JSWSL/Envt/MoEF&CC/HYR/2021-22/82
28th October 2021

**The Director**
**Ministry of Environment, Forest and Climate Change**
**Regional Office (SEZ), Ist and IInd Floor,**
**Handloom Export Promotion Council,**
**34, Cathedral Garden Road, Nungambakkam,**
**Chennai – 600034.**

Dear Sir,

**Sub: Half Yearly Compliance Report to the period January 2021 to June 2021 – Reg.**
**Ref: Environmental Clearances F.No. J-11011/281/2006-IA. II(I) dated 10.02.2020 and 07.07.2017**

With reference to the above subject, herewith find submitting the Half Yearly (January 2021 to June 2021) compliance status report to the Environment Clearances issued dated 10.02.2020 & 07.07.2017.

This is for your kind information and receipt of this letter may please be acknowledged.

Thanking you,

Yours faithfully,
**For JSW Steel Limited., Salem works**

for

**B. N. S. Prakash Rao**
**Plant Head**

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

**Cc:** Central Pollution Control Board, Zonal Office Bangalore, 1st & 2nd Floors,
Nisarga Bhavan, A-Block, Thimmaiah Main Road, 7th D Cross, Shivanagar,
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
Indira Paryavaran Bhawan, Jor Bagh Road, Aliganj, New Delhi – 110003.

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JINDAL
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# JSW STEEL LTD., Salem Works

**Pottaneri, M. Kalipatti Village, Mecheri**
**Mettur Taluk, Salem – Tamilnadu**

## 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 Jan 2021 to June 2021**
**issued for 1.0 to 1.3 MTPA Expansion**

# Contents

## COMPLIANCE STATUS REPORT TO ENVIRONMENTAL CLEARANCES (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 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 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 the relevant details related to the general conditions are given in the EC compliance status report 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)) has been obtained from TNPCB. After establishment of pickling unit, Consent to operate (CTO Exp –II, order no. 2007130760657 (W) & 2007230760657(A) dated.18.11.2020) has been obtained from the TNPCB for the operation of 1.15 MTPA steel plant including pickling unit. To the operations of value addition and work area environment improvement projects CTO – EXP-III application is submitted to TNPCB and wait for CTO. JSW assures that the balance establishment activities (1.15 to 1.30 MTPA) will be completed before the validity period of EC or would be approached your good office for EC 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)) has been accorded dated 07.07.2017 for the expansion of steel plant capacity from 1.0 to 1.3 MTPA, subsequently Consent to Establishment (CTE-order no. 170619163265(W) & 170629163265(A) dated 23.09.2017)) has been obtained from TNPCB. Establishment activities have been scheduled 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.

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

| S.No | Manufacturing facilities | UOM | Existing capacity | Proposed Expansion as per EC 2017 | 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/new one to be installed |
| 6 | Blast Furnace - 2 (550 to 650 $m^3$) | MTPA | 0.578 | 0.105 | 0.683 | Project completed and in operation |
| **S.No** | **Manufacturing facilities** | **UOM** | **Existing capacity** | **Proposed Expansion as per EC 2017** | **Total Capacity after Expansion** | **Present status** |
| 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 | 0.5 | - | 0.5 | In operation |
| 15 | Continuous Casting Machine - 3 | MTPA | - | 0.45 | 0.45 | In operation |
| 16 | Bar & Rod Mill augmentation | MTPA | 0.4 | 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 January 2021 to June 2021 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/$Nm^3$ | The establishment activities are under progress and 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 in the plant area which is about 33.5 % and the same 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 | The existing authorization is valid till 31.03.2022 and a fresh authorization has been applied to TNPCB to include the pickling plant waste. |

**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. | 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.<br><br>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.<br><br>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 (along with TNPCB report) of stack emission is given in **Annexure –B**. |

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| ii. | The project proponent shall monitor fugitive emissions in the plant premised at least once in every quarter through labs recognized under Environment (Protection) Act, 1986. | Fugitive emissions in the plant are being monitored on monthly and as and when required basis by a NABL accredited external laboratory and the monitoring 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 being now 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 - B** and the manual stack emission monitoring results are given in **Annexure –C**. |
| 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 process and raw material handling areas. Water sprinklers, dry & wet 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. |

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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. Dust analyzers are installed in the stacks and the real time parameters are connected with CAC,TNPCB,Chennai |
| 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. The CREP guidelines and its status of compliance is given in Annexure – G of this report |
| xi. | Sufficient number of mobile or stationery vacuum cleaners shall be provided to clean plant roads, shop floors, roofs regularly. | 3 Numbers of road sweeping machines are dedicatedly deployed for road cleaning applications and Mobile vacuum cleaners are also 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. Coke pushing car facility is provided in COP for coke pushing to avoid any spillage of coke and cleaning activity is periodically done. |
| 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. |

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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 NOx control facility shall be provided to meet the prescribed standards. | Not applicable since our Coke oven is non-recovery type. |
| 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. | 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.<br><br>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. |
| 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.<br><br>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. |

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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. |
| 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**

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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**

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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. |
| 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. | Waste gas utilization from BF stoves not feasible and Sinter machine waste heat being utilized. Sinter cooler waste heat will be used in BF slag grinding unit and BF gas is utilized in Mills operations, BF stoves and CPPs for power generation. Also, in view of waste heat and energy conservation measures power generation through the existing CPP#1 will be stopped and the existing 25 TPH (2 Nos) boilers will be replaced by process boilers with the capacity of 8 TPH ( 2 Nos). In this connection a written approval is requested from TNPCB,Chennai. |
| 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 installation at Canteen and other areas are under progress for street lights and township and will be implemented in phased manner. |

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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. | BF slag grinding unit installation is under progress to produce ground granulated BF slag which will be sold to cement industries for value addition. |
| 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 where by certain level of GHG emission is offset. |
| 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 |
| 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 with various size is reused in internal applications like sinter plant, EOF as hearth layer and cooling media respectively and to cement industries. Portion of crushed slag is used in paver block facility as replacement to the natural aggregate. With this 100 % reuse of rejects being ensured. |
| 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. |

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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**

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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 ha which is 33.5 % and 240109 trees exist throughout the plant (till June 2021) 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**

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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. |
| 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**

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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. | With respect to the Corporate Environmental Responsibility all the actions are being implemented and the details are given in the Annexure-M of this report. |
| 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. |
| 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**

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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. |
| 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 has been informed to the JCEE of TNPCB, Salem dated 25.11.2020 and the same has been communicated through six months compliance report |
| 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. |

| S.No | CONDITION | COMPLIANCE STATUS |
|---|---|---|
| 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.<br>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 has 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 have been completed and the cost involvement is about Rs.650 Crs and till date the amount spent towards ESC is about 4.04 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 given 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 is under progress for street lights and township. |
| 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.<br>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.<br>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.<br><br>"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<br><br>i) negative pressure<br>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 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. | The standards issued by the Ministry vide G.S.R. 277(E) dated 31st March 2012 are related to emission standards of Iron and Steel plant.<br>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.<br><br>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. | 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. | 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 a coal-based boiler which is installed in CPP II. The boiler has installed in the year 2006 and the parameters of SPM, $SO_2$, Mercury are in the range of 35-40, 500- 550, BDL against the norms of 50, 600, 0.03 mg/$Nm^3$ respectively. Specific water consumption is 3.1 $m^3$/Mwh against the norms of 3.5 $m^3$/Mwh. As per the revised notification the NOx compliance to be met before 31.12.2023. To comply 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 the specific water consumption is about 0.3 $m^3$/Mwh. |
| 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. | 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 $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_x$ 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 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.** |
| 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. | Continuous Ambient Air Quality monitoring stations of four numbers are installed in the plant peripheral. 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 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, $SO_2$ & $NO_x$. 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.** |

| 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$^{o}$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$^{o}$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.<br>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.<br>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.<br>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 30th 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 m3 and rain water harvesting will be practiced to maximum possible extent. |
| 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 form 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.<br>Pellet plant is not installed in our process.<br>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 trail runs are being conducted to make paver from crushed EOF slag.<br>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.<br>Coke breeze and dust from the air pollution control systems are collected and reused in the Sinter Plant.<br>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 237.38 ha and Green belt development is established about 82 ha which is 33.5 % and 240109 trees exist throughout the plant (till June 2021) 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 4.04 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 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. | 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.<br><br>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.<br><br>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.** |

| 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.<br>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 19th May, 1993 and 31st 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 19th May, 1993 and 31st 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.<br>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.<br>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.<br>Quenching tower with grit arrestor is provided to control emission during coke quenching (wet type).<br>Secondary de-dusting system (bag filters) are provided in Energy Optimizing Furnaces I & II, Ladle Refining Furnaces.<br>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 June 2021 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.** |
| 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. |

| B. | GENERAL CONDITIONS | COMPLIANCE STATUS |
|---|---|---|
| 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. | The compliance of the stipulated environment clearance conditions including results of monitored data is uploaded in our website once in six months.<br><br>Simultaneously the compliance reports are being submitted (email) to the Regional Office of the Mo EF&CC at Chennai and the Zonal Office of CPCB, Bangalore and the TNPCB, Chennai.<br><br>The criteria pollutant levels namely; $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_X$, CO (real time values) and stack emissions (manually monitored values) are displayed near both entrance of our 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. | 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 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. | As prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, the environmental statement for each financial year ending 31st 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. |
| 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 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. | 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. |
| 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. | Date of financial closure and land development work is informed to Regional Office vide letter dated 12.10.2017. |

# Annexure –A

Production & Waste generation details for the period of January’21 – June’21

## Annexure -A

### I. Production details for the period of Jan'21 – Jun'21

| 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)** | **MT** | | | | **MT** | **MW (Avg load)** |
| **Jan-21** | 94854 | 1.8 | 30 | 389 | 0 | 497 | 214 | 66.4 |
| **Feb-21** | 89805 | 2.1 | 30 | 335 | 0 | 445 | 486 | 69.5 |
| **Mar-21** | 100060 | 2.2 | 30 | 415 | 0 | 504 | 483 | 73.1 |
| **Apr-21** | 91263 | 2.0 | 65 | 396 | 0 | 456 | 770 | 63.9 |
| **May-21** | 95575 | 2.3 | 74 | 526 | 0 | 383 | 436 | 72.5 |
| **Jun-21** | 87110 | 2.0 | 54 | 560 | 50 | 445 | 236 | 67.8 |
| **Total** | **558667** | **2.1** | **283** | **2620** | **50** | **2729** | **2625** | **68.9** |
| **Consented quantity per Annum** | **1150000** | **7.0** | **1200** | **15000** | **2000** | **8000** | **30000** | **90.0** |

**Note:**
- **MT – Metric Ton**
- **MW – Mega watt**

### II. Waste generation details for the period of Jan'21 – Jun'21

| Month | Steel Plant & CPP#2 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hazardous Waste | BF granulated Slag | SMS Slag | GCP sludge | Mill scale | Fly Ash | APC dust | E - waste | Bio medical waste | Battery waste |
| **UoM** | **MT/Month** | | | | | | | **Kg/Month** | | |
| **Jan-21** | 9.4 | 37519 | 20836 | 4258 | 1490 | 1182 | 1550 | 27 | 7 | 283 |
| **Feb-21** | 5.4 | 34475 | 19840 | 3542 | 1273 | 1108 | 1550 | 385 | 5 | 73 |
| **Mar-21** | 12.8 | 39251 | 22066 | 4100 | 1335 | 980 | 1550 | 350 | 5 | 0 |
| **Apr-21** | 9.8 | 36435 | 20106 | 3361 | 1404 | 512 | 680 | 1425 | 5 | 1260 |
| **May-21** | 3.3 | 38352 | 21008 | 3502 | 1458 | 575 | 691 | 30 | 0 | 1333 |
| **Jun-21** | 8.5 | 34899 | 19236 | 2900 | 1273 | 602 | 366 | 0 | 10 | 0 |
| **Total** | **49** | **220931** | **123092** | **21663** | **8233** | **4959** | **6388** | **2217** | **32** | **2949** |

# Annexure –B

Stack emission monitoring report of TNPCB & NABL accredited laboratory for the period of

January’21 – June’21

## Annexure -B

**Stack emission monitoring report of TNPCB & NABL accredited laboratory for the period Jan'21 to Jun'21.**

| 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 | 72865 | 59 | 37 | 12 |
| 2 | Sinter Plant – I - Cooling System | 73335 | 49 | 19 | 9 |
| 3 | Sinter Plant – I Dedusting System | 82614 | 47 | _ | _ |
| 4 | Sinter Plant – I RMHS | 18024 | 62 | _ | _ |
| 5 | Sinter Plant - II - Sinter Machine | 512383 | 77 | 53 | 6 |
| 6 | Sinter Plant - II - Cooling & De-dusting System | 465079 | 47 | _ | _ |
| 7 | Sinter Plant - II - RMHS | 61112 | 48 | _ | _ |
| 8 | Blast Furnace - I - Hot stove | 49704 | 28 | 32 | 12 |
| 9 | Blast Furnace - I - Stock House | 38438 | 47 | _ | _ |
| 10 | Blast Furnace - I - RMHS | 17898 | 40 | _ | _ |
| 11 | Blast Furnace - I - Cast House | 270617 | 77 | 13 | 18 |
| 12 | Blast Furnace - II - Hot stove | 69811 | 29 | 24 | 19 |
| 13 | Blast Furnace - II - Stock House | 120980 | 39 | _ | _ |
| 14 | Blast Furnace - II - Cast House | 425931 | 73 | 11 | 6 |
| 15 | Blast Furnace - II - PCI | 28723 | 56 | 27 | 4 |
| 16 | CPP - I - Boiler | 66681 | 28 | 77 | 81 |
| 17 | VD boiler | 13895 | 40 | 53 | 24 |
| 18 | Energy Optimizing Furnace -I | 73905 | 47 | 64 | 13 |
| 19 | Energy Optimizing Furnace -II | 63971 | 73 | 64 | 11 |
| 20 | EOF Secondary dedusting system I & II | 288874 | 68 | _ | _ |
| 21 | Ladle Refining Furnace - 1 | 21710 | 48 | 40 | 14 |
| 22 | Ladle Refining Furnace - 2,3,4 | 277264 | 45 | 24 | 4 |
| 23 | CCM-I Steam Exhaust | 25394 | 65 | _ | _ |
| 24 | CCM-II Steam Exhaust - II | 17000 | 46 | _ | _ |
| 25 | CCM-II Cut fumes Exhaust | 50418 | 62 | _ | _ |
| 26 | BRM – Re Heating Furnace | 33349 | 65 | 77 | 14 |
| 27 | BLM – Re Heating Furnace -I | 23231 | 44 | 69 | 11 |
| 28 | LRF –secondary de dusting system | 277264 | 45 | 24 | 4 |
| 29 | Coke Oven - WHRB -II | 45618 | 44 | 179 | 5 |
| 30 | Coke Oven - WHRB -III | 46308 | 39 | 187 | 6 |
| 31 | Coke Oven - WHRB -IV | 35822 | 47 | 192 | 8 |
| 32 | BF Gas Fired Boiler | 27912 | 32 | 149 | 7 |
| 33 | AFBC - Boiler | 159156 | 27 | 197 | 29 |
| 34 | DG Set (625 KVA) EOF 1 | 416 | 32 | 21 | 5 |
| 35 | DG Set II (625 KVA) EOF 1 | 394 | 28 | 19 | 5 |
| 36 | CCM-III Steam Exhaust | 22970 | 42 | _ | _ |
| 37 | COAL CRUSHER CPP 2 | 4184 | 52 | _ | _ |
| 38 | CPP II COAL SCREENING SECTION | 15380 | 56 | _ | _ |
| 39 | PICKLING PLANT - ACID FUMES EXHAYST SYSTEM SATACK | 21430 | 27 | 32 | <0.5 |
| 40 | PICKLING PLANT - ACID - HOT WATER GENERATOR SATACK | 575 | 19 | 21 | 4 |

| 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) | 115 | 56 | 57 | 98293 |
| 2 | Cooling System (Sinter Plant I) | 60 | 30 | 27 | 88550 |
| 3 | Dedusting System (Sinter Plant I) | 52 | - | - | 115204 |
| 4 | Dust Extraction System For RMHS (Sinter Plant I) | 41 | - | - | 19697 |
| 5 | Hot Stove (Blast Furnace I) | 30 | 50 | 43 | 52767 |
| 6 | GCP Flare (Blast Furnace I) -Emergency stack | - | - | - | - |
| 7 | Stock House Dedusting System (Blast Furnace I) | 53 | - | - | 62097 |
| 8 | Dust Extraction System for RMHS (Blast Furnace I) | 46 | - | - | 17682 |
| 9 | Cast House Dedusting System (Blast Furnace I) | 36 | - | - | 280409 |
| 10 | CPP I Boiler 2 Nos of 25 TPH each (Common Stack) | 31 | 51 | 52 | 61674 |
| 11 | Energy Optimizing Furnace (Steel Melting Shop I) | 62 | 51 | 47 | 35412 |
| 12 | Ladle Furnaces (Steel Melting Shop I) | 53 | 32 | 29 | 20291 |
| 13 | Continuous Casting Machine (Steel Melting Shop I) | 30 | _ | _ | 24425 |
| 14 | Energy Optimizing Furnace (Steel Melting Shop II) | 68 | 49 | 48 | 45713 |
| 15 | Secondary Dedusting System EOF I&II (Combined SMS II) | 55 | - | - | 382461 |
| 16 | Sec. Dedusting System of LRF IV( Common) (SMS II) | 50 | - | - | 351919 |
| 17 | Ladle Furnaces(Common Stack) (Steel Melting Shop II) | 59 | 42 | 39 | 50378 |
| 18 | Vacuum Degasing Unit (Boiler) (Steel Melting Shop II) | 36 | 38 | 35 | 15283 |
| 19 | Steam Exhaust System (2 Nos) (Bloom Caster | 28 | - | - | 22705 |
| 20 | Cut Fumes Exhaust System (Bloom Caster) | 40 | - | - | 65972 |
| 21 | Reheating Furnace (Furnace 1 No2 Chimney) (BLM) | 33 | 52 | 47 | 25646 |
| 22 | Reheating Furnace (Furnace 1 No1 Chimney) (BLM) | 28 | 38 | 37 | 22853 |
| 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) | 39 | 313 | 245 | 55941 |
| 27 | Waste Heat Recovery Boiler II (Coke Oven) | 35 | 305 | 245 | 56745 |
| 28 | Waste Heat Recovery Boiler III (Coke Oven) | 38 | 315 | 236 | 58209 |
| 29 | Waste Heat Recovery Boiler IV (Coke Oven) | 34 | 308 | 242 | 54421 |
| 30 | Waste Heat Recovery Boiler V (Coke Oven) | 35 | 307 | 244 | 53731 |
| 31 | BF Gas Fired Boiler | 29 | 22 | 20 | 38000 |
| 32 | Reheating Furnace (Bar & Rod Mill) | 35 | 55 | 51 | 31730 |
| 33 | Sinter Machine (Sinter Plant II) | 129 | 54 | 49 | 554553 |
| 34 | Plant Dedusting and Cooling (Sinter Plant II) | 61 | - | - | 438292 |
| 35 | Crushing of Fuel & Raw Materials (Sinter Plant II) | 55 | - | - | 106370 |
| 36 | Hot Stove (Blast Furnace II) | 31 | 51 | 46 | 80479 |
| 37 | GCP Flare (Blast Furnace II) -Emergency stack | - | - | - | - |
| 38 | Stock House Dedusting & RMHS (Blast Furnace II) | 63 | - | - | 274559 |
| 39 | Cast House Dedusting System (Blast Furnace II) | 49 | - | - | 500901 |
| 40 | Pulverized Coal Injection (Blast Furnace) | 58 | 31 | 29 | 36410 |
| 41 | Steam exhaust system -2 | 31 | - | - | 22155 |
| 42 | Steam Exhaust System - CCM-III | 34 | - | - | 27574 |
| 43 | Pickling Plant- Acid Fumes exhaust system stack | 20 | - | - | 25836 |
| 44 | Pickling Plant- Acid - Hot water Generator Stack | 30 | 42 | 34 | 1799 |
| 45 | CPPII-AFBC Boiler | 26 | 502 | 427 | 132964 |
| 46 | CPPII-Coal crusher | 45 | - | - | 6108 |
| 47 | CPP-IICoal screening | 51 | - | - | 15441 |

