office (SEZ), 1st and 11nd Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai – 34.
- iii. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-Cum-Office Complex, East Arjun Nagar, New Delhi-110 032.
- iv. The Chairman, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai-600 032, Tamil Nadu.
- v. The Member Secretary, Central Ground Water Authority, West Block -II, Wing -3, Sector I, R.K.Puram, New Delhi – 110086.
- vi. The District Collector, District, Salem, Government of Tamil Nadu.
- vii. Guard File/Record File/Monitoring File.
- viii. MoEF&CC Website


(A.K. Agrawal)
Director

Environmental Clearance for the project titled "Installation of 0.8 MTPA slag grinding unit and new facilities related to value addition and technological upgradation within the existing 1.3 MTPA Integrated Steel Plant premises by M/s JSW Steel Limited located at Mecheri, Taluk Mettur, District Salem, Tamil Nadu".

**Copy of the Environmental Clearance
dated.07.07.2017**

F. No. J-11011/281/2006-IA.II (I)
Government of India
Ministry of Environment, Forest and Climate Change
(Impact Assessment Division)

Indira Paryavaran Bhawan
Jor Bagh Road, Aliganj,
New Delhi - 110003
E-mail: sharath.kr@gov.in
Tel: 011-24695319

Dated: 7th July, 2017

To

**M/s JSW Steel Ltd.,
Mecheri, Taluk Mettur,
District Salem, Tamil Nadu - 636453
e-mail: d.ravichandar@jsw.in**

Subject: Expansion of Integrated Steel Plant (1.0 MTPA to 1.3 MTPA) of M/s JSW Steel Ltd., located at Mecheri, Taluk Mettur, District Salem, Tamil Nadu – Environmental Clearance under EIA Notification, 2006 Regarding.

Sir,

This has reference to your online application vide proposal no. IA/TN/IND/26508/2015, dated 28th October 2016 along with copies of EIA/EMP report seeking environmental clearance under the provisions of the EIA Notification, 2006 for the project mentioned above. The proposed project activity is listed at Sl. No. 3 (a) metallurgical (Ferrous and Non-Ferrous) under Category "A" under the provisions of EIA Notification 2006.

2.0 The proposed expansion of 1.0 to 1.3 MTPA Special Alloy Steel of M/s JSW Salem Works was initially received in the Ministry 16.01.2015 for obtaining Terms of Reference (ToR) as per EIA Notification, 2006. The project was appraised by the Expert Appraisal Committee (Industry-I) [EAC(I)] during its meeting held on 11.02.2015 and prescribed ToRs to the project for undertaking detailed EIA study for obtaining environmental clearance. Accordingly, the Ministry had prescribed ToRs to the project on 12.06.2015 vide letter No. J-11011/281/2006-IA.II(I). Based on the ToRs prescribed to the project, the project proponent applied for environmental clearance to the Ministry online on 28.10.2016. The proposal was placed in the 15th meeting of Appraisal Committee (Industry-I) [EAC(I)] held during 2nd – 3rd February 2017. The committee sought additional information and the PP submitted reply on 28.03.2017.

3.0 M/s. JSW Salem Works operating 1.0 MTPA Integrated Steel Plant located at M. Kallipatti and Pottaneri Village, Mettur Tehsil, Salem District, Tamil Nadu for which environmental clearance was granted vide Lr. No. J-11011/281/2006-IA.II(I) dated 02.01.2007. Certified compliance status of existing plant was obtained vide Lr. No. EP/12.1/2016-17/20/TN/0162, dated 31.01.2017.

