Executive Summary of Environmental Impact Assessment & Environmental Management Plan (EIA/EMP) for Proposed FAB City and E-City Manufacturing Clusters

Submitted to
Telangana State Pollution Control Board
Sanath Nagar, Hyderabad, T.S

Submitted by
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Survey No. 91/4, Gachibowli Hyderabad
2016
### CONTENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Introduction</td>
<td>I</td>
</tr>
<tr>
<td>1.1</td>
<td>Categorization of proposed project</td>
<td>II</td>
</tr>
<tr>
<td>1.2</td>
<td>Description of Project</td>
<td>II</td>
</tr>
<tr>
<td>1.3</td>
<td>Selection criteria for Project location</td>
<td>II</td>
</tr>
<tr>
<td>1.4</td>
<td>Man power requirement</td>
<td>III</td>
</tr>
<tr>
<td>2.0</td>
<td>Project location</td>
<td>III</td>
</tr>
<tr>
<td>2.1</td>
<td>Land breakup of Project</td>
<td>III</td>
</tr>
<tr>
<td>2.2</td>
<td>Physical features</td>
<td>IV</td>
</tr>
<tr>
<td>2.2.1</td>
<td>Infrastructure availability</td>
<td>IV</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Water Requirement</td>
<td>IV</td>
</tr>
<tr>
<td>2.2.3</td>
<td>Power Requirement</td>
<td>V</td>
</tr>
<tr>
<td>2.2.4</td>
<td>Solid waste</td>
<td>V</td>
</tr>
<tr>
<td>2.3</td>
<td>Semiconductor and electronic manufacturing Industries –</td>
<td>VI</td>
</tr>
<tr>
<td></td>
<td>Technology &amp; process</td>
<td></td>
</tr>
<tr>
<td>2.3.1</td>
<td>Semiconductor and electronic manufacturing Industries</td>
<td>VI</td>
</tr>
<tr>
<td>2.3.2</td>
<td>Technology</td>
<td>VII</td>
</tr>
<tr>
<td>2.3.3</td>
<td>Cleaner Technologies</td>
<td>IX</td>
</tr>
<tr>
<td>2.4</td>
<td>Transport Connectivity</td>
<td>X</td>
</tr>
<tr>
<td>2.5</td>
<td>Ecological Sensitive areas</td>
<td>X</td>
</tr>
<tr>
<td>2.6</td>
<td>Socio Economic Environment