# Annexure –C

Online stack emission monitoring & Ambient air quality monitoring report for the period of

January’21 – June’21

# Annexure -C

## Online stack emission monitoring & Ambient air quality monitoring report for the period Jan'21 to Jun'21

### I. Online stack emission monitoring summary report (Jan '21 to Jun'21)

| Stack No. | Source name | Parameter | UoM | Stack emission monthly average | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Month | | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
| 1 | Sinter Machine (Sinter Plant I) | SPM | $mg/m^3$ | 45.40 | 8.83 | 48.69 | 56.65 | 49.88 | 38.31 |
| | | $SO_2$ | $mg/m^3$ | 54.57 | 72.84 | 73.28 | 74.71 | 52.33 | 53.99 |
| 2 | Cooling System (Sinter Plant I) | SPM | $mg/m^3$ | 62.70 | 55.43 | 17.86 | 19.87 | 37.81 | 25.20 |
| 3 | Dedusting System (Sinter Plant I) | SPM | $mg/m^3$ | 34.44 | 24.05 | 16.58 | 37.69 | 37.91 | 29.99 |
| 4 | Dust Extraction System For RMHS (Sinter Plant I) | SPM | $mg/m^3$ | 3.54 | 2.67 | 2.36 | 2.79 | 2.00 | 6.88 |
| 5 | Hot Stove (Blast Furnace I) | SPM | $mg/m^3$ | 6.40 | 6.26 | 4.71 | 4.12 | 0.85 | 0.85 |
| | | $SO_2$ | $mg/m^3$ | 14.15 | 14.04 | 50.56 | 45.35 | 1.30 | 1.30 |
| | | NOx | $mg/m^3$ | 9.12 | 9.50 | 4.70 | 17.54 | 2.80 | 2.80 |
| | | CO | ppm | 139 | 74 | 896 | 137 | 0 | 0 |
| 6 | GCP Flare (Blast Furnace I) -Emergency stack | NA | NA | - | - | - | - | - | - |
| | | NA | NA | - | - | - | - | - | - |
| 7 | Stock House Dedusting System (Blast Furnace I) | SPM | $mg/m^3$ | 1.52 | 14.66 | 25.96 | 31.18 | 33.75 | 26.13 |
| | | | $mg/m^3$ | 2.7 | 7.4 | 6.3 | 6.6 | 7.7 | 8.8 |
| 8 | Dust Extraction System for RMHS (Blast Furnace I) | SPM | $mg/m^3$ | 33.69 | 20.32 | 41.47 | 35.52 | 22.74 | 30.92 |
| | | | $mg/m^3$ | 42.5 | 34.3 | 0.0 | 0.9 | 0.8 | 0.8 |
| 9 | Cast House Dedusting System (Blast Furnace I) | SPM | $mg/m^3$ | 2.04 | 8.60 | 4.57 | 0.42 | 0.75 | 0.66 |
| | | | $mg/m^3$ | 5.8 | 6.0 | 14.5 | 4.7 | 6.3 | 5.5 |
| 10 | CPP I Boiler 2 Nos of 25 TPH each (Common Stack) | SPM | $mg/m^3$ | 22.42 | 21.46 | 31.40 | 23.06 | 14.67 | 15.79 |
| | | $SO_2$ | $mg/m^3$ | 35.40 | 35.58 | 30.89 | 22.00 | 28.25 | 24.44 |
| 11 | Energy Optimizing Furnace (Steel Melting Shop I) | SPM | $mg/m^3$ | 86.89 | 65.15 | 51.21 | 39.90 | 45.38 | 49.61 |
| 12 | Ladle Furnaces (Steel Melting Shop I) | SPM | $mg/m^3$ | 21.52 | 28.35 | 14.51 | 15.01 | 27.08 | 18.40 |
| 13 | Continuous Casting Machine (Steel Melting Shop I) | SPM | $mg/m^3$ | 69.68 | 23.71 | 18.85 | 13.36 | 24.34 | 31.81 |
| 14 | Energy Optimizing Furnace (Steel Melting Shop II) | SPM | $mg/m^3$ | 58.23 | 54.90 | 52.85 | 55.00 | 61.46 | 57.08 |
| 15 | Secondary Dedusting System EOF I&II (Combined SMS II) | SPM | $mg/m^3$ | 21.22 | 28.92 | 0.00 | 2.16 | 3.03 | 2.73 |
| 16 | Sec. Dedusting System of LRF IV( Common) (SMS II) | SPM | $mg/m^3$ | 22.83 | 24.92 | 9.51 | 8.80 | 11.65 | 14.67 |
| 17 | Ladle Furnaces(Common Stack) (Steel Melting Shop II) | SPM | $mg/m^3$ | 10.47 | 12.58 | 11.41 | 13.91 | 32.46 | 32.44 |
| 18 | Vacuum Degasing Unit (Boiler) (Steel Melting Shop II) | SPM | $mg/m^3$ | 56.67 | 53.06 | 36.79 | 28.08 | 26.41 | 32.92 |
| 19 | Steam Exhaust System 1 (Bloom Caster | SPM | $mg/m^3$ | 29.33 | 40.66 | 23.74 | 15.05 | 23.62 | 18.28 |
| 19 | Steam Exhaust System 2 (Bloom Caster | SPM | $mg/m^3$ | 40.68 | 29.74 | 27.33 | 31.87 | 36.04 | 43.67 |
| 20 | Cut Fumes Exhaust System (Bloom Caster) | SPM | $mg/m^3$ | 17.01 | 16.65 | 12.04 | 19.62 | 18.37 | 20.59 |
| 21 | Reheating Furnace (Furnace 1 No2 Chimney) (BLM) | SPM | $mg/m^3$ | 42.82 | 43.96 | 26.36 | 5.35 | 1.78 | 1.77 |
| | | $SO_2$ | $mg/m^3$ | 9.51 | 37.68 | 57.59 | 4.14 | 0.44 | 0.42 |
| 22 | Reheating Furnace (Furnace 1 No1 Chimney) (BLM) | SPM | $mg/m^3$ | 6.97 | 18.68 | 38.08 | 0.70 | 0.19 | 0.17 |
| | | $SO_2$ | $mg/m^3$ | 0.60 | 3.31 | 5.46 | 5.23 | 0.42 | 0.40 |
| 23 | Coke Oven Chimney I (Coke Oven) -Emergency stack | NA | NA | Emergency stack no flow | | | | | |
| | | 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 | | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
| 26 | Waste Heat Recovery Boiler I (Coke Oven) | SPM | $mg/m^3$ | 27.61 | 28.91 | 35.62 | 23.55 | 30.49 | 26.72 |
| | | $SO_2$ | $mg/m^3$ | 91.70 | 62.21 | 47.52 | 26.07 | 146.75 | 149.22 |
| 27 | Waste Heat Recovery Boiler II (Coke Oven) | SPM | $mg/m^3$ | 131.65 | 73.10 | 201.74 | 84.48 | 99.53 | 135.19 |
| | | $SO_2$ | $mg/m^3$ | 22.52 | 21.15 | 0.00 | 17.74 | 26.30 | 25.54 |
| 28 | Waste Heat Recovery Boiler III (Coke Oven) | SPM | $mg/m^3$ | 32.22 | 35.20 | 7.39 | 12.80 | 23.42 | 23.72 |
| | | $SO_2$ | $mg/m^3$ | 160.88 | 171.95 | 157.51 | 183.54 | 263.58 | 231.08 |
| 29 | Waste Heat Recovery Boiler IV (Coke Oven) | SPM | $mg/m^3$ | - | - | - | - | - | - |
| | | $SO_2$ | $mg/m^3$ | - | - | - | - | - | - |
| 30 | Waste Heat Recovery Boiler V (Coke Oven) | SPM | $mg/m^3$ | - | - | - | - | - | - |
| | | $SO_2$ | $mg/m^3$ | - | - | - | - | - | - |
| 31 | BF Gas Fired Boiler | SPM | $mg/m^3$ | 21.43 | 21.69 | 26.70 | 26.61 | 34.64 | 32.47 |
| 32 | Reheating Furnace (Bar & Rod Mill) | SPM | $mg/m^3$ | 11.75 | 8.34 | 14.11 | 7.62 | 17.61 | 8.92 |
| | | $SO_2$ | $mg/m^3$ | 51.34 | 64.56 | 62.63 | 29.88 | 25.96 | 30.17 |
| 33 | Sinter Machine (Sinter Plant II) | SPM | $mg/m^3$ | 48.36 | 45.84 | 39.59 | 47.31 | 33.23 | 29.58 |
| | | $SO_2$ | $mg/m^3$ | 103.81 | 169.69 | 178.36 | 147.13 | 9.56 | 138.84 |
| 34 | Plant Dedusting and Cooling (Sinter Plant II) | SPM | $mg/m^3$ | 46.15 | 33.96 | 33.95 | 23.31 | 12.44 | 13.90 |
| 35 | Crushing of Fuel & Raw Materials (Sinter Plant II) | SPM | $mg/m^3$ | 66.23 | 47.88 | 45.27 | 44.42 | 48.78 | 45.40 |
| 36 | Hot Stove (Blast Furnace II) | SPM | $mg/m^3$ | 2.32 | 7.66 | 16.21 | 10.58 | 9.29 | 6.55 |
| | | $SO_2$ | $mg/m^3$ | 49.47 | 21.81 | 21.57 | 10.68 | 9.48 | 6.71 |
| | | NOx | $mg/m^3$ | 6.14 | 4.10 | 0.00 | 0.30 | 0.50 | 0.47 |
| | | CO | ppm | 1243 | 389 | 0 | 0 | 0 | 0 |
| 37 | GCP Flare (Blast Furnace II) -Emergency stack | NA | NA | Emergency stack no flow | | | | | |
| | | NA | NA | | | | | | |
| 38 | Stock House Dedusting & RMHS (Blast Furnace II) | SPM | $mg/m^3$ | 17.61 | 19.42 | 8.37 | 13.05 | 14.10 | 11.56 |
| | | $SO_2$ | $mg/m^3$ | 4.0 | 4.3 | 5.0 | 4.3 | 5.8 | 5.0 |
| 39 | Cast House Dedusting System (Blast Furnace II) | SPM | $mg/m^3$ | 8.45 | 1.34 | 4.15 | 6.72 | 0.35 | 0.33 |
| | | $SO_2$ | $mg/m^3$ | 2.0 | 1.9 | 3.8 | 2.1 | 2.7 | 2.3 |
| 40 | Pulverized Coal Injection (Blast Furnace) | SPM | $mg/m^3$ | 7.14 | 4.52 | 0.52 | 0.42 | 0.64 | 0.67 |
| | | $SO_2$ | $mg/m^3$ | 10.96 | 9.20 | 8.62 | 11.46 | 11.82 | 11.77 |
| 41 | Steam Exhaust System - CCM-III | SPM | $mg/m^3$ | CEMS Not applicable | | | | | |
| | | NA | NA | | | | | | |
| 42 | CPPII-AFBC Boiler | SPM | $mg/m^3$ | 15.06 | 28.73 | 12.43 | 16.95 | 20.03 | 12.92 |
| | | $SO_2$ | $mg/m^3$ | 324.43 | 283.37 | 278.27 | 288.14 | 320.40 | 315.48 |
| | | NOx | $mg/m^3$ | 266.19 | 273.49 | 368.01 | 398.45 | 453.02 | 433.50 |

## II. Continuous Ambient Air Quality Monitoring Results (Jan'21 to Jun'21)

| Month | CAAQMS#1 | | | | | CAAQMS#2 | | |
|---|---|---|---|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ | CO | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ |
| UoM | $\mu g/m^3$ | $\mu g/m^3$ | $\mu g/m^3$ | $\mu g/m^3$ | $mg/m^3$ | $\mu g/m^3$ | $\mu g/m^3$ | $\mu g/m^3$ |
| Jan-21 | 34 | 27 | 20 | 18 | 0.17 | 29 | 24 | 24 |
| Feb-21 | 26 | 28 | 26 | 22 | 0.00 | 34 | 22 | 25 |
| Mar-21 | 44 | 22 | 24 | 20 | 0.00 | 46 | 19 | 23 |
| Apr-21 | 28 | 27 | 28 | 24 | 0.36 | 46 | 36 | 20 |
| May-21 | 20 | 11 | 32 | 28 | 0.44 | 22 | 20 | 13 |
| Jun-21 | 29 | 15 | 33 | 26 | 0.33 | 19 | 20 | 19 |

| Month | CAAQMS#3 | | | CAAQMS#4 | | |
|---|---|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ |
| UoM | $\mu g/m^3$ | $\mu g/m^3$ | $\mu g/m^3$ | $\mu g/m^3$ | $\mu g/m^3$ | $\mu g/m^3$ |
| Jan-21 | 32 | 26 | 14 | 32 | 31 | 26 |
| Feb-21 | 31 | 28 | 19 | 25 | 37 | 30 |
| Mar-21 | 54 | 32 | 12 | 29 | 27 | 27 |
| Apr-21 | 50 | 28 | 10 | 25 | 22 | 20 |
| May-21 | 40 | 15 | 16 | 20 | 9 | 19 |
| Jun-21 | 40 | 12 | 19 | 29 | 12 | 35 |

Tolerance limit: PM10: 100 $\mu g/m^3$, PM2.5: 60 $\mu g/m^3$, NOx: 80 $\mu g/m^3$, $SO_2$: 80 $\mu g/m^3$,
CO: 1 hr avg - 4 $mg/m^3$ , 8 hr avg - 2 $mg/m^3$

The results are well within the prescribed standards.