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Environmental Clearance for the proposed expansion of Integrated Steel Plant (1.0 MTPA to 1.3 MTPA) of M/s JSW Steel Ltd., located at Mecheri, Taluk Mettur, District Salem, Tamil Nadu

4.0 Now, it is proposed to expand the capacity from 1.0 MTPA to 1.3 MTPA. The details of existing and the proposed capacities are given below:

Sl. No.	Manufacturing Facilities	Existing Capacity	Proposed Expansion	Total Capacity after Expansion
1	Coke Oven Plant – 1 (Non-Recovery type)	0.5	-	0.5
2	Sinter plant – 1 (20 m ²)	0.175	-	0
3	Sinter plant – 2 (90 m ²)	1.06	-	1.06
4	Sinter plant – 3 (90 m ²)	-	1.06	1.06
5	Blast Furnace – 1 (402 to 650 m ³)	0.367	0.316	0.683
6	Blast Furnace – 2 (550 to 650 m ³)	0.578	0.105	0.683
7	Energy Optimizing Furnace - 1 (45 to 65 T)	0.41	0.23	0.64
8	Energy Optimising Furnace-2 (45 T)	0.62	-	0.62
9	Ladle Furnace – 1 (45 to 65 T)	45 T/heat	20 T/heat	65 T/heat
10	Ladle Furnace – 2 (65 T)	65 T/heat	-	65 T/heat
11	Ladle Furnace – 3 (65 T)	65 T/heat	-	65 T/heat
12	Ladle Furnace – 4 (65 T)	65 T/heat	-	65 T/heat
13	Continuous Casting Machine - 1	0.35	-	0.35
14	Continuous Casting Machine - 2	0.5	-	0.5
15	Continuous Casting Machine - 3	-	0.45	0.45
16	Bar & Rod Mill augmentation	0.4	0.08	0.48
17	Blooming Mill augmentation	0.36	0.12	0.48
18	Pickling and Annealing steel unit	-	0.06	0.06
19	Peeled and ground	-	0.04	0.04
20	Air separation plant – 1 (150 T/day)	150 T/day	-	150 T/day
21	Air separation plant – 2 (390 T/day)	390 T/day	-	390 T/day
22	Air separation plant – 3 (250 T/day)	-	250 T/day	250 T/day
23	Captive power plant – 1	7 MW	-	7 MW
24	Captive power plant – 2	2 X 30 MW	-	2 X 30 MW
25	Captive power plant – 3	-	30 MW	30 MW

5.0 The total available plant site is 237.28 ha and township is 30.80 ha. The land required for the proposed expansion project is 11.74 ha, out of total plant site and township area, scrub land is 37.89 ha, vegetation area is 47.83 ha, open scrub is 27.19, built-up area is 69.27 ha, water bodies like rainwater harvesting pond, guard pond etc is 5.34 ha, open land is 62.50 ha, stock yard is 3.82 ha, roads 9.57 ha and rocky terrain 4.711 ha. No forest land is involved. The entire land has been already acquired for the project. No river/stream passes through the project area. It has been reported that no water body exist around the project and no modification/diversion in the existing natural drainage pattern at any stage has not been proposed.

6.0 The topography of the area is slightly undulating and reported to lie between 11° 48' 16" to 11° 49' 2" N latitude and 77° 0' 54" to 77° 55' 43" E longitude in Survey of India topo sheet No. 58 E/13, 58 E/14, 58 I/1 and 58 I/2, at an elevation of 339 to 368 m AMSL. The ground water table is reported to range between 1.0 to 31.23 m below the land surface during March to May 2015. Based on hydro-geological studies, it has been reported that the radius of influence of pumped out water will be 60 m. Further, the stage of groundwater development is reported to be 0% and 100% in core and buffer zone respectively and thereby these are designated as critically exploited areas.

7.0 No national park/wildlife sanctuary/biosphere reserve/tiger reserve/elephant reserve etc. are reported in the core and buffer zone of the project. The area also does not report to form corridor for Schedule-I fauna.