## III. Ambient Air Quality Monitoring results of NABL Accredited laboratory

| Month | AQ-1 | | | | AQ-2 | | | |
|---|---|---|---|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ |
| Jan-21 | 53.1 | 22 | 6.74 | 16.57 | 46.7 | 17.9 | 6.97 | 15.82 |
| Feb-21 | 50.8 | 21.9 | 6.45 | 15.98 | 46.6 | 18.4 | 5.99 | 15.46 |
| Mar-21 | 46.3 | 17.4 | 5.71 | 15.37 | 45.9 | 19.8 | 6.09 | 15.5 |
| Apr-21 | 52.4 | 21.8 | 6.04 | 16.56 | 49.7 | 18.7 | 6.12 | 15.68 |
| May-21 | 14.98 | 17.50 | 5.9 | 14.98 | 53.8 | 23.1 | 6.26 | 15.84 |
| Jun-21 | 50.4 | 19.2 | 6.46 | 15.46 | 52.8 | 22.9 | 6.82 | 16.64 |

| Month | AQ-3 | | | | AQ-4 | | | |
|---|---|---|---|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ |
| Jan-21 | 53 | 22.9 | 6.77 | 16.19 | 54.8 | 23.8 | 6.34 | 16.21 |
| Feb-21 | 53.3 | 24.8 | 6.36 | 16.11 | 53.9 | 23.1 | 6.26 | 15.81 |
| Mar-21 | 53.1 | 22 | 6.72 | 16.53 | 53 | 22.8 | 6.77 | 16.1 |
| Apr-21 | 53.4 | 23.3 | 6.62 | 16.26 | 53 | 24.2 | 6.57 | 16.39 |
| May-21 | 52.4 | 22.5 | 6.14 | 14.5 | 53.5 | 22.1 | 6.24 | 16.18 |
| Jun-21 | 45.6 | 17.4 | 6.43 | 16.4 | 53.6 | 23.8 | 6.69 | 16.33 |

| Month | AQ-5 | | | | AQ-6 | | | |
|---|---|---|---|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ |
| Jan-21 | 52.8 | 22.6 | 6.29 | 15.98 | 52.7 | 22.2 | 6.69 | 16.02 |
| Feb-21 | 52.9 | 22.5 | 6.24 | 15.08 | 52.3 | 23.5 | 6.53 | 15.99 |
| Mar-21 | 55.1 | 25.8 | 6.41 | 16.63 | 52.3 | 22.1 | 6.32 | 15.79 |
| Apr-21 | 54.4 | 24.9 | 6.69 | 16.51 | 49.1 | 21.6 | 6.07 | 16.01 |
| May-21 | 53.3 | 24.9 | 6.27 | 15.58 | 48.8 | 20.1 | 6.1 | 15.84 |
| Jun-21 | 54.4 | 23.6 | 6.39 | 16.55 | 45..9 | 16.3 | 5.74 | 15.88 |

| Month | AQ-7 | | | | AQ-8 | | | |
|---|---|---|---|---|---|---|---|---|
| | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | $NO_2$ |
| Jan-21 | 46.4 | 17.2 | 5.72 | 15.37 | 55.1 | 25.8 | 6.41 | 16.63 |
| Feb-21 | 47.8 | 16.9 | 5.9 | 15.4 | 54.6 | 23.8 | 5.76 | 15.8 |
| Mar-21 | 48.7 | 21.4 | 5.86 | 15.66 | 52.7 | 22.2 | 6.69 | 16.02 |
| Apr-21 | 51.1 | 22.1 | 6.38 | 16.21 | 50.1 | 21.6 | 6.37 | 16.22 |
| May-21 | 54.8 | 24.3 | 5.94 | 16.1 | 51.8 | 23.2 | 6.38 | 15.43 |
| Jun-21 | 53.9 | 22.8 | 5.99 | 16.66 | 55.6 | 24.8 | 6.59 | 16.41 |

Tolerance limit: PM10: 100 µg/$m^3$, PM2.5: 60 µg/$m^3$, $NO_2$: 80 µg/m3, $SO_2$: 80 µg/$m^3$

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** | 14.98 | 45.90 | 45.60 | 53.00 | 52.80 | 48.80 | 46.40 | 50.10 |
| **Maximum** | 53.10 | 53.80 | 53.40 | 54.80 | 55.10 | 52.70 | 54.80 | 55.60 |
| **Average** | 44.66 | 49.25 | 51.80 | 53.63 | 53.82 | 51.04 | 50.45 | 53.32 |
| **Standard deviation** | 14.73 | 3.41 | 3.06 | 0.67 | 0.95 | 1.92 | 3.40 | 2.15 |
| **98$^{th}$ Percentile** | 53.03 | 53.70 | 53.39 | 54.71 | 55.03 | 52.67 | 54.71 | 55.55 |

| $PM_{2.5}$ in µg/$m^3$ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Location** | **AQ1** | **AQ-2** | **AQ-3** | **AQ-4** | **AQ-5** | **AQ-6** | **AQ-7** | **AQ-8** |
| **Minimum** | 17.40 | 17.90 | 17.40 | 22.10 | 22.50 | 16.30 | 16.90 | 21.60 |
| **Maximum** | 22.00 | 23.10 | 24.80 | 24.20 | 25.80 | 23.50 | 24.30 | 25.80 |
| **Average** | 19.97 | 20.13 | 22.15 | 23.30 | 24.05 | 20.97 | 20.78 | 23.57 |
| **Standard deviation** | 2.21 | 2.31 | 2.51 | 0.78 | 1.36 | 2.54 | 3.05 | 1.58 |
| **98$^{th}$ Percentile** | 21.99 | 23.08 | 24.65 | 24.16 | 25.71 | 23.37 | 24.15 | 25.70 |

| $SO_2$ in µg/$m^3$ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Location** | **AQ-1** | **AQ-2** | **AQ-3** | **AQ-4** | **AQ-5** | **AQ-6** | **AQ-7** | **AQ-8** |
| **Minimum** | 5.71 | 5.99 | 6.14 | 6.24 | 6.24 | 5.74 | 5.72 | 5.76 |
| **Maximum** | 6.74 | 6.97 | 6.77 | 6.77 | 6.69 | 6.69 | 6.38 | 6.69 |
| **Average** | 6.22 | 6.38 | 6.51 | 6.48 | 6.38 | 6.24 | 5.97 | 6.37 |
| **Standard deviation** | 0.39 | 0.41 | 0.24 | 0.23 | 0.17 | 0.34 | 0.22 | 0.32 |
| **98$^{th}$ Percentile** | 6.71 | 6.96 | 6.77 | 6.76 | 6.66 | 6.67 | 6.34 | 6.68 |

| $NO_2$ in µg/$m^3$ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Location** | AQ-1 | AQ-2 | AQ-3 | AQ-4 | AQ-5 | AQ-6 | AQ-7 | AQ-8 |
| **Minimum** | 14.98 | 15.46 | 14.50 | 15.81 | 15.08 | 15.79 | 15.37 | 15.43 |
| **Maximum** | 16.57 | 16.64 | 16.53 | 16.39 | 16.63 | 16.02 | 16.66 | 16.63 |
| **Average** | 15.82 | 15.82 | 16.00 | 16.17 | 16.06 | 15.92 | 15.90 | 16.09 |
| **Standard deviation** | 0.66 | 0.43 | 0.75 | 0.21 | 0.63 | 0.10 | 0.51 | 0.43 |
| **98$^{th}$ Percentile** | 16.57 | 16.56 | 16.52 | 16.38 | 16.62 | 16.02 | 16.62 | 16.61 |

Tolerance limit: PM10: 100 µg/$m^3$, PM2.5: 60 µg/$m^3$, $NO_2$: 80 µg/m3, $SO_2$: 80 µg/$m^3$
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 | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
|---|---|---|---|---|---|---|---|---|
| 1 | Effluent Inlet flow | $m^3$ | 61755 | 72271 | 81738 | 73300 | 80221 | 83091 |
| 2 | Treated effluent water reuse in process | $m^3$ | 69242 | 71204 | 80188 | 7346 | 80531 | 70688 |
| 3 | ETP outlet discharge flow | $m^3$ | 0 | 0 | 0 | 0 | 0 | 0 |

**Note; Consented Trade efflunet generation 2960 KLD**

**II.Treated trade effluent of Steel by NABL Accredited laboratory**

| S.No | Parameter | Unit | TNPCB Tolerance Limit | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | $_P$H @ 25$^o$C | -- | 5.5 - 9.0 | 7.96 | 7.78 | 7.56 | 7.32 | 7.45 | 7.28 |
| 2 | Temperature | $^o$C | Shall not exceed 5 °C above the receiving water temperature | 29 | 29 | 29 | 29 | 29 | 30 |
| 3 | 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 | shall pass 850 | shall pass 850 | shall pass 850 |
| 4 | Total Dissolved solids (Inorganic) | mg/l | 2100 | 1198 | 1042 | 1172 | 448 | 516 | 596 |
| 5 | Total Suspended solids | mg/l | 100 | 20 | 17 | 15 | 7.6 | 6.8 | 5.4 |
| 6 | Chloride as Cl | mg/l | 1000 | 356 | 304 | 342 | 97 | 114 | 130 |
| 7 | Sulphate as $SO_4$ | mg/l | 1000 | 136 | 120 | 135 | 16 | 22 | 29 |
| 8 | BOD @ 27$^o$C for 3 Days | mg/l | 30 | 10 | 13 | 10 | 12 | 14 | 12 |
| 9 | Oil & Grease | mg/l | 10 (DL: 1.0) | BDL (DL : 1.0) | BDL (DL : 1.0) | BDL (DL : 1.0) | BDL(D.L.1.0) | BDL(D.L.1.0) | BDL(D.L.1.0) |
| 10 | COD | mg/l | 250 | 75 | 86 | 74 | 96 | 110 | 97 |
| 11 | Arsenic as As | mg/l | 0.2 (DL : 0.005) | BDL (DL : 0.005) | BDL (DL : 0.005) | BDL (DL : 0.005) | BDL(D.L.0.01) | BDL(D.L.0.01) | BDL(D.L.0.01) |
| 12 | Mercury as Hg | mg/l | 0.01 (DL : 0.001) | BDL (DL : 0.001) | BDL (DL : 0.001) | BDL (DL : 0.001) | BDL(D.L.0.001) | BDL(D.L.0.001) | BDL(D.L.0.001) |
| 13 | Lead as Pb | mg/l | 0.1 (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL(D.L.0.01) | BDL(D.L.0.01) | BDL(D.L.0.01) |
| 14 | Zinc as Zn | mg/l | 1.0 (DL : 0.005) | BDL (DL : 0.005) | BDL (DL : 0.005) | BDL (DL : 0.005) | BDL(D.L.0.05) | BDL(D.L.0.05) | BDL(D.L.0.05) |
| 15 | Copper as Cu | mg/l | 3.0 (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL(D.L.0.05) | BDL(D.L.0.05) | BDL(D.L.0.05) |
| 16 | Cadmium as Cd | mg/l | 2.0 (DL : 0.005) | BDL (DL : 0.005) | BDL (DL : 0.005) | BDL (DL : 0.005) | BDL(D.L.0.001) | BDL(D.L.0.001) | BDL(D.L.0.001) |
| 17 | Nickel as Ni | mg/l | 3.0 (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL(D.L.0.01) | BDL(D.L.0.01) | BDL(D.L.0.01) |
| 18 | Cyanide as CN | mg/l | 0.2 (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL(D.L.0.05) | BDL(D.L.0.05) | BDL(D.L.0.05) |
| 19 | Phenolic compounds as $C_6H_5OH$ | mg/l | 1.0 (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL (DL : 0.01) | BDL(D.L.0.001) | BDL(D.L.0.001) | BDL(D.L.0.001) |
| 20 | Percent Sodium | % | -- | 33 | 30 | 28 | 35 | 33 | 35 |
| 21 | Residual Sodium Carbonate | mg/l | -- | NIL | NIL | NIL | 1.54 | 1.6 | 1.83 |
| 22 | Sulphide as S | mg/l | 2.0 (DL : 0.5) | BDL (DL : 0.5) | BDL (DL : 0.5) | BDL (DL : 0.5) | BDL(D.L.0.05) | BDL(D.L.0.05) | BDL(D.L.0.05) |
| 23 | Boron as B | mg/l | 2.0 (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL(D.L.0.01) | BDL(D.L.0.01) | BDL(D.L.0.01) |
| 24 | Total Chromium as Cr | mg/l | 2.0 (DL : 0.03) | BDL (DL : 0.03) | BDL (DL : 0.03) | BDL (DL : 0.03) | BDL(D.L.0.01) | BDL(D.L.0.01) | BDL(D.L.0.01) |
| 25 | Hexavalent Chromium ($Cr^{6+}$) | mg/l | 0.1 (DL : 0.03) | BDL (DL : 0.03) | BDL (DL : 0.03) | BDL (DL : 0.03) | BDL(D.L.0.05) | BDL(D.L.0.05) | BDL(D.L.0.05) |
| 26 | Fluoride as F | mg/l | 2.0 (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | 0.43 | 0.47 | 0.61 |
| 27 | Dissolved Phosphate as P | mg/l | 5.0 | 0.81 | 0.75 | 0.91 | 0.87 | 0.72 | 0.91 |
| 28 | Total Residual Chlorine | mg/l | 1.0 (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL(D.L.0.01) | BDL(D.L.0.01) | BDL(D.L.0.01) |
| 29 | Free ammonia as $NH_3$ | mg/l | 5.0 | 0.37 | 0.31 | 0.34 | 0.26 | 0.24 | 0.27 |
| 30 | Ammonical Nitrogen as N | mg/l | 50 | 2.86 | 3.14 | 2.45 | 2.42 | 2.06 | 2.33 |
| 31 | Total kjeldahl Nitrogen as N | mg/l | 100 | 3.32 | 3.98 | 3.17 | 4.01 | 3.98 | 4.15 |

**III. Treated trade effluent of CPPII-Cooling tower water by NABL accredited laboratory**

| S.No | Parameter | Unit | TNPCB Tolerance Limit | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | pH @ 25°C | -- | 5.5 - 9.0 | 7.86 | 7.57 | 7.43 | 7.86 | 7.95 | 7.71 |
| 2 | Temperature | °C | Shall not exceed 5 °C above the receiving water temperature | 29 | 29 | 29 | 29 | 29 | 29 |
| 3 | 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 |
| 4 | Total Dissolved solids (Inorganic) | mg/l | 2100 | 1492 | 1310 | 1496 | 1581 | 1378 | 1214 |
| 5 | Total Suspended solids | mg/l | 100 | 31 | 27 | 32 | 28 | 30 | 27 |
| 6 | Chloride as Cl | mg/l | 1000 | 478 | 412 | 505 | 574 | 496 | 430 |
| 7 | Sulphate as $SO_4$ | mg/l | 1000 | 501 | 448 | 479 | 508 | 421 | 376 |
| 8 | BOD @ 27°C for 3 Days | mg/l | 30 | 16 | 14 | 16 | 17 | 14 | 10 |
| 9 | 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) |
| 10 | COD | mg/l | 250 | 124 | 110 | 134 | 150 | 110 | 81 |
| 11 | 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) |
| 12 | 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) |
| 13 | 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) |
| 14 | 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) |
| 15 | 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) |
| 16 | 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) |
| 17 | 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) |
| 18 | Cyanide as CN | mg/l | 0.2 (DL : 0.01) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) |
| 19 | Phenolic compounds as $C_6H_5OH$ | 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) |
| 20 | Percent Sodium | % | -- | 33 | 31 | 30 | 35 | 34 | 36 |
| 21 | Residual Sodium Carbonate | mg/l | -- | NIL | NIL | NIL | 1.65 | 1.81 | 1.69 |
| 22 | 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) |
| 23 | 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) |
| 24 | 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) |
| 25 | 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) |
| 26 | 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) |
| 27 | Dissolved Phosphate as P | mg/l | 5.0 | 1.05 | 1.27 | 1.05 | 1.27 | 1.5 | 1.78 |
| 28 | Total Residual Chlorine | mg/l | 1.0 (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL (DL : 0.1) | BDL(D.L.0.01) | BDL(D.L.0.01) | BDL(D.L.0.01) |
| 29 | Free ammonia as $NH_3$ | mg/l | 5.0 | 0.47 | 0.4 | 0.48 | 0.39 | 0.37 | 0.33 |
| 30 | Ammonical Nitrogen as N | mg/l | 50 | 9.14 | 8.34 | 7.63 | 5.44 | 6.12 | 4.98 |
| 31 | Total kjeldahl Nitrogen as N | mg/l | 100 | 11.6 | 10.09 | 10.81 | 8.12 | 8.96 | 7.12 |

**IV. Result of analysis of treated trade effluent by TNPCB**

| S.No | Parameter | Unit | TNPCB Tolerance Limit | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | pH @ 25°C | Number | 5.5-9.0 | 8.73 | COVID | COVID | 7.49 | 6.64 | 6.91 |
| 2 | TSS at 103°C - 105°C | mg/l | shall not exceed 5ºC above the receiving water temperature | 28 | | | 16 | 16 | 44 |
| 3 | Total Dissolved Solids at 180°C | mg/l | 2100 | 1132 | | | 1124 | 924 | 1056 |
| 4 | Chloride as Cl | mg/l | 1000 | 295 | | | 330 | 275 | 330 |
| 5 | Sulphates as SO4 | mg/l | 1000 | 206 | | | 96 | 44 | 57 |
| 6 | Oil & Grease | mg/l | 10 | <4 | | | <4 | <4 | <4 |
| 7 | BOD (at 27°C for 3 days) | mg/l | 30 | 4.4 | | | 5.8 | 2 | 12 |
| 8 | COD | mg/l | 250 | 32 | | | 56 | 16 | 72 |
| 9 | Phenolic compounds | mg/l | 1 | <0.05 | | | <0.05 | <0.05 | <0.05 |
| 10 | Ammonical Nitrogen as $NH_3$-N | mg/l | 50 | <2 | | | 2.8 | <2 | 2.24 |
| 11 | Cyanide | mg/l | 0.2 | <0.05 | | | <0.05 | <0.05 | <0.05 |

## V.Result of analysis of ground water by NABL accredited laboratory

| S.No | Parameter | Unit | Desirable Limits as for IS : 10500: 1991 | Permissable Limits as for IS : 10500: 1991 R.2012 | Jan-21 | | | Feb-21 | | Mar-21 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Bore well mr.kaliammal teacher pottaneri | govt bore well parrynagar | open well kuttapati pudur mr. govindraj | Govt bore well moorthipatti | Open well mr.Rajamani / kuttapattipudur | Govt hand pump Eravati | open well mr. vellaiyan moorthipatti |
| 1 | Colour | Hazen | -- | 15 | 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 | Unobjectionable |
| 3 | Taste | -- | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable |
| 4 | Turbidity | NTU | 5 | 5 | BDL (DL : 0.5) | BDL (DL : 0.5) | BDL (DL : 0.5) | 1.8 | 1.3 | 2.4 | 1.8 |
| 5 | $_{P}$H @ 25$^{o}$C | -- | 6.5--8.5 | 6.5--8.5 | 7.28 | 7.61 | 7.05 | 7.04 | 7.47 | 7.75 | 7.49 |
| 6 | Chloride as Cl | mg/l | 250 | 1000 | 410 | 314 | 709 | 692 | 396 | 360 | 1187 |
| 7 | Total Hardness as CaCO3 | mg/l | 300 | 600 | 1245 | 858 | 1218 | 1096 | 552 | 575 | 2100 |
| 8 | Calcium as CA | mg/l | 75 | 200 | 218 | 182 | 220 | 205 | 110 | 78 | 322 |
| 9 | Magnesium as Mg | mg/l | 30 | 100 | 168 | 97 | 160 | 140 | 66 | 91 | 311 |
| 10 | Dissolved solids (Inorganic) | mg/l | 500 | 2000 | 2019 | 1574 | 2617 | 2642 | 1388 | 1456 | 3541 |
| 11 | Sulphate as $SO_4$ | mg/l | 200 | 400 | 775 | 491 | 801 | 790 | 170 | 192 | 1114 |
| 12 | Copper as Cu | mg/l | 0.05 | 1.50 | 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 | 0.3 | 0.3 | 0.06 | 2 | 0.05 | 0.07 | 0.05 | 0.06 | 0.09 |
| 14 | Manganese as Mn | mg/l | 0.1 | 0.3 | 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 | 45 | 45 | 3..2 | 2 | 2.5 | 2.43 | 4.01 | 2.47 | 15.4 |
| 16 | Fluoride as F | mg/l | 1 | 1.5 | 1.55 | 1.21 | 1.83 | 1.86 | 1.94 | 1.63 | 1.78 |
| 17 | phenolic compound | mg/l | 0.001 | 0.002 | 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 | 0.001 | 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) | BDL (DL : 0.001) |
| 19 | Cadmium as Cd | mg/l | 0.0 | 0.0 | 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 | 0.01 | 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) | BDL (DL : 0.01) |
| 21 | Arsenic as As | mg/l | 0.05 | 0.05 | 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 | 0.05 | 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) | BDL (DL : 0.05) |
| 23 | Lead as Pb | mg/l | 0.05 | 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) | BDL (DL : 0.01) |
| 24 | Zinc as Zn | mg/l | 5.0 | 15.0 | 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 | 0.05 | 0.05 | 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 | 0.2 | 1.0 | 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 | 200.0 | 600.0 | 231.0 | 256.0 | 298.0 | 308.0 | 295.0 | 275.0 | 241.0 |
| 28 | Aluminium as AL | mg/l | 0.03 | 0.20 | 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 | 1.0 | 1.0 | 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 | -- | 0.5 | 0.20 | 0.23 | 0.25 | 0.22 | 0.26 | 0.21 | 0.18 |
| 31 | Nickel as Ni | mg/l | -- | 0.0 | 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 | -- | 0.1 | 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) |

| V.Result of analysis of ground water by NABL accredited laboratory | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S.No | Parameter | Unit | Desirable Limits as for IS : 10500: 1991 | Permissable Limits as for IS : 10500: 1991 R.2012 | Apr-21 | | May-21 | | Jun-21 | | | |
| | | | | | Govt bore well /Kavadanur | Open well mr.Balan/pudur, panankadu | OPEN WELL /VENKATESAN/ POTTANERI | Govt bore well KARAPAATTI PALLAM | Bore well mr.kaliammal teacher | govt bore well parrynagar | Govt bore well / Kuttapatti pudur, near | |
| 1 | Colour | Hazen | -- | 15 | _ | _ | _ | _ | _ | _ | _ | |
| 2 | Odour | -- | -- | Unobjectionable | _ | _ | _ | _ | _ | _ | _ | |
| 3 | Taste | -- | Agreeable | Agreeable | _ | _ | _ | _ | _ | _ | _ | |
| 4 | Turbidity | NTU | 5 | 5 | 1.90 | 1.50 | 0.80 | 0.60 | 0.60 | 0.50 | 0.50 | |
| 5 | $_{P}$H @ 25$^{o}$C | -- | 6.5--8.5 | 6.5--8.5 | 7.52 | 7.49 | 7.68 | 7.42 | 7.25 | 7.59 | 7.08 | |
| 6 | Chloride as Cl | mg/l | 250 | 1000 | 496.0 | 658.0 | 170.0 | 240.0 | 362.0 | 300.0 | 618.0 | |
| 7 | Total Hardness as CaCO3 | mg/l | 300 | 600 | 741.00 | 1124.00 | 736.00 | 518.00 | 1181.00 | 804.00 | 1137.00 | |
| 8 | Calcium as CA | mg/l | 75 | 200 | _ | _ | _ | _ | _ | _ | _ | |
| 9 | Magnesium as Mg | mg/l | 30 | 100 | _ | _ | _ | _ | _ | _ | _ | |
| 10 | Dissolved solids (Inorganic) | mg/l | 500 | 2000 | 1824 | 2280 | 1728 | 984 | 1998 | 1462 | 2494 | |
| 11 | Sulphate as $SO_4$ | mg/l | 200 | 400 | 172 | 280 | 721 | 70 | 766 | 475 | 723 | |
| 12 | Copper as Cu | mg/l | 0.05 | 1.50 | 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 | 0.3 | 0.3 | 0.06 | 0.09 | 0.01 | 0.06 | 0.06 | 0.07 | 0.05 | |
| 14 | Manganese as Mn | mg/l | 0.1 | 0.3 | _ | _ | _ | _ | _ | _ | _ | |
| 15 | Nitrate as $NO_3$-N | mg/l | 45 | 45 | _ | _ | _ | _ | _ | _ | _ | |
| 16 | Fluoride as F | mg/l | 1 | 1.5 | 1.75 | 1.81 | 1.47 | 1.37 | 1.38 | 1.07 | 1.72 | |
| 17 | phenolics | mg/l | 0.001 | 0.002 | 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 | 0.001 | 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) | BDL (DL : 0.001) | |
| 19 | Cadmium as Cd | mg/l | 0.0 | 0.0 | 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 | 0.01 | 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) | BDL (DL : 0.01) | |
| 21 | Arsenic as As | mg/l | 0.05 | 0.05 | 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 | 0.05 | 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) | BDL (DL : 0.05) | |
| 23 | Lead as Pb | mg/l | 0.05 | 0.01 | 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) | |
| 24 | Zinc as Zn | mg/l | 5.0 | 15.0 | 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) | |
| 25 | Total Chromium as Cr | mg/l | 0.05 | 0.05 | 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) | |
| 26 | Total Residual Chlorine | mg/l | 0.2 | 1.0 | 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 | 200.0 | 600.0 | 517.00 | 489.00 | 216.00 | 189.00 | 240.00 | 255.00 | 310.00 | |
| 28 | Aluminium as AL | mg/l | 0.03 | 0.20 | _ | _ | _ | _ | _ | _ | _ | |
| 29 | Boron as B | mg/l | 1.0 | 1.0 | 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 | -- | 50 | 0.25 | 0.24 | 0.27 | 0.25 | 0.22 | 0.24 | 0.26 | |
| 31 | Nickel as Ni | mg/l | -- | 0.02 | 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) | |
| 32 | Sulphide as S | mg/l | -- | 0.1 | 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) | |

**VI. Result of analysis of ground water by TNPCB**

| S.No | Parameter | Unit | Jan-21 | Kaliyammal house | Govt bore well /Kavadanur | Govt bore well KARAPAATTI PALLAM | Govt bore well moorthipatti | Mar-21 | Govt bore well ERVADI | Govt bore well /PARI NAGAR |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Feb-21 | | | | | Apr-21 | |
| 1 | Turbidity | NTU | SAMPLE NOT TAKEN | 4.20 | 5.90 | 2.30 | 3.60 | SAMPLE NOT TAKEN | 1.70 | 3.90 |
| 2 | Colour | ml | | <5 | <5 | <5 | <5 | | <5 | <5 |
| 3 | Conductivity at 25° C | µmhos/cm | | 2330.00 | 2210.00 | 3080.00 | 5250.00 | | 1738 | 6480 |
| 4 | pH at 25° C | Number | | 7.59 | 7.22 | 7.71 | 6.91 | | 7.28 | 6.99 |
| 5 | TSS at 25° C | mg/L | | 8.00 | 12.00 | 8.00 | 16.00 | | 8.00 | 8.00 |
| 6 | Total Dissolved Solids at 180° C | mg/L | | 1496.00 | 1404.00 | 1964.00 | 3428.00 | | 1136.00 | 4256.00 |
| 7 | Chloride as Cl | mg/L | | 230.00 | 295.00 | 400.00 | 750.00 | | 170.00 | 1175.00 |
| 8 | Sulphate as SO4 | mg/L | | 201.00 | 153.00 | 372.00 | 768.00 | | 243.00 | 493.00 |
| 9 | O&G | mg/L | | <4 | <4 | <4 | <4 | | <4 | <4 |
| 10 | BOD (at 27° C for 3 days | mg/L | | <2 | <2 | <2 | <2 | | <2 | <2 |
| 11 | COD | mg/L | | 16.00 | 16.00 | 16.00 | 16.00 | | 16.00 | 24.00 |
| 12 | Mangnese | mg/L | | <0.1 | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 |
| 13 | Ammonical Nitrogen as NH3 -N | mg/L | | <2 | <2 | 2.24 | 2.80 | | <2 | <2 |
| 14 | Total Kjeldhal Nitrogen | mg/L | | 3.36 | 3.36 | 3.92 | 4.48 | | 2.24 | 2.80 |
| 15 | Fluoride as F | mg/L | | 0.46 | 0.89 | 0.77 | 0.59 | | 0.28 | 0.237 |
| 16 | Ph Compounds | mg/L | | <0.05 | <0.05 | <0.05 | <0.05 | | <0.05 | <0.05 |
| 17 | % Sodium | % | | 27.00 | 45.00 | 47.00 | 50.00 | | 48.00 | 61.00 |
| 18 | Total Hardness as CaCO3 | mg/L | | 800.00 | 520.00 | 770.00 | 1180.00 | | 120.00 | 540.00 |
| 19 | Alkalinity as CaCO3 | mg/L | | 304.00 | 408.00 | 440.00 | 512.00 | | 140.00 | 290.00 |
| 20 | Ph. Alkalinity | mg/L | | 32.00 | 48.00 | 32.00 | <1 | | <1 | 30.00 |
| 21 | Nitrate Nitrogen as NO3 | mg/L | | 0.10 | 0.56 | 0.19 | 0.11 | | 0.14 | 0.16 |
| 22 | Nitrite Nitrogen as NO2 | mg/L | | 0.22 | 0.06 | 0.01 | 0.01 | | 0.07 | 0.08 |
| 23 | Phosphate as PO4 | mg/L | | 0.09 | 0.06 | 0.12 | 0.06 | | 0.09 | 0.29 |
| 24 | Cyanide | mg/L | | <0.05 | <0.05 | <0.05 | <0.05 | | <0.05 | <0.05 |
| 25 | Calcium as Ca | mg/L | | 96.00 | 48.00 | 80.00 | 152.00 | | 12.00 | 116.00 |
| 26 | Magnesium as Mg | mg/L | | 136.00 | 97.00 | 139.00 | 194.00 | | 22.00 | 61.00 |
| 27 | Sodium as Na | mg/L | | 140.00 | 198.00 | 317.00 | 558.00 | | 67.00 | 411.00 |
| 28 | Potassium as K | mg/L | | 35.00 | 5.00 | 17.00 | 23.00 | | 32.00 | 29.00 |
| 29 | Iron Total as Fe | mg/L | | 0.02 | 0.37 | 0.02 | 0.04 | | <0.05 | <0.05 |
| 30 | Free Ammonia | mg/L | | 0.60 | 0.60 | 1.19 | 1.49 | | - | - |
| 31 | Boron | mg/L | | <0.002 | <0.002 | <0.002 | <0.002 | | <0.002 | <0.002 |
| 32 | Hexavalent Chromium | mg/L | | <0.05 | <0.05 | <0.05 | <0.05 | | <0.05 | <0.05 |
| 33 | Total Residule Chlorine | mg/L | | <1 | <1 | <1 | <1 | | <1 | <1 |
| 34 | SAR | mg/L | | 2.20 | 3.80 | 4.90 | 7.10 | | (-)Ve | (-) Ve |
| 35 | Residule Sodium Carbonate | - | | Neg | Neg | Neg | Neg | | Neg | Neg |
| 36 | Total Chromium | mg/L | | <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 |
| 38 | Zinc | mg/L | | <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 |
| 40 | Cadmium | mg/L | | <0.0008 | <0.0008 | <0.0008 | <0.0008 | | <0.0008 | <0.0008 |
| 41 | Nickel | mg/L | | <0.006 | <0.006 | <0.0006 | <0.006 | | <0.006 | <0.006 |

| S.No | Parameter | Unit | Open well mr.Balan/KARAPATTIPALLAM | Vellaya House Moorthipatti | Vellaya House Moorthipatti | Balan house Panankadu | pudhur panakadu | Kaliammal teacher pottaneri | kavandanoor | Govt bore well moorthipatti |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Apr-21 | | | May-21 | Jun-21 | | | |
| 1 | Turbidity | NTU | 2.40 | 2.00 | 2.00 | SAMPLE NOT TAKEN | 3.00 | 4.20 | 3.20 | 3.60 |
| 2 | Colour | ml | <5 | <5 | <5 | | <5 | <5 | <5 | <5 |
| 3 | Conductivity at 25° C | µmhos/cm | 2270 | 1906 | 1906 | | 3330 | 6880 | 2320 | 4650 |
| 4 | pH at 25° C | Number | 6.95 | 7.20 | 7.20 | | 7.06 | 6.53 | 6.93 | 7.17 |
| 5 | TSS at 25° C | mg/L | 16.00 | 8.00 | 8.00 | | 8.00 | 4.00 | 4.00 | 4.00 |
| 6 | Total Dissolved Solids at 180° C | mg/L | 1480.00 | 1244.00 | 1244.00 | | 2156.00 | 4564 | 1524.00 | 3032 |
| 7 | Chloride as Cl | mg/L | 380.00 | 310.00 | 310.00 | | 570.00 | 1475 | 410.00 | 980 |
| 8 | Sulphate as SO4 | mg/L | 242.00 | 248.00 | 248.00 | | 191.00 | 251 | 63.00 | 202 |
| 9 | O&G | mg/L | <4 | <4 | <4 | | <4 | <4 | <4 | <4 |
| 10 | BOD (at 27° C for 3 days | mg/L | <2 | <2 | <2 | | <2 | <2 | <2 | <2 |
| 11 | COD | mg/L | 16.00 | 16.00 | 16.00 | | 16.00 | 24.00 | 16.00 | 16.00 |
| 12 | Mangnese | mg/L | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | <0.1 |
| 13 | Ammonical Nitrogen as NH3 -N | mg/L | <2 | <2 | <2 | | <2 | 2.24 | <2 | <2 |
| 14 | Total Kjeldhal Nitrogen | mg/L | 2.24 | 2.24 | 2.24 | | 2.80 | 3.96 | <2 | 2.24 |
| 15 | Fluoride as F | mg/L | 0.21 | 0.24 | 0.24 | | 0.11 | 0.70 | 0.09 | 0.28 |
| 16 | Ph Compounds | mg/L | <0.05 | <0.05 | <0.05 | | <0.05 | <0.05 | <0.05 | <0.05 |
| 17 | % Sodium | % | 76.00 | 77.00 | 77.00 | | 52.00 | 29.00 | 51.00 | 55.00 |
| 18 | Total Hardness as CaCO3 | mg/L | 170.00 | 140.00 | 140.00 | | 620.00 | 2060.00 | 560.00 | 630.00 |
| 19 | Alkalinity as CaCO3 | mg/L | 200.00 | 120.00 | 120.00 | | 600.00 | 920.00 | 540.00 | 610.00 |
| 20 | Ph. Alkalinity | mg/L | 10.00 | <1 | <1 | | 30.00 | 40.00 | 20.00 | 20.00 |
| 21 | Nitrate Nitrogen as NO3 | mg/L | 0.14 | 0.13 | 0.13 | | 0.10 | 3.37 | 2.76 | 2.17 |
| 22 | Nitrite Nitrogen as NO2 | mg/L | 0.05 | 0.05 | 0.05 | | 0.01 | 0.34 | 0.19 | 0.44 |
| 23 | Phosphate as PO4 | mg/L | 0.22 | 0.06 | 0.06 | | 0.13 | 0.32 | 0.18 | 0.13 |
| 24 | Cyanide | mg/L | <0.05 | <0.05 | <0.05 | | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Calcium as Ca | mg/L | 36.00 | 20.00 | 20.00 | | 44.00 | 340.00 | 36.00 | 48.00 |
| 26 | Magnesium as Mg | mg/L | 19.00 | 22.00 | 22.00 | | 124.00 | 294.00 | 114.00 | 124.00 |
| 27 | Sodium as Na | mg/L | 266.00 | 237.00 | 237.00 | | 316.00 | 381.00 | 266.00 | 361.00 |
| 28 | Potassium as K | mg/L | 9.30 | 13.00 | 13.00 | | 4.30 | 23.00 | 4.40 | 13.70 |
| 29 | Iron Total as Fe | mg/L | <0.05 | <0.05 | <0.05 | | <0.05 | <0.05 | <0.05 | <0.05 |
| 30 | Free Ammonia | mg/L | - | - | - | | 0.90 | 1.10 | 0.90 | 0.90 |
| 31 | Boron | mg/L | <0.002 | <0.002 | <0.002 | | <0.002 | <0.002 | <0.002 | <0.002 |
| 32 | Hexavalent Chromium | mg/L | <0.05 | <0.05 | <0.05 | | <0.05 | <0.05 | <0.05 | <0.05 |
| 33 | Total Residule Chlorine | mg/L | <1 | <1 | <1 | | <1 | <1 | <1 | <1 |
| 34 | SAR | mg/L | (-) Ve | (-) Ve | (-) Ve | | 6.30 | 3.70 | 4.90 | 6.30 |
| 35 | Residule Sodium Carbonate | - | 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 |
| 37 | Copper | mg/L | <0.0015 | <0.0015 | <0.0015 | | <0.0015 | <0.0015 | <0.0015 | <0.0015 |
| 38 | Zinc | mg/L | <0.0015 | <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 |
| 40 | Cadmium | mg/L | <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 | <0.006 |

# Annexure –E

Treated sewage quality monitoring report of NABL accredited laboratory for the period of

January’21 – June’21

**Annexure -E**

**Treated sewage quality monitoring report of TNPCB & NABL accredited laboratory for the period of Jan'21 to Jun '21**

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

| S.No | Parameter | Unit | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
|---|---|---|---|---|---|---|---|---|
| 1 | pH @ 25°C | Number | 7.57 | 7.05 | 6.66 | 6.98 | 6.97 | 6.67 |
| 2 | TSS at 103°C - 105°C | mg/l | 12 | 8 | 8 | 8 | 8 | 12 |
| 3 | BOD (at 27°C for 3 days) | mg/l | <2 | <2 | 3 | <2 | <2 | <2 |
| 4 | COD | mg/l | – | – | – | – | – | – |
| 5 | Ammonical Nitrogen as $NH_3N$ | mg/l | – | – | – | – | – | – |
| 6 | Total Nitrogen | mg/l | – | – | – | – | – | – |
| 7 | Feacal Coliform | MPN/100ML | – | – | – | – | – | – |
| 8 | Total Coliform | MPN/100ML | – | – | – | – | – | – |