8.0 The raw material requirement for the project are listed below:

Sl. No.	Raw material	Present Quantity (MTPA)	Post Exp. Quantity (MTPA)	Source
1	Iron ore fines	0.845	1.47	Indigenous/Imported
2	Iron ore pellets	NA	0.5	Indigenous source
3	Lump ore	0.806	0.705	Indigenous/Imported
4	Coking coal	0.585	0.585	Imported
5	Non-coking coal for COP	0.147	0.147	Imported
6	Non-coking coal for PCI	0.147	0.215	Imported
7	Power plant coal	0.172	0.172	Indigenous/Imported
8	Coke breeze for SP	0.023	0.023	In house
9	Limestone	0.08	0.135	Imported/indigenous
10	Dolomite	0.091	0.147	Indigenous
11	Quartzite	0.030	0.039	Indigenous
12	Dunite	0.030	0.039	Indigenous
13	Lime powder	0.0585	0.0945	Imported/indigenous
14	Mill scale	0.097	0.158	Indigenous
15	Purchase coke	0	0.156	Imported
16	Anthracite	0.039	0.095	Imported

9.0 The proposed expansion of 0.3 MTPA Integrated Steel Plant (ISP) has been contemplated to adopt conventional BF (Blast Furnace) - EOF (Energy Optimizing Furnace) - CC (Continuous Casting) and RM (Rolling Mill) route. In expansion, additional 1 X 30 MW using the WHR boilers of COP and BF gas is planned.

10.0 The targeted production capacity of the proposed expansion is 1.3 MTPA. The ore for the plant would be procured from imported. The ore transportation will be done through rail.

11.0 An agreement exists between PWD and JSW to utilize 5 MGD of raw water from downstream of river Cauvery. The present requirement is about 3.17 MGD of raw water, which is met from the intake well located at downstream of Mettur dam which meets the 1 MTPA capacity of steel plant and captive power plant of 67 MW. Total fresh water requirement after expansion will be to the tune of about 4.4 MGD.

12.0 The average power demand of the plant after expansion is estimated to be about 90 MW. It is expected that the power to the tune of 97 MW will be generated from the steel plant facilities after expansion. It is proposed to meet the entire energy requirement from the captive sources taking the support of state electricity grid for stability. Provision will be made to sell out the surplus power if any, through the grid.

13.0 Ambient air quality monitoring has been carried out at 8 locations during March to May 2015 and the data submitted indicated: PM_{10} (23.28 $\mu g/m^3$ to 76.0 $\mu g/m^3$), $PM_{2.5}$ (8.90 to 34.83 $\mu g/m^3$), SO_2 (1.21 to 9.50 $\mu g/m^3$) and NO_x (11.41 to 60.76 $\mu g/m^3$). The results of the modelling study indicates that the maximum increase of GLC for the proposed expansion project is 83.0 $\mu g/m^3$ with respect to the PM_{10} , 10.6 $\mu g/m^3$ with respect to the SO_2 , 20.5 $\mu g/m^3$ with respect to the NO_x . There is no habitation in the core zone of the project. No R&R is involved.

14.0 Samples of ground (8) and surface (4) water samples were collected during monitoring season. The results indicate that most of parameters are within the prescribed norms of groundwater except for total hardness, calcium and TDS. The reason could be attributable to mixing of surface water. The area is encountered by hard rock overlain by sedimentary rock which may contain calcium and magnesium and leads to increase in hardness. Whereas, the surface water parameters are meeting the norms.

15.0 It has been reported that a total of 80 TPD of scrap waste will be generated due to the expansion project from CCM and rolling mill, and the entire waste will be dumped in the earmarked dump yard. It has been already developed that an area of 78.9 ha as green belt around the project site to attenuate the noise levels and trap the dust generated due to the project development activities.

16.0 The Public hearing for the project was held on 12.08.2016 for production of 1.0 to 1.3 million TPA of Special Alloy Steels, in the existing premises under the chairmanship of District Collector, Salem. The issues raised during the public hearing were employment to the local people; pollution due to the project; water scarcity; etc.

17.0 The capital cost of the project is Rs. 1025 Crores and the capital cost for environmental protection measures is proposed as Rs. 50.5 Crores. The annual recurring cost towards the environmental protection measures is proposed as Rs. 8.05 Crores. The project is scheduled to be completed in a period of 36 months.

18.0 The manpower working in existing project are 5041 including 4000 contractual employees. It has been planned to retain the existing man power for the proposed expansion programme. The company had spent Rs. 455.04 Lakhs for development of region as a part of CSR in last four financial years.

19.0 The proponent has mentioned that there is no court case to the project or related activity. There is no violation under EIA Notification, 2016.

20.0 The proposal was considered in the 15th meeting of Expert Appraisal Committee (Industry-I) [EAC(I)] held during 2nd – 3rd February 2017. Based on the presentation made and discussions held, the Committee desired additional information. The project proponent has submitted reply on 28.03.2017. The revised list of raw materials along with the source of the raw material given as follows:

Sl. No.	Raw material	Present Quantity (MTPA)	Post Exp. Quantity (MTPA)	Source
1	Iron ore fines	0.845	1.47	Jharkhand
2	Iron ore pellets	NA	0.5	Karnataka
3	Lump ore	0.806	0.705	Monitoring committee, Karnataka
4	Coking coal	0.585	0.585	Australia/Russia
5	Non-coking coal for COP	0.147	0.147	Australia/Russia
6	Non-coking coal for PCI	0.147	0.215	Australia/Russia
7	Power plant coal	0.172	0.172	Australia/Russia
8	Coke breeze for SP	0.023	0.023	In-house
9	Limestone	0.08	0.135	Oman
10	Dolomite	0.091	0.147	Tamil Nadu
11	Quartzite	0.030	0.039	Tamil Nadu, Andhra Pradesh
12	Dunite	0.030	0.039	South Africa
13	Lime powder	0.0585	0.0945	Malaysia
14	Mill scale	0.097	0.158	Tamil Nadu
15	Purchase coke	0	0.156	Tamil Nadu
16	Anthracite	0.039	0.095	Australia/Russia

21.0 It was informed that the iron ore lumps purchase through “Monitoring committee of Karnataka”, Auction No: 107 for a quantity of about 20000 MT. The iron ore fines quantity of about 150000 MT is being purchased from M/s. Rungta mines, Jharkhand.

22.0 The Effluent Treatment Plant (ETP) is designed for 920 m³/hr capacity with inlet suspended solids level of 2500 ppm and Outlet suspended solid level of 50 ppm.

23.0 The revised table on the cost component for environmental pollution control measures is given below:

Sl. No	Item	Capital Cost (Rs in Crores)	Recurring cost per annum (Rs in Crores)
1	Air Pollution Control	30	4
2	Water Pollution Control	1	0.2
3	Solid Waste Management	10	1
4	Noise Pollution Control	2	0.2
5	Occupational health	3	0.3
6	Environmental survey and sampling	5	0.5
	Total	51	6.2

24.0 The cost break up for the ESC component along with the time line to implement is given below:

Sl.No	Activity wise fund Allocation in Rs in Crores.		Commitment period (Year)					Total
	Description of activities	Numbers	I	II	III	IV	V	
1	Toilets	2000	0.5	0.75	0.75	0.5	0.5	3
2	Health centre	1	0.25	0.25	0.25	0.25		1
3	Community hall	2		0.5	0.5			1
4	Hospital	1	0.5	0.5	0.5	0.25	0.25	2
5	Modern school New with GYM and Play ground	1			1	0.5	0.5	2
6	Water shed program	1		0.25	0.25	0.25	0.25	1
7	Water body strengthening /Drinking water bore well drilling			0.25	0.25	0.25	0.25	1
8	Drainage		0.25	0.25	0.25	0.25		1
9	Government school improvement	1		0.25	0.25	0.25	0.25	1
10	Total		1.5	3	4	2.5	2	13

25.0 Based on the reply submitted the proposal was placed on 18th meeting of Expert Appraisal Committee (Industry-I) held during 3rd - 5th May 2017. After detailed deliberations, the committee recommended the project for Environmental Clearance with following stipulated Specific Conditions along with other environmental conditions while considering for accord of environmental clearance by the ministry.