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

| S.No | Parameter | Unit | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
|---|---|---|---|---|---|---|---|---|
| 1 | pH @ 25°C | Number | 7.04 | 7.12 | Sample not taken | 6.36 | 7.02 | 6.75 |
| 2 | TSS at 103°C - 105°C | mg/l | 20 | 12 | | 12 | 4 | 8 |
| 3 | BOD (at 27°C for 3 days) | mg/l | <2 | <2 | | <2 | <2 | <2 |
| 4 | COD | mg/l | – | – | | – | – | – |
| 5 | Ammonical Nitrogen as $NH_3N$ | mg/l | – | – | | – | – | – |
| 6 | Total Nitrogen | mg/l | – | – | | – | – | – |
| 7 | Feacal Coliform | MPN/100ML | – | – | | – | – | – |
| 8 | Total Coliform | MPN/100ML | – | – | | – | – | – |

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

| S.No | Parameter | Unit | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
|---|---|---|---|---|---|---|---|---|
| 1 | pH @ 25°C | -- | 7.14 | 6.75 | 6.57 | 6.74 | 6.81 | 6.94 |
| 2 | Total Dissolved solids | mg/l | 586 | 562 | 503 | – | – | – |
| 3 | Total uspended solids | mg/l | 7 | 9.6 | 7.8 | 9.6 | 12 | 10 |
| 4 | BOD at 27 C for 3 days | mg/l | 5.6 | 5 | 6.7 | 5.4 | 7.9 | 6.4 |
| 5 | COD | mg/l | 20 | 14 | 21 | 17 | 31 | 27 |
| 6 | Ammonical Nitrogen as N | mg/l | 1.56 | 1.81 | 1.46 | 1.96 | 1.74 | 1.86 |
| 7 | Total Kjeldhal Nitrogen as N | mg/l | 1.91 | 2.17 | 1.92 | 2.53 | 2.2 | 2.09 |
| 8 | Sodium Absorption Ratio | vmillimole/L | – | – | – | 1.44 | 1.33 | 1.3 |
| 9 | Fecal Coliform | MPN/100ml | *34* | *25* | *26* | 30 | 49 | 45 |
| 10 | Total Coliform | MPN/100ml | – | – | – | *58* | 67 | *63* |

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

| S.No | Parameter | Unit | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 |
|---|---|---|---|---|---|---|---|---|
| 1 | pH @ 25°C | -- | 6.98 | 6.49 | 6.35 | 6.65 | 6.96 | 7.14 |
| 2 | Total Dissolved solids | mg/l | 497 | 424 | 396 | – | – | – |
| 3 | Total uspended solids | mg/l | 5 | 18 | 12 | 10 | 8.8 | 7.3 |
| 4 | BOD at 27 C for 3 days | mg/l | 4.2 | 7.2 | 5.6 | 6.6 | 6 | 4.9 |
| 5 | COD | mg/l | 13 | 24 | 18 | 20 | 22 | 18 |
| 6 | Ammonical Nitrogen as N | mg/l | 1.14 | 1.26 | 1.2 | 1.58 | 1.42 | 1.37 |
| 7 | Total Kjeldhal Nitrogen as N | mg/l | 1.54 | 1.95 | 1.73 | 2.17 | 2.07 | 1.82 |
| 8 | Sodium Absorption Ratio | vmillimole/L | – | – | – | 1.37 | 1.21 | 1.25 |
| 9 | Fecal Coliform | MPN/100ml | 30 | 38 | 34 | 37 | 32 | 34 |
| 10 | Total Coliform | MPN/100ml | – | – | – | 64 | 55 | 60 |

# Annexure –F

Ambient & Source Noise level monitoring report of NABL accredited laboratory for the period of

January’21 – June’21

## Annexure -F

**Ambient & Source Noise level monitoring report of NABL accredited laboratory for the period of Jan'21 to jun '21**

**I. Ambient Noise Monitoring results (Jan'21 to Jun '21)**

| S.No | Location | Day Time Noise Level in dB(A) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 | Maximum | Minimum | Average | STD Deviation |
| 1 | Main gate | 68.1 | 69.4 | 68 | 69.1 | 68.5 | 69.1 | 69.8 | 68.0 | 68.7 | 0.58 |
| 2 | Guest house | 69.3 | 69.5 | 69.8 | 69.5 | 69.8 | 69.4 | 67.8 | 69.3 | 69.6 | 0.21 |
| 3 | Ground hopper BF II | 67.6 | 66.2 | 67.5 | 66.7 | 66.1 | 67.8 | 66.8 | 66.1 | 67.0 | 0.75 |
| 4 | ASP I & II | 66.8 | 64.2 | 65.7 | 64 | 65.9 | 65 | 67.7 | 64.0 | 65.3 | 1.07 |
| 5 | Temp gate | 65.1 | 66.8 | 64.3 | 67.2 | 67.7 | 66.3 | 68.9 | 64.3 | 66.2 | 1.30 |
| 6 | New Reservoir | 65.7 | 67 | 67.9 | 68.8 | 68 | 68.9 | 69.4 | 65.7 | 67.7 | 1.21 |
| 7 | RS Gate | 67.9 | 68.6 | 69.2 | 69.4 | 68.3 | 67.5 | 69.9 | 67.5 | 68.5 | 0.74 |
| 8 | Raw water pump house | 69.2 | 67.1 | 68.4 | 69.3 | 69.9 | 69.2 | 66.5 | 67.1 | 68.9 | 0.98 |
| 9 | Railway Quarters | 66.5 | 65.3 | 64.1 | 65.6 | 64.2 | 64.6 | 68.7 | 64.1 | 65.1 | 0.93 |
| 10 | South East corner | 68 | 66.7 | 68.6 | 66.8 | 67.4 | 68.7 | 69.9 | 66.7 | 67.7 | 0.87 |
| 11 | Near rail end | 69.4 | 69 | 69.3 | 69.9 | 69.1 | 69.5 | 69.9 | 69.0 | 69.4 | 0.32 |

| S.No | Location | Night Time Noise Level in dB(A) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 | Maximum | Minimum | Average | STD Deviation |
| 1 | Main gate | 57.9 | 55.6 | 56.9 | 57.8 | 58.5 | 58 | 58.5 | 55.6 | 57.5 | 1.04 |
| 2 | Guest House | 58.5 | 59.1 | 59.4 | 58.3 | 56.9 | 59.3 | 59.4 | 56.9 | 58.6 | 0.93 |
| 3 | BF II Ground hopper | 58 | 54.3 | 56.2 | 57.2 | 55.4 | 56.6 | 58.0 | 54.3 | 56.3 | 1.31 |
| 4 | ASP I & II | 57.7 | 56.4 | 57 | 59.1 | 57.6 | 56.2 | 59.1 | 56.2 | 57.3 | 1.06 |
| 5 | Temp gate | 54.3 | 58 | 56.8 | 58.4 | 60.2 | 58.9 | 60.2 | 54.3 | 57.8 | 2.03 |
| 6 | New Reservoir | 56.8 | 58.7 | 59.1 | 54.9 | 55.8 | 59.6 | 59.6 | 54.9 | 57.5 | 1.93 |
| 7 | RS Gate | 57.4 | 59.6 | 60.5 | 59.5 | 60.3 | 61.4 | 61.4 | 57.4 | 59.8 | 1.36 |
| 8 | Raw water pump house | 58.6 | 59.3 | 57.7 | 60.7 | 60.1 | 62.7 | 62.7 | 57.7 | 59.9 | 1.75 |
| 9 | Railway Quarters | 55.1 | 56.8 | 55.3 | 56.5 | 55 | 55.9 | 56.8 | 55.0 | 55.8 | 0.76 |
| 10 | South East corner | 58.5 | 59.9 | 57.4 | 54.3 | 55.7 | 59.3 | 59.9 | 54.3 | 57.5 | 2.17 |
| 11 | Near rail end | 59.2 | 59.4 | 59.6 | 60 | 60.6 | 61.8 | 61.8 | 59.2 | 60.1 | 0.97 |

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 (Jan'21 to Jun '21)**

| S.No | Plant | Location | Unit | Std | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SP-1 | Mixing & Nodulizing Drum area | dB | 90 | 84.9 | 84.0 | 86.1 | 86.7 | 85.8 | 86.3 | 85.6 |
| 2 | | Waste Gas fan area | dB | 90 | 86.5 | 85.8 | 84.9 | 85.5 | 85.1 | 85.7 | 85.6 |
| 3 | | Cooling air fan area | dB | 90 | 85.3 | 86.7 | 85.4 | 84.3 | 84 | 84.9 | 85.1 |
| 4 | | RMHS | dB | 90 | 86.1 | 86.5 | 87.3 | 87.8 | 87.2 | 87.4 | 87.1 |
| 5 | SP-2 | Near de-dusting fan area | dB | 90 | 84.8 | 84.2 | 85.8 | 86.4 | 87.5 | 86.8 | 85.9 |
| 6 | | Near circular cooler area | dB | 90 | 85.4 | 86.6 | 86.0 | 86.9 | 86.3 | 86 | 86.2 |
| 7 | | Near Crusher house area | dB | 90 | 86.0 | 85.1 | 87.4 | 87 | 87.7 | 87.2 | 86.7 |
| 8 | | Near waste gas fan area | dB | 90 | 87.1 | 86.0 | 86.7 | 87.2 | 85.9 | 84.5 | 86.2 |
| 9 | | Product Screen House Area | dB | 90 | 86.7 | 86.3 | 84.2 | 85.6 | 86.4 | 85.1 | 85.7 |
| 10 | BF-1 | Stock House area | dB | 90 | 87.4 | 87.8 | 87.0 | 87.8 | 87.1 | 87.4 | 87.4 |
| 11 | | Furnace area | dB | 90 | 86.9 | 84.9 | 85.4 | 84.1 | 85.4 | 84.3 | 85.2 |
| 12 | | Snort Valve area | dB | 90 | 85.2 | 83.8 | 83.1 | 83.6 | 84.2 | 84 | 84.0 |
| 13 | | GCP area | dB | 90 | 84.0 | 84.5 | 86.6 | 85.5 | 86.7 | 87.5 | 85.8 |
| 14 | BF-2 | Blower house area | dB | 90 | 87.3 | 87.7 | 87.9 | 87.3 | 87.6 | 87.9 | 87.6 |
| 15 | | GCP area | dB | 90 | 84.5 | 85.9 | 86.3 | 86.9 | 86.1 | 87.3 | 86.2 |
| 16 | | Near Furnace area | dB | 90 | 83.3 | 83.1 | 84.4 | 84 | 83.4 | 83 | 83.5 |
| 17 | | Stock house area | dB | 90 | 85.0 | 85.8 | 83.7 | 83.2 | 83.7 | 84.6 | 84.3 |
| 18 | | Snort valve area | dB | 90 | 87.4 | 87.0 | 86.5 | 87.5 | 87.9 | 87.1 | 87.2 |
| 19 | | PCI Inner area | dB | 90 | 85.6 | 86.4 | 87.2 | 87.8 | 86.3 | 85.5 | 86.5 |
| 20 | CPP-I | Near Boiler area | dB | 90 | 87.8 | 86.5 | 86.1 | 85.6 | 86.3 | 87.4 | 86.6 |
| 21 | | Near Turbine area | dB | 90 | 85.1 | 85.7 | 84.8 | 83.4 | 83.7 | 84.9 | 84.6 |
| 22 | | Near Condenser area | dB | 90 | 87.3 | 87.9 | 87.5 | 87.1 | 86 | 86.8 | 87.1 |
| 23 | | Near ID fan area | dB | 90 | 84.5 | 85.2 | 87.0 | 86.8 | 87.5 | 87.2 | 86.4 |
| 24 | EOF-I | Near Furnace area | dB | 90 | 87.0 | 85.8 | 86.4 | 87.5 | 87.7 | 85.7 | 86.7 |
| 25 | | Near ID fan area | dB | 90 | 86.3 | 86.6 | 86.9 | 87.3 | 87.9 | 86.3 | 86.9 |

| S.No | Plant | Location | Unit | Std | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | EOF-II | Near Furnace area | dB | 90 | 84.1 | 85.4 | 84.3 | 85.9 | 85.2 | 86.6 | 85.3 |
| 27 | | Near ID fan area | dB | 90 | 86.6 | 87.1 | 86.2 | 87.4 | 86.4 | 86 | 86.6 |
| 28 | CCM | Near Tundish area | dB | 90 | 82.8 | 83.7 | 84.9 | 85.6 | 86.8 | 84.7 | 84.8 |
| 29 | LRF | Furnace area | dB | 90 | 85.4 | 85.0 | 85.7 | 87.1 | 87 | 88 | 86.4 |
| 30 | BRM | Near Furnace area | dB | 90 | 86.2 | 87.2 | 87.8 | 87.3 | 87.7 | 88.3 | 87.4 |
| 31 | | Three High Rod mill area | dB | 90 | 83.9 | 82.5 | 83.1 | 83.9 | 84.4 | 85.6 | 83.9 |
| 32 | | Near Blower area | dB | 90 | 86.0 | 84.8 | 82.0 | 82.6 | 83.1 | 83.4 | 83.7 |
| 33 | ASP-2 | LOX Pump area | dB | 90 | 87.9 | 87.1 | 86.4 | 87.4 | 88 | 87.7 | 87.4 |
| 34 | | Main Compressor House area | dB | 90 | 86.4 | 87.5 | 87.8 | 87.6 | 87.4 | 87.9 | 87.4 |
| 35 | | Air Compressor area - Inner | dB | 90 | 85.7 | 86.8 | 87.5 | 87.9 | 87.5 | 88.2 | 87.3 |
| 36 | COP | Coke Cutter area - during operation | dB | 90 | 86.4 | 86.9 | 85.3 | 85.1 | 84.3 | 85 | 85.5 |
| 37 | | Double duct screen house area | dB | 90 | 86.6 | 87.5 | 87.7 | 85.8 | 86.4 | 86.9 | 86.8 |
| 38 | | Warf area | dB | 90 | 87.8 | 87.0 | 87.4 | 86.3 | 86.7 | 85.4 | 86.8 |
| 39 | | Hammer Mill area | dB | 90 | 86.0 | 87.8 | 86.9 | 87.5 | 87.1 | 87.7 | 87.2 |
| 40 | | Stamping Station Area - I | dB | 90 | 87.3 | 87.5 | 87.1 | 87.9 | 86.8 | 87.3 | 87.3 |
| 41 | | Stamping Station Area - II | dB | 90 | 88.1 | 88.4 | 88.0 | 88.4 | 88.2 | 88.4 | 88.3 |
| 42 | | Single Duct Screen | dB | 90 | 88.5 | 88.2 | 88.5 | 88.2 | 88 | 88.1 | 88.3 |
| 43 | BLM | UV Bag Inspection area | dB | 90 | 89.0 | 89.4 | 89.1 | 88.7 | 88.9 | 88.5 | 88.9 |
| 44 | | Near CP-6 Hacksaw | dB | 90 | 88.4 | 88.7 | 88.3 | 89 | 89.4 | 89.7 | 88.9 |
| 45 | | Near CP-5 Mill area | dB | 90 | 88.1 | 89.0 | 89.6 | 89.3 | 88.5 | 89.1 | 88.9 |
| 46 | Pickling plant | Outlet scrubber Blower | dB | | | 78.9 | 78.0 | 78.8 | 77.3 | 76 | 77.8 |
| 47 | | common collection Water pump area | dB | 90 | _ | 73.4 | 74.2 | 76.7 | 75 | 77.2 | 75.3 |
| 48 | | APR Bottom Area | dB | 90 | _ | 72.8 | 73.4 | 75.1 | 76.7 | 78.7 | 75.3 |
| 49 | | Pickling Blower Area | dB | 90 | _ | 77.3 | 78.6 | 79.4 | 78.2 | 78.9 | 78.5 |
| 50 | | ETP Area | dB | 90 | _ | _ | _ | _ | _ | 83.7 | 83.7 |
| 51 | | Bar annealing | dB | 90 | _ | _ | _ | _ | _ | 85.4 | 85.4 |
| 52 | | Coil annealing | dB | 90 | _ | _ | _ | _ | _ | 86 | 86.0 |
| 53 | ASP- 1 | Vessel Area | dB | 90 | _ | _ | _ | _ | _ | 85.8 | 85.8 |
| 54 | | Main compressor House area | dB | 90 | _ | _ | _ | _ | _ | 87.9 | 87.9 |
| 55 | | Control Room Area | dB | 90 | _ | _ | _ | _ | _ | 82.4 | 82.4 |
| 56 | Wagon Tippler | Tippling Area | dB | 90 | _ | _ | _ | _ | _ | 86.5 | 86.5 |
| 57 | | Hydraulic Room Area | dB | 90 | _ | _ | _ | _ | _ | 84.9 | 84.9 |
| 58 | | Control Room Area | dB | 90 | _ | _ | _ | _ | _ | 83.1 | 83.1 |
| 59 | CPP-2 | Near Admin Building area | dB | 90 | 77.6 | 75.9 | 77.1 | 78.8 | 78 | 76.3 | 77.3 |
| 60 | | Near STG building Inner area | dB | 90 | 76.1 | 78.0 | 75.4 | 76.4 | 77.5 | 78.9 | 77.1 |
| 61 | | Near Turbine area - 1 | dB | 90 | 83.9 | 85.4 | 83.4 | 85 | 84.2 | 85.2 | 84.5 |
| 62 | | Near Cooling Tower area | dB | 90 | 84.7 | 83.8 | 84.2 | 82.6 | 83.9 | 82 | 83.5 |
| 63 | | Near ID fan area | dB | 90 | 83.0 | 84.6 | 86.0 | 86.9 | 87.2 | 88.4 | 86.0 |
| 64 | | Near Turbine area - 2 | dB | 90 | 82.3 | 83.5 | 81.9 | 82.5 | 83.6 | 85.7 | 83.3 |
| 65 | | Near ESP Area | dB | 90 | 84.4 | 86.0 | 86.7 | 87.9 | 86.1 | 86.9 | 86.3 |

# 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:**<br>To meet the parameters PLD (% leaking doors), PLL (% leaking lids), PLO (% leaking off take) of the notified standards under EPA.<br><br>To rebuild at least 40% of the coke oven batteries* in next 10 years by December 2012. | Our COP Non-recovery type coke oven and this requirement is not applicable. |
| 2 | **Steel Melting Shop**<br>**Fugitive Emission Status**<br>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.<br><br>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.<br><br>Dedicated secondary dedusting systems are installed in EOF & LRF and fugitive emissions are significantly reduced. Dedicated dust monitoirng systems are installed in the respective stacks and the real time parameters are connected with CA,TNPCB |
| 3 | **Blast Furnace**<br>- 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 (to till 150 - 160 kg/THM) and the implementation resulted in reduction of coke consumption in BF which leads to energy saving. |
| 4 | **Solid Waste/Hazardous Waste Management**<br>Utilization of Steel Melting Shop (SMS) / Blast Furnace (BF) slag as per the following.<br><br>• By 2004 – 70%<br>• By 2006 – 80% and<br>• By 2007 – 100%<br><br>**Hazardous Waste:**<br>- Charge of tar sludge/ETP sludge to coke oven by June 2003.<br>- 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.<br>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.<br>Our coke oven plant is non-recovery type and hence Tar sludge & ETP sludge is not applicable.<br>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**<br>- To reduce specific water consumption to 5 m3/ 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, SO2 & NOx are transmitted to the Care Air Centre of TNPCB and CPCB servers.<br>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.<br>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 along with 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. | Being Complied. |
| 9 | The industry will initiate the steps to adopt the following clean technologies/measures to improve the performance of industry towards production, energy and environment. | |
| | ✔ Energy recovery of top blast furnace (BF) gas. | Our BF gas pressure (plant capacity is 0.683 MTPA only) is not adequate to install TRT. |
| | ✔ Use of tar-free runner linings. | Our coke oven plant is non-recovery type and hence not applicable. |
| | ✔ De-dusting of cast house at tap holes, runners, skimmers ladle and charging points. | The de-dusting system commissioned at BF-I & II cast house covering tap holes, runners, skimmers ladles and charging points. |
| | ✔ Suppression of fugitive emissions using nitrogen gas or other inert gas. | Water sprinkling system, Dry & Wet fog systems and the compressed air are used for suppression of fugitive emissions. |
| | ✔ 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. | Since we are purchasing raw materials from outside sources, it is not applicable. |
| | ✔ Processing of the waste containing flux & ferrous wastes through waste recycling plant. | 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. |
| | ✔ To implement rainwater harvesting. | Four rain water harvesting ponds are provided. Two are in the plant premises and Tow are in township. |
| | ✔ Reduction of green house gases by, | 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, Renewable energy and resource conservation. |
| | • Reduction in power consumption. | To reduce the power consumption VFDs are being installed whereever possible. LED lights are installed to replace the sodium vapor lamps and many Kaizens are implemented to conserve power. |
| | • Use of by-products gases for power generation. | By product BF gas is being used as fuel in Power Plant for power generation. |
| | • Promotion of energy optimization technology including energy audit. | 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. |
| | • To set targets for resource conservation such as raw material, energy and water consumption to match International Standards. | 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. |
| | • Up-gradation in the monitoring and analysis facilities for air and water pollutants. Also to impact elaborate training to the manpower so that realistic data is obtained in the environmental monitoring laboratories. | 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. |
| | • To improve over all house keeping. | 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. |

# Annexure –H

Copy of advertisement in local newspaper for EC dated. 10.02.2020

Annexure -H

Copy of advertisement in local newspaper for EC dated. 10.02.2020

THE NEW INDIAN EXPRESS TAMIL NADU

05 DHARMAPURI FRIDAY 14.02.2020

# 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 ஸ்டீல் லிமிடெட் நிறுவனத்திற்கு 0.8 MTPA ஸ்லாக் அரைக்கும் அலகு நிறுவுதல் 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 மாசுக்கட்டுப்பாடு வாரியம் மற்றும் இணையத்தளம் http://environmentclearance.nic.in மூலம் தெரிந்து கொள்ளலாம்.

MoEF&CC அறிவுறுத்தலின் பேரில் இந்த அறிவிப்பு வெளியிடப்படுகிறது.

ஜே.எஸ். டபுள்யூ. ஸ்டீல் லிமிடெட், சேலம்

# Annexure –I

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

Annexure -I

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

**JSW Steel Limited**

JSW Steel

**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**

மாவட்ட ஆட்சித்தலைவர் அலுவலகம் சேலம் 30 MAY 2020

**Salem Works**
P.O. Pottaneri, Mecheri,
Mettur - Tk, Salem - Dt. Pin : 636 453
Tamilnadu, India.
CIN No L27102MH1994PLC152925
T +91 4298 272000
www.jsw.in

**Registered Office**
JSW Centre
Bandra Kurla Complex
Bandra East, Mumbai 400 051
T +91 22 4286 1000
F +91 22 4286 3000

JINDAL
O P Jindal Group

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**

**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,**

JSW STEEL LTD. POTTANERI SALEM(DT)

**Authorized Signatory,**

Copy Received !
தலைவர்
பொட்டனேரி ஊராட்சி,
மேச்சேரி ஒன்றியம்.

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

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

JINDAL Part of O.P. Jindal Group

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,**

JSW STEEL LTD POTTANERI SALEM(DT)

**Authorized Signatory,**

Received Copy

PANCHAYAT SECRETARY
M.Kalipatty Panchayat
Mecheri Union .

**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 January’21 – June’21 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 (Jan'21 to Jun'21) | | Total Rs . (in Crs) | |
| | | | Committed | Spent | Committed | Spent | Committed | Spent | Committed | Spent | Committed | Spent | Committed | Spent |
| 1 | Toilets | 2000 | 0.50 | 0.32 | 0.75 | 0.19 | 0.75 | 0.04 | 0.50 | 0.00 | 0.50 | 0.00 | **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 | 0.06 | **1.00** | **0.53** |
| 3 | Community hall | 2 | 0.00 | 0.00 | 0.50 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | **1.00** | **0.03** |
| 4 | Hospital | 1 | 0.50 | 0.00 | 0.50 | 0.00 | 0.50 | 0.00 | 0.25 | 0.25 | 0.25 | 0.01 | **2.00** | **0.26** |
| 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 | 0.00 | **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 | 0.00 | **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 | 0.00 | **1.00** | **0.63** |
| 8 | Drainage | | 0.25 | 0.00 | 0.25 | 0.39 | 0.25 | 0.10 | 0.25 | 0.00 | 0.00 | 0.10 | **1.00** | **0.59** |
| 9 | Government school improvement | 1 | 0.00 | 0.47 | 0.25 | 0.34 | 0.25 | 0.17 | 0.25 | 0.02 | 0.25 | 0.00 | **1.00** | **1.00** |
| **Total** | | | **1.50** | **1.03** | **3.00** | **1.12** | **4.00** | **0.94** | **2.50** | **0.75** | **2.00** | **0.20** | **13.00** | **4.04** |

**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 - Lime Calcining Plant (Not in Operation) | Process | bag filter with Stack |
| 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 (HSD based) | Process | Stack |
| 51 | Pickling Plant- ARP - Hot water Generator Stack (LPG based) | Process | Stack |
| 52 | Pickling Plant- MEE – Thermic fluid Heater Stack (HSD based) | 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 |
| 35 | 01.01.2021 to 30.06.2021 | 4449 |
| **Total** | | **240109** |

# Annexure –M

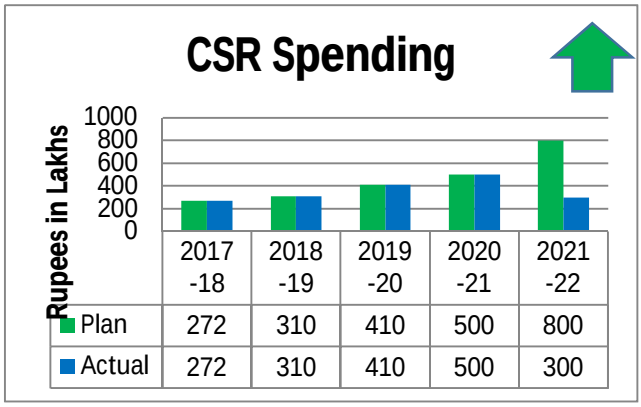
Report of CSR activities for the period of January’21 – June’21 with cumulative

## CSR REPORT FOR THE PERIOD of Janurary 2021 to June 2021

### Background

JSW is deeply conscious of its vision and responsibilities to the community around the plant. Empowering citizen with better health, education and employment opportunities is JSW's mission.JSWis committed to improve the quality of life of surrounding community through Corporate Social Responsibility (CSR) programmes. We have well laid down community development program under CSR.Our focus is on

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




| | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 2021-22 |
|---|---|---|---|---|---|
| Plan | 272 | 310 | 410 | 500 | 800 |
| Actual | 272 | 310 | 410 | 500 | 300 |

People in Pottaneri, M.Kalipatti, Kuttapatti, Viruthasampatti, Gonur Panchayats and Mecheri Town are covered under CSR projects. Our CSR spending for the financial year 2022 is Rs. 8.00 Crores.

### AGRICULTURE – Established Value Addition Unit

We have mobilized 1500 farmers as shareholder and it has registered as Mecheri Farmer Producer Company Limited.With support of JSW, the MFPCL is established a value addition unit for the benefits of surrounding farmers.

To ensure the uninterrupted supply of vegetables and fruits to the nearbyvillages and township areas, JSW CSR facilitated mobile vehicle for sale ofvegetables, fruits, grocery items etc., in coordination with Mecheri Farmersproducer company Limited.

### HEALTH – Supplying Safe Drinking Water through Tankers by JSW

Last six years, we have been supplying drinking water tosurrounding villages during summer months to address thewater scarcity. This year we have started supplying safedrinking water to the surrounding villages. In a day 3000households are getting benefited through this intervention.We are supplying water to our direct impact zones, 4 panchayats namely, Pottaneri, M.Kallipati, Virudhasampatti, Kuttapatti and Mecheri Union. Apart from the above intervention, also we are supplying water to COVID Care Centers on request basis.

## Sanitation – Sanitation facilities at Govt Schools

To promote safe sanitary practices among school children.This year, we have constructed 3 sanitary blocks in three government schools(Kullamudayanoor, Vaniyanoor and Vellar). Worth of Rs. 27,00,000/-. Through this intervention 3217 children shall get benefit every year. Also we have ensured safety of girl children at surrounding government schools.


Thus far we have constructed 23 such toilets in surrounding government schools. Apart from this also renovated sanitation block at Early Intervention Center, Mecheri. This center is being accessed by 37 specially abled children from in and around mecheri union.

## CSR Initiative – 500 Bedded COVID care center sponsored by JSW

Salem district is reporting more number of Covid cases and the district administration is taking all efforts to control the spread and treat every COVID affected patient with utmost care. To tackle the present scenario, we have supported district administration for setting up of 500 bedded Covid Care Center at Salem District. This intervention is immensely supportive to treat Covid affected patients equally regardless of their economic status. Also this center is helping to mitigate COVID-19 spread.

## Education – Classroom Renovated at 2 Govt Schools

This year we have renovated 2 government school clasrroms on request basis from school head masters.An unused classrooms converted into accustomed classrooms. These classrooms are being accessed by 195 students.


## Rural Development – Drainage Construction

In two panchayts we have constructed 1.5 KM length of drainages to avoide the inconvinent for the residence. In rainy seasons water stagnates on roads and overflows. To avoid such critical situations among communities we have constructed drainages for well being of the community. Drainages constructed worth of Rs.60,00,000/-

**ENVIRONMENT SOCIAL COMMITMENT**

**HALF YEARLY REPORT (January 2021 to June 2021)**

## Health Care – Sponsored Masks& Sanitizers

The entire world is striving to save every single life and win over thevirus (Covid-19). In India, the situation being the positive casesincreasing day by day. Failures of wearing the face mask and notmaintaining good hygienic practices were found as a major reason forthe spread of this virus. As part of our CSR initiative, we have initiatedto bring changes among the community and educated them to wearmasks and utilize sanitizer to sanitize their hands often to reduce thetransmission of virus spread and save the people's lives. In order tosupport this initiative, we have been sponsoring masks and sanitizersto all the villages around our factory. On priority basis, we distributed the self-protection kits to public front line workers. We also sponsored 1 lakhsurgical masks, 10,000 hand sanitizer and 2000 N-95 masks to nearby Health centers, GovernmentHospitals, Police station, Farmers from Farmer producer organization, panchayats and also to our associateemployees.

## Health – Conducted Health Survey

We have conducted health assessment survey to know the health status of surrounding communities. The survey conducted by the Government Mohan Kumaramangalam Medical College Hosipital, Salem. Surveyconducted with 700 households from 4 panchayats and 1 union (Mecheri, Pottaneri, M. Kalipati, Virudhasmpatti and Kuttapati )

## Community Development - Kerala Samage

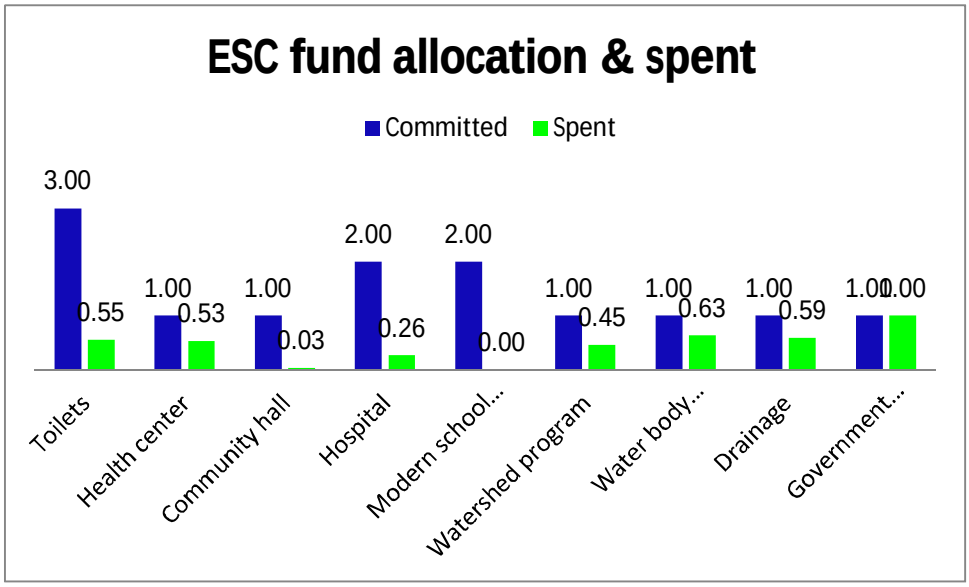
As salem camp secretary requested us to repair the Kerala Samaj wall. Due to drainage water stagnation, nearby houses are facing diffculties for their regular access.

## Repairing and Renovation – Whitewash to Mecheri Police Station

Whitewash and civil pitching work has done at police station building , Mecheri.

# ESC fund allocation & Spent (Rs. in Crs)

| 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(Jan'21 to Jun'21) | | Total Rs . (in Crs) | |
| | | | Committed | Spent | Committed | Spent | Committed | Spent | Committed | Spent | Committed | Spent | Committed | Spent |
| 1 | Toilets | 2000 | 0.50 | 0.32 | 0.75 | 0.19 | 0.75 | 0.04 | 0.50 | 0.00 | 0.50 | 0.00 | 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 | 0.06 | 1.00 | 0.53 |
| 3 | Community hall | 2 | 0.00 | 0.00 | 0.50 | 0.00 | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 1.00 | 0.03 |
| 4 | Hospital | 1 | 0.50 | 0.00 | 0.50 | 0.00 | 0.50 | 0.00 | 0.25 | 0.25 | 0.25 | 0.01 | 2.00 | 0.26 |
| 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 | 0.00 | 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 | 0.00 | 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 | 0.00 | 1.00 | 0.63 |
| 8 | Drainage | | 0.25 | 0.00 | 0.25 | 0.39 | 0.25 | 0.10 | 0.25 | 0.00 | 0.00 | 0.10 | 1.00 | 0.59 |
| 9 | Government school improvement | 1 | 0.00 | 0.47 | 0.25 | 0.34 | 0.25 | 0.17 | 0.25 | 0.02 | 0.25 | 0.00 | 1.00 | 1.00 |
| | Total | | 1.50 | 1.03 | 3.00 | 1.12 | 4.00 | 0.94 | 2.50 | 0.75 | 2.00 | 0.20 | 13.00 | 4.04 |



# 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 30.06.2021)**

| ENVIRONMENTAL POLLUTION CONTROL | | | | | | | ENVIRONMENTAL & POLLUTION MONITORING | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sl.No** | **Expansion activity** | **Air pollution Control** | **Water pollution control** | **Solid waste Management** | **Noise Control** | **Occupational Health** | **Envt.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 | Envt.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 Mangement** | **Noise Control** | **OHC** | **Environmental survey & Sampling** | **Social Corporate Responsibility** | **Green belt development** |
| 1 | Coke oven plant | 0.01 | | | | | | | |
| 2 | Sinter plant | | | | | | | | |
| 3 | BF#2 | 0.20 | 0.02 | | | | | | |
| 4 | EOF #1 | | | | | | | | |
| 5 | LRF#1 | | | | | | | | |
| 6 | CCM#3 | | | | | | | | |
| 7 | BRM augmentation | 0.05 | | | | | | | |
| 8 | Blooming Mill augmentation | | | | | | | | |
| 9 | Pickling & Annealing plant | | | | | | | | |
| 10 | Peeled and ground | | | | | | | | |
| 11 | CPP II - Unit # 3 | 0.84 | | | | | | | |
| 12 | OHC | | 0.00 | 0.00 | | 0.10 | | | |
| 13 | Environmental survey & Sampling | 0.06 | | | | | 0.18 | 0.20 | |
| 14 | Corporate Social Responsibility | | | | | | | | |
| 15 | Greenbelt development | 0.02 | | | | | | | |
| **Total Rs. In Crs** | | **1.19** | **0.02** | **0.00** | **0.00** | **0.10** | **0.18** | **0.20** | **0.00** |
| **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.**

## INDEX

## 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

Date : 09.04.2021

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

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 ($CO_2$) from the atmosphere or capturing anthropogenic (human) $CO_2$ from large-scale stationary sources like power plants before it is released to the atmosphere. As Per CPCB ,India

Once captured, the $CO_2$ gas (or the carbon portion of the $CO_2$) is put into long-term storage. $CO_2$ sequestration has the potential to significantly reduce the level of carbon that occurs in the atmosphere as $CO_2$ and to reduce the release of $CO_2$ to the atmosphere from major stationary human sources, including power plants and refineries. There are two major types of $CO_2$ sequestration: terrestrial and geologic.