26.0 The Ministry of Environment, Forest and Climate Change has considered the application based on the recommendations of the Expert Appraisal Committee (Industry-I) and hereby decided to grant environmental clearance for the proposed expansion of Integrated Steel Plant (1.0 MTPA to 1.3 MTPA) of M/s JSW Steel Ltd., located at Mecheri, Taluk Mettur, District Salem, Tamil Nadu under the provision of EIA Notification dated 14th September, 2006, as amended, subject to strict compliance of the following Specific and General conditions:

A. SPECIFIC CONDITION:

- The occupational health survey of the active workmen involved shall be carried as per the ILO guidelines and all the employees shall cover in every 5 years @ 20% every year.
- The amount allocated for ESC i.e. Rs. 13 Crores shall be provided as CAPEX and the ESC shall be treated as project and monitored annually and the report of same shall be submitted to Regional office of MoEF&CC.
- The project proponent shall provide for solar light system for all common areas, street lights, villages, parking around project area and maintain the same regularly.
- The project proponent shall provide for LED lights in their offices and residential areas.

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- v. The project proponent should install 24x7 air monitoring devices to monitor air emission and submit report to Ministry and its Regional Office.
 - vi. The ETP for Blast furnace effluent should be designed to meet Cyanide standards as notified by the MoEFCC.
 - vii. No effluent shall be discharged outside the plant premises and 'zero' discharge shall be adopted.
 - viii. The ETP for coke oven by-product should be designed to meet EPA notified standards especially the cyanide and phenol.
 - ix. Coke oven plant should meet visible emission standards notified by the MoEFCC.
 - x. The Standards issued by the Ministry vide G.S.R. 277(E) dated 31st March 2012 shall be strictly adhered to and the Standards prescribed for the Coke Oven plant shall be monitored and the report should be submitted along with the six-monthly compliance report
 - xi. The emission standards specified in the Environmental (Protection) Amendment Rules, 2015 issued by vide S.O. 3305 (E) dated 7th December 2015 for the Thermal Power Plant shall be strictly adhered to.
 - xii. 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.
 - xiii. On-line ambient air quality monitoring and continuous stack monitoring facilities for all the stacks shall be provided and sufficient air pollution control devices viz. Electrostatic precipitator (ESP), and bag filters etc. shall be provided.
 - xiv. A statement on carbon budgeting including the quantum of equivalent CO₂ being emitted by the existing plant operations, the amount of carbon sequestered annually by the existing green belt and the proposed green belt and the quantum of equivalent CO₂ that will be emitted due to the proposed expansion shall be prepared by the project proponent and submitted to the Ministry and the Regional Office of the Ministry. This shall be prepared every year by the project proponent. The first such budget shall be prepared within a period of 6 months and subsequently it should be prepared every year.
 - xv. For the employees working in high temperature zones falling in the plant operation areas, the total shift duration would be 4 hrs or less per day where the temperature is more than 50°C. Moreover, the jobs of these employees will be alternated in such a way that no employee is subjected to working in high temperature area for more than 1 hr continuously. Such employees would be invariably provided with proper protective equipment, garments and gears such as head gear, clothing, gloves, eye protection etc. There should also be an arrangement for sufficient drinking water at site to prevent dehydration etc.
 - xvi. In-plant control measures and dust suppression system shall be provided to control fugitive emissions from all the vulnerable sources. Dust extraction and suppression system shall be provided at all the transfer points, coal handling plant and coke sorting plant of coke oven plant. Bag filters shall be provided to hoods and dust collectors to coal and coke handling to control dust emissions. Water sprinkling system shall be provided to control secondary fugitive dust emissions generated during screening, loading, unloading, handling and storage of raw materials etc.