**Terrestrial**

Terrestrial (or biologic) sequestration means using plants to capture $CO_2$ 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 $CO_2$ at anthropogenic sources before it is released to the atmosphere and then transporting the $CO_2$ 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 –Enironmental 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 Pharmaceuiticals ,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 ,CERCELA, 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 $CO_2$ 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 |

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|---|---|---|---|---|
| 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, Pomegranarte |
| 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 Furit-50,Thekku-25,Almond-50,Tamarind-25,Neem-40,Ficus Racemosa-25,Guava-25,Kumil-50 |

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| 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,Banian 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,Banian-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,Banian-50,Guava-50,Thekku-50,Tamarind-50,Henna-50,Jamun Fruit-50,Eeati-50,Siris Tree-50,Yellow Konna-50 Sandel-5 |
| 76 | 10-Aug-20 | New Land area | 1000 | Jack Fruit-50,Guaya-50,Banian-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,Banian-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 |

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| 92 | 03-Sep-20 | Townchip 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 |

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| 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 |

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| 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 RESERVIOR | 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 |

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|---|---|---|---|---|
| 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 sequestrated 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 ($CO_2$) is the prime cause of global warming. The levels of $CO_2$ 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. $CO_2$ 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 $CO_2$ 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 $CO_2$, 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 $CO_2$ : $CO_2$ 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 fossils fuels used in transportation, residential and commercial buildings. $CO_2$ 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 $CO_2$, so that it can be transported to storage sites at high pressures.

The reason for concentrating the $CO_2$ stream is to make it economically feasible. Transportation of $CO_2$ 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 $CO_2$ 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 $CO_2$ 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 $CO_2$ 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 $CO_2$ 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 >= 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**

$CO_2$ 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 $CO_2$ is C+2*O=43.999915.

The ratio of $CO_2$ 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 $CO_2$ 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 "Agrofores 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:

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

240 lbs. * 120% = 288 lbs. green weight (roots included)

288 lbs. *80 = 230.4 lbs. dry weight

230.4 lbs. * 50% = 115.2 lbs. carbon

115.2 lbs * 3.6663 = 422.4 lbs. $CO_2$ sequestered

422.4 lbs / 10 years =42.2 lbs. $CO_2$ 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 $CO_2$ 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 $CO_2$ sequestered per year.

Or an Albizzia lebbek, 15 years old, 30 feet tall, with a 12 inch trunk: 76.0lbs. of $CO_2$ 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 $CO_2$ 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 lbs * 3.6663 = 73,326 lbs $CO_2$/ha/year, or, taking an average of 1,000 trees per hectare, 73.326 lbs $CO_2$/tree/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 than 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

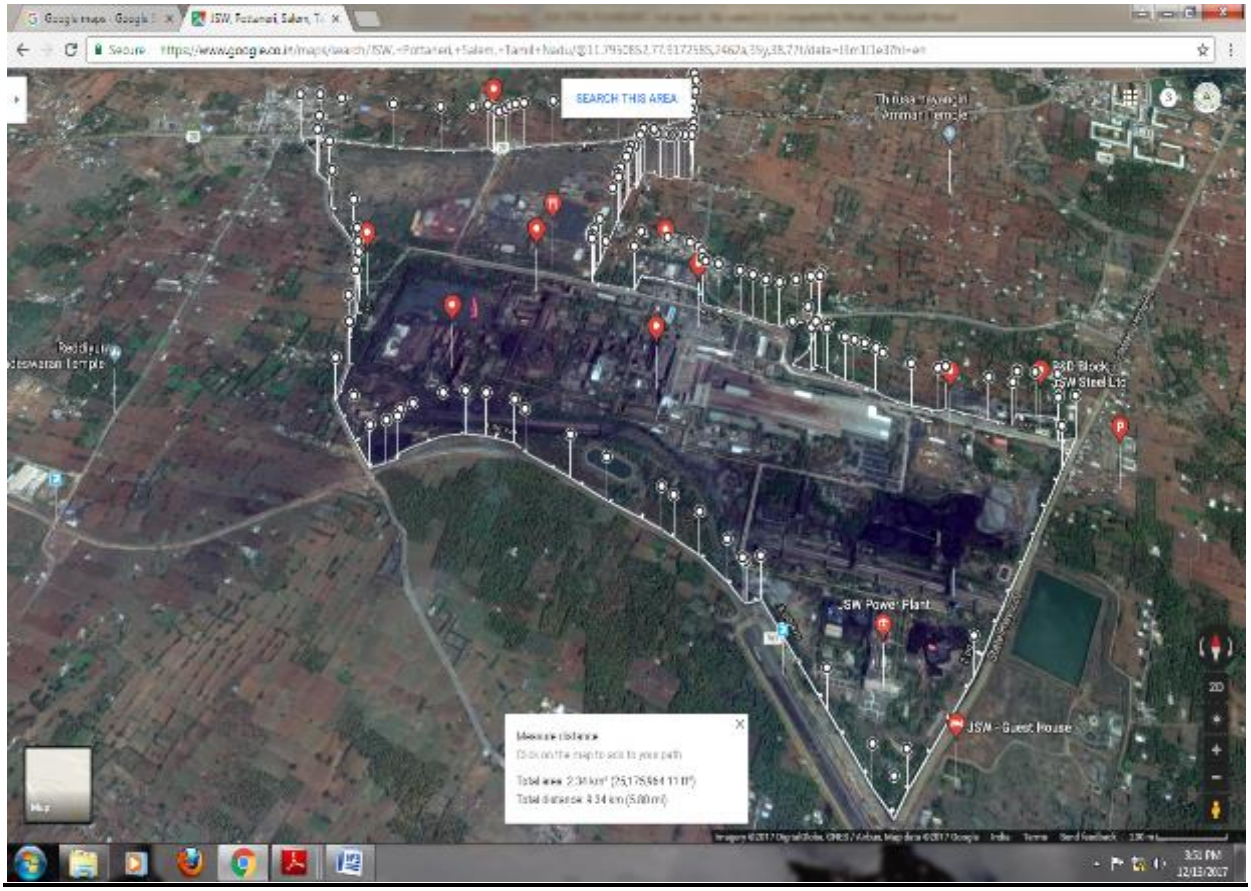
## XI. Site Visit

We performed Carbon Sequestration Study for the following areas

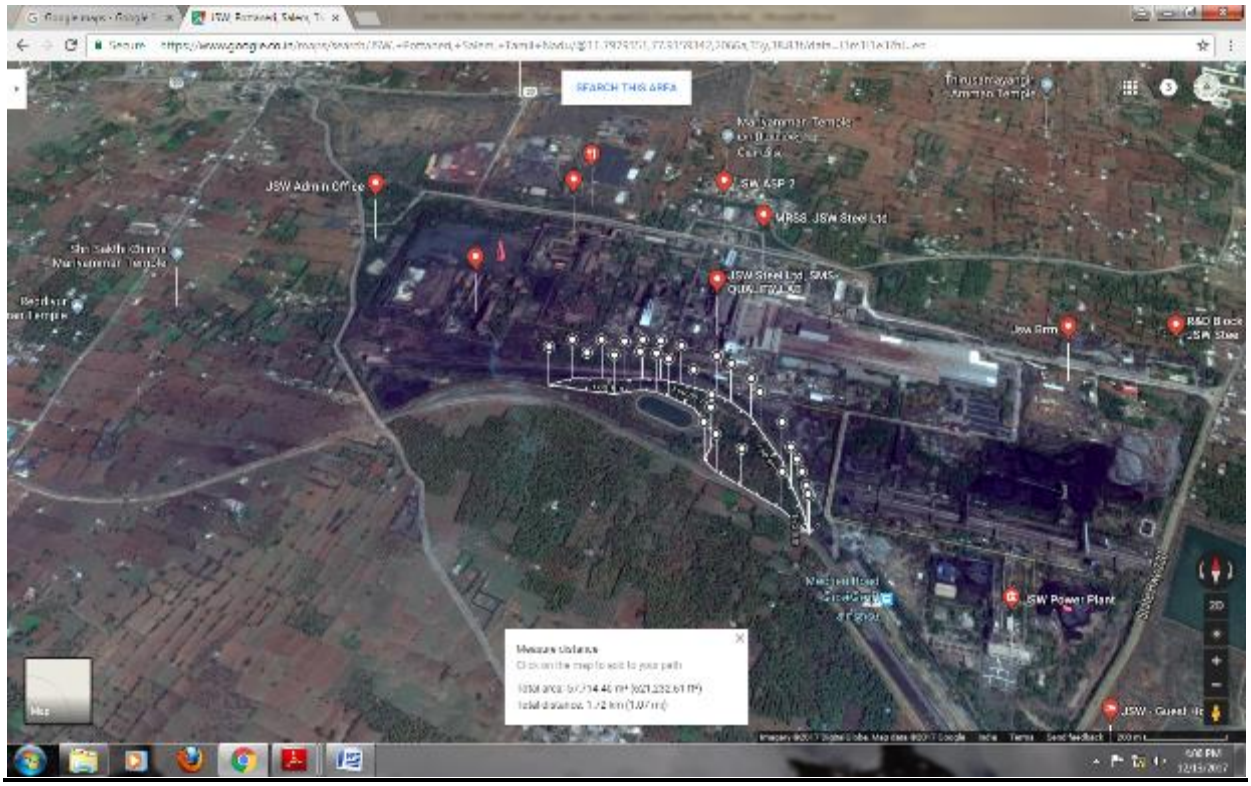
- Boundary's of plant
- Old gust house
- New gust house
- New plant area
- Temple area
- Wagon tippler
- Non Recovery Type Coke Oven Plant
- Sinter Plant
- Blast Furnace
- Steel Making
- Air Separation Plant
- Steel Refining
- Continuous Casting of Billets and Blooms
- Bar and Rod Mill
- Blooming Mill
- 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

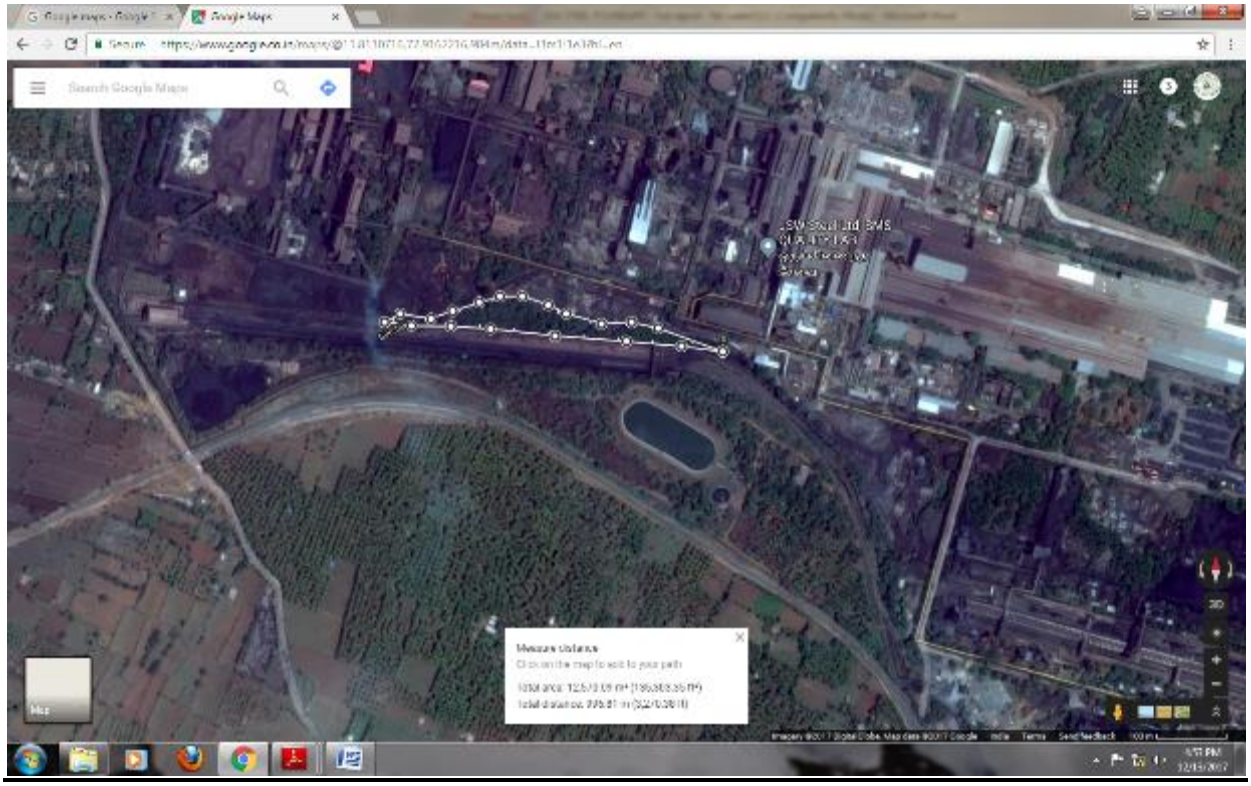
### Topo Map:

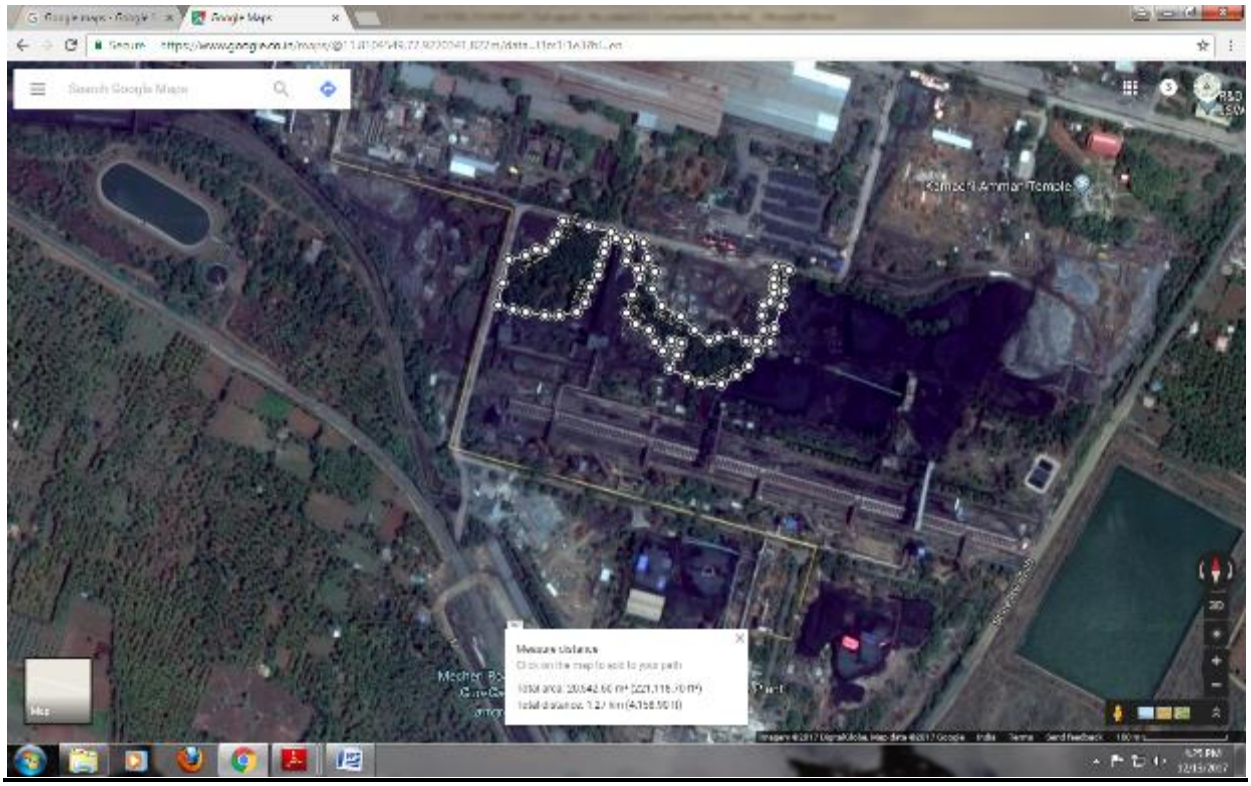
## Water Reservoir



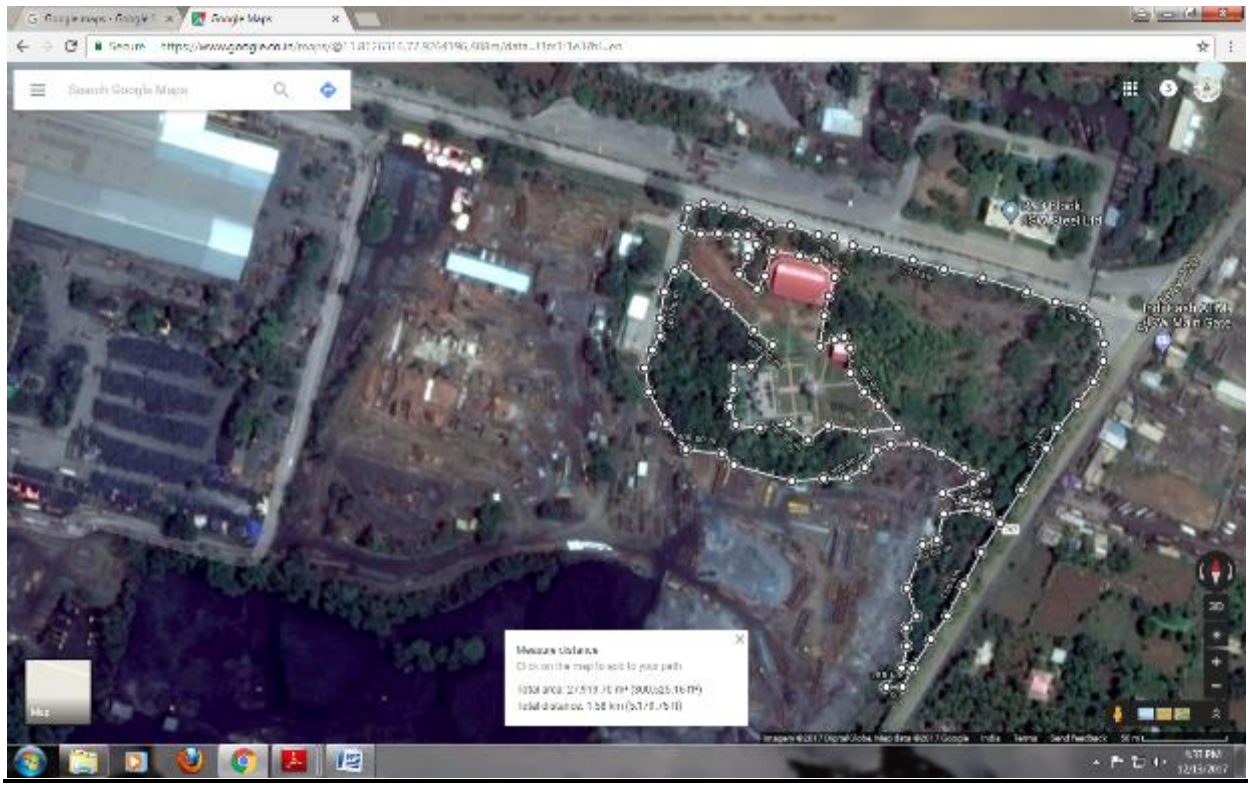

## Wagon to near by Water reservoir:



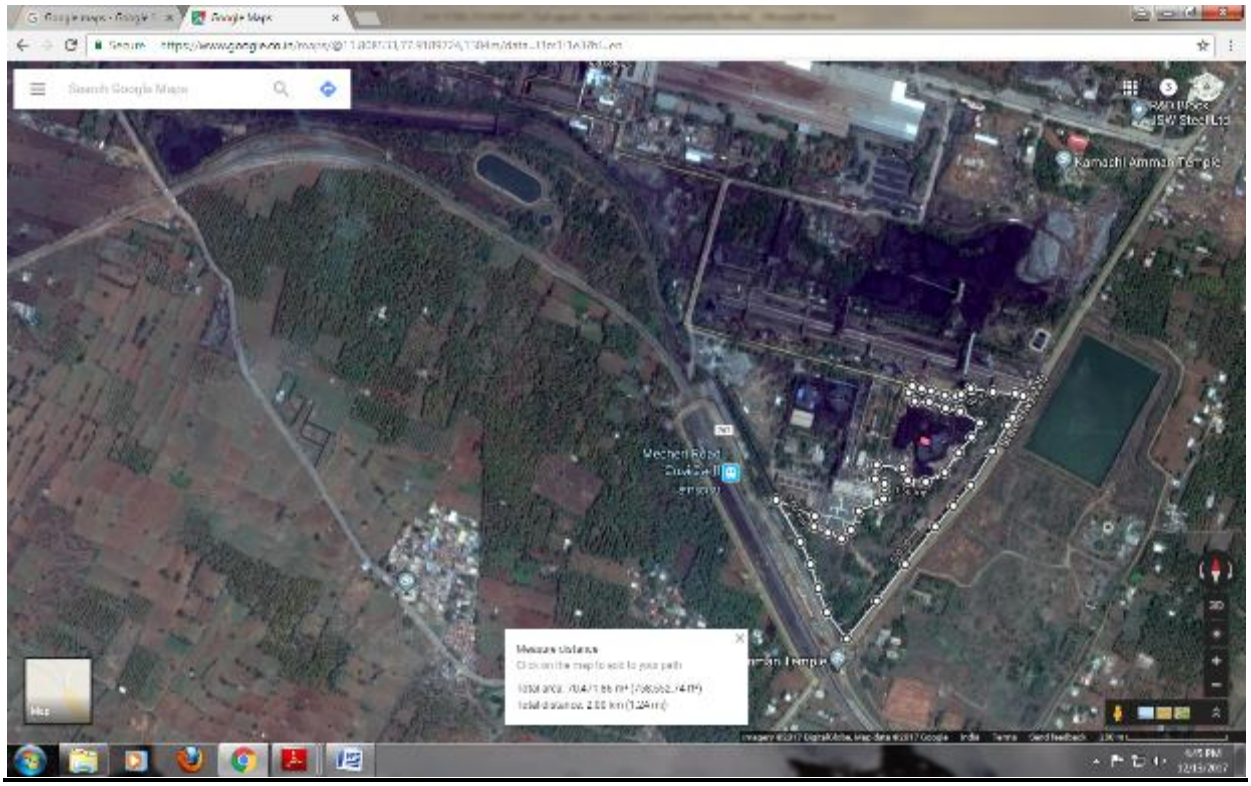
## Coke storage area



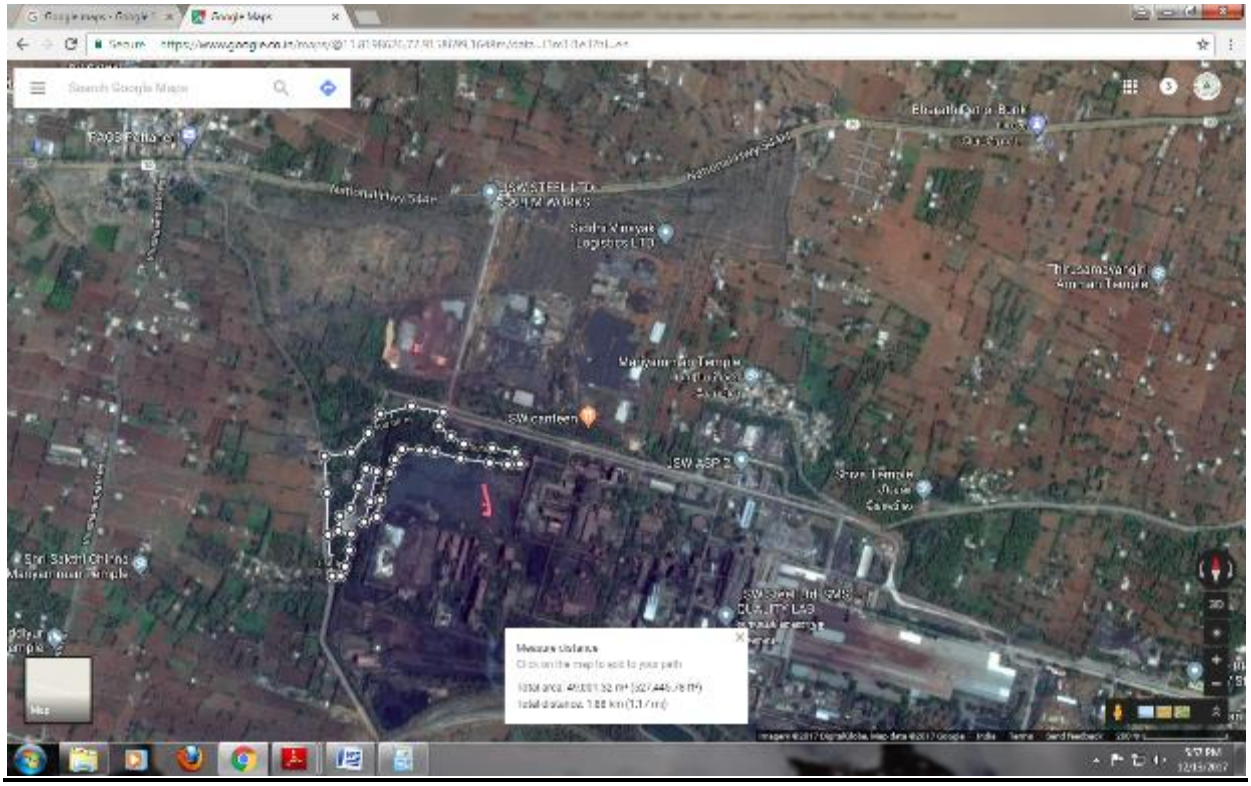
## Temple Area:



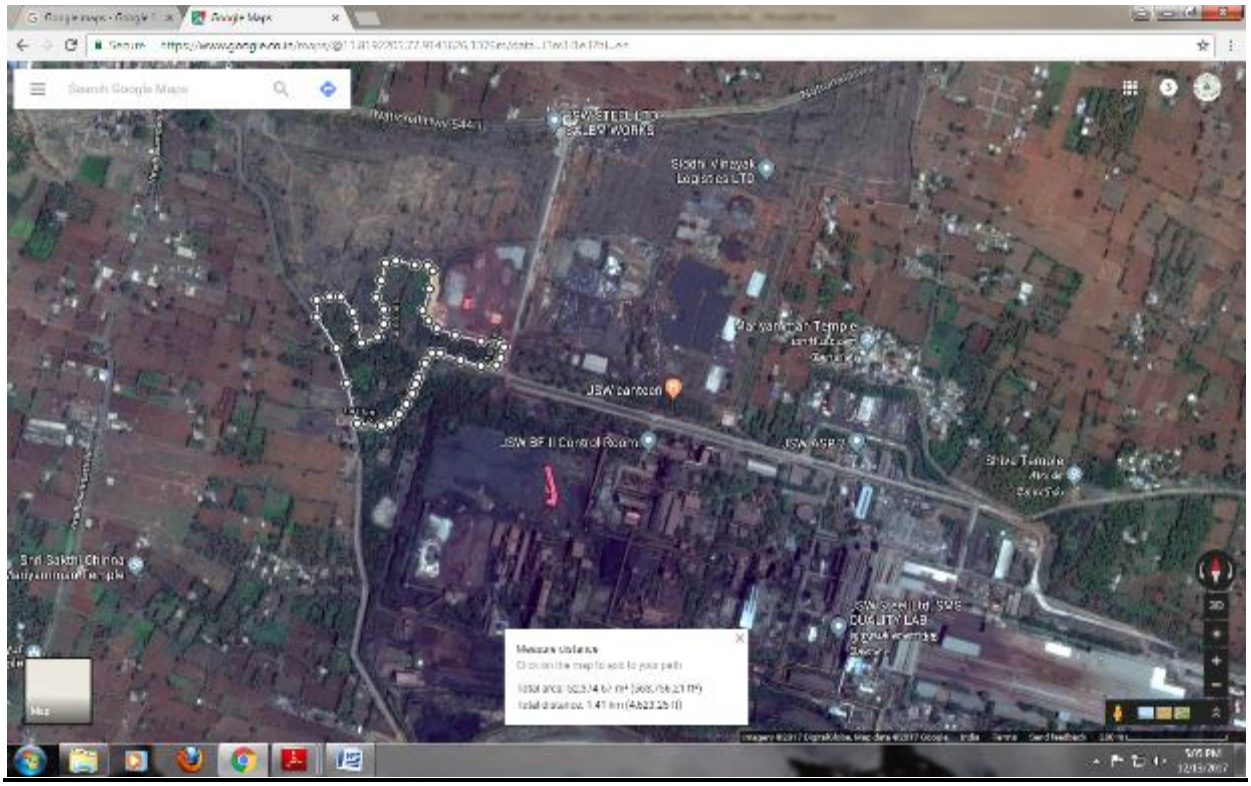
## JSW Power plant Area:



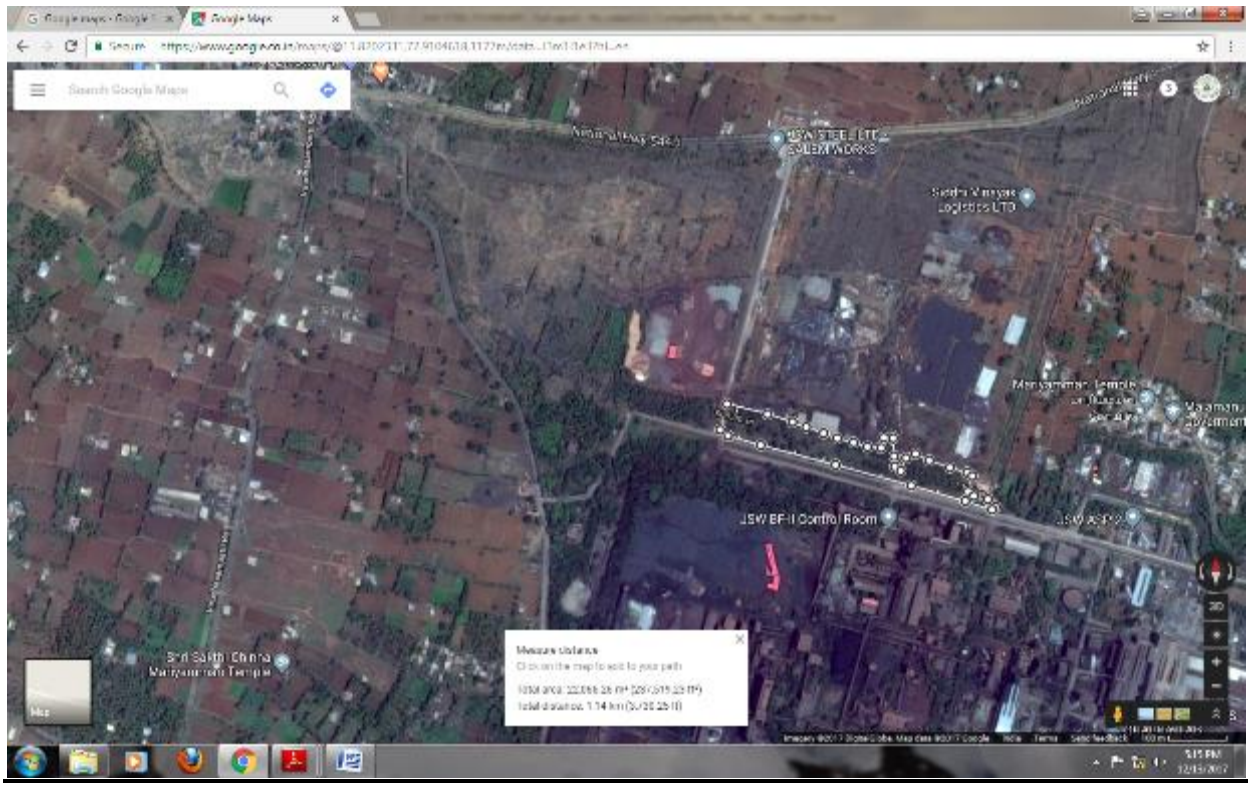
## Raw Material Yard (Admin Building)



## 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 (Ailenthus 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 f**or 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 SOx – 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) NOx 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 x (Dia)$^2$ x (Height) x (1.2 Wet weitht )x ( 0.8 dry weight ) x ( 50% carbon content ) x (3.6663 Co2 in Carbon ) x 0.454 ( Pounds to Kg ) / 1000 (Kg to Ton )**

| Sl.no | Botonical 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 lebbeck | 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 | 235.28 | 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 | 121.13 | 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 |

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|---|---|---|---|---|---|---|---|---|---|
| 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 | 117.71 | 10 | 11.8 |
| 591 | Saraca asoca | 289 | Temple East | 13.736 | 28.9 | 85934.27 | 315.06 | 12 | 26.3 |
| 592 | Tectona grandis | 600 | Temple East | 13.756 | 37.0 | 229162.85 | 840.18 | 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 | 210.38 | 18 | 11.7 |
| 595 | Tectona grandis | 305 | Temple East | 16.160 | 40.1 | 173973.38 | 637.84 | 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 | 118.88 | 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 | 122.02 | 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


In house Nursery Development

## 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.

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 |

| 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 36$^{th}$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 6$^{th}$ 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 |

| 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:**<br><br>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.<br><br>**Emission reduction:**<br>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. |
| Sinter Plant – 3 (90 SquareMeter) | - | 1.06 | 1.06 | |
| 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 |

| 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.<br><br>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**<br>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.<br>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 |

| 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.<br>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.<br>To maintain the acid temperature of $55^0$ in the pickling bath.<br>To maintain the treated spent acid temp. of $55^0$ for reuse.<br>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, $SO_2$ & NOx with 70, 1000 and 600 $mg/Nm^3$ respectively.<br>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. |

| 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<br>1x1750 KVA<br>3x275 KVA<br>1x650 KVA<br>1x400 KVA<br>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 | 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.<br><br>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 |

| 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 |

| 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 |

| 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 $SO_2$ 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 $PM_{10}$ – 54.71 to 70.98 µg/m$^3$; $SO_2$ – 9.55 to 14.68 µg/m$^3$; $NO_2$ – 19.63 to 27.53 µg/m$^3$. AAQ modelling study emissions indicates that the maximum incremental GLCs after the proposed amendment is 4.17 µg/m$^3$ with respect to $PM_{10}$, 0.62 µg/m$^3$ with respect to $SO_2$, 0.38 µg/m$^3$ with respect to $NO_2$.The proposed technological upgradation and other facilities will lead to reduction in pollution load – SPM by 11.8%, $SO_2$ 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 | | | | | |

| 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 | |

| 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.

    i. Particulate emission from the rod mill of slag grinding unit shall be less than 10 mg/Nm$^3$.
    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.

**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**

    i. Particulate emission from the rod mill of slag grinding unit shall be less than 10 mg/Nm$^3$.
    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.

**B. General conditions**

**I. Statutory compliance:**

    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.
    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.
    iii. The project proponent shall obtain authorization under the Hazardous and other Waste Management Rules, 2016 as amended from time to time.

**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.

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 $O_2$ 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 NOx 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

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. $CO_2$ 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.

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.

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; $PM_{10}$, $SO_2$, NOx (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), I$^{st}$ and II$^{nd}$ 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**

**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.

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 $11^0$ 48' 16" to $11^0$ 49' 2" N latitude and $77^0$ 0' 54" to $77^0$ 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 habitant 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 overlined 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 $m^3$/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:**

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.

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.

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.

iv. The project proponent shall provide for LED lights in their offices and residential areas.

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 $CO_2$ 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.

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.

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 $PM_{10}$, $PM_{2.5}$, $SO_2$ 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.

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.

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; $PM_{10}$, $SO_2$, NOx (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 Bhubaneshwar.

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.

7/7/17

**(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.**

7/7/17

**(Sharath Kumar Pallerla)**
**Scientist 'F'/Director**