- xvii. 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.
- xviii. Hot gases from DRI Kiln should be passed through dust settling chamber (DSC) to remove coarse solids and After Burning Chamber (ABC) to burn CO completely and used in Waste Heat Recovery Boiler (WHRB). The gas then shall be cleaned in ESP before dispersion out into the atmosphere through ID fan and stack. ESP shall be installed to control the particulate emission from WHRB.
- xix. Efforts shall further be made to use maximum water from the rain water harvesting sources. If needed, capacity of the reservoir shall be enhanced to meet the maximum water requirement.
- xx. Risk and Disaster Management Plan along with the mitigation measures 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.
- xxi. All the blast furnace (BF) slag shall be granulated and provided to cement manufacturers for further utilization. Flue dust from sinter plant and SMS and sludge from BF shall be re-used in sinter plant. Coke breeze from coke oven plant shall be used in sinter and pellet plant. SMS Slag shall be given for metal recovery and properly utilized. All the other solid waste including broken refractory mass shall be properly disposed off in environment-friendly manner.
- xxii. Coal and coke fines shall be recycled and reused in the process. The breeze coke and dust from the air pollution control system shall be reused in sinter plant. The waste oil shall be properly disposed of as per the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.
- 8X xxiii. Green belt shall be developed in 33 % of plant area. Selection of plant species shall be as per the CPCB guidelines in consultation with the DFO.
- xxiv. All the recommendations made in the Charter on Corporate Responsibility for Environment Protection (CREP) for the Steel Plants and Coke Oven Plants shall be implemented.
- xxv. 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 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.
- xxvi. 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. The plan so prepared shall be based on SMART (Specific, Measurable, Achievable, Relevant and Time bound) concept. The expenditure should be aimed at sustainable development and direct free distribution and temporary relief should not be included.

- xxvii. All the commitments made to the public during the Public Hearing / Public Consultation meeting shall be satisfactorily implemented and a separate budget for implementing the same shall be allocated and information submitted to the Ministry's Regional Office at Bhubaneswar.
- xxviii. 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.

B. GENERAL CONDITIONS:

- i. The project authorities must strictly adhere to the stipulations made by the concerned State Pollution Control Board and the State Government.
- ii. No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (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, PM_{2.5}, SO₂ and NO_x are anticipated in consultation with the SPCB. Data on ambient air quality and stack emission shall be regularly submitted to this Ministry including its Regional Office at Chennai and the SPCB/CPCB once in six months.
- 84 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.
- v. The overall noise levels in and around the plant area shall be kept well within the standards (85 dB(A)) 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 dB(A) during day time and 70 dB(A) during night time.
- vi. Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.
- 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.
- 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.
- 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 (MoEF&CC) 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 Chennai. The funds so provided shall not be diverted for any other purpose.

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- 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.
 - 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 MoEF&CC at Chennai. The respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; PM₁₀, SO₂, 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.
 - 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 MoEF&CC, the respective Zonal Office of CPCB and the SPCB. The Regional Office of this Ministry at Chennai/ CPCB / SPCB shall monitor the stipulated conditions.
 - 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 MoEF&CC at Chennai by e-mail.
 - 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, Forests and Climate Change (MoEF&CC) 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.
 - 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.

27.0 The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.

28.0 The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.

29.0 The PP shall abide by all the commitments and recommendations made in the EIA/EMP report and also that during their presentation to the EAC. The commitment made by the project proponent to the issue raised during Public Hearing shall be implemented by the proponent.

30.0 The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and rules.

31.0 This EC supersedes the earlier EC granted vide letter Lr. No. J-11011/281/2006-IA.II(I) dated 02.01.2007 for the 1.0 MTPA capacity.


32.0 Any appeal against this EC shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

This issues with the approval of Competent Authority.


(Sharath Kumar Pallerla)
Scientist 'F'/Director

Copy to:-

- 1). **The Secretary**, Department of Environment, Government of Tamil Nadu, Chennai.
- 2). **The Secretary**, Department of Forests, Government of Tamilnadu, Chennai
- 3). **The Additional Principal Chief Conservator of Forests**, Ministry of Environment, Forest and Climate Change, Regional Office (SEZ), 1st and 2nd Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai – 34
- 4). **The Chairman**, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
- 5). **The Chairman**, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai- 600 032, Tamil Nadu.
- 6). **The Member Secretary**, Central Ground Water Authority, A2, W- 3 Curzon Road Barracks, K.G. Marg, New Delhi-110001.
- 7). **The District Collector**, Salem District, State of Tamil Nadu.
- 8). **Guard File / Record file / Monitoring file.**
- 9). **MOEF&CC Website.**


(Sharath Kumar Pallerla)
Scientist 'F'/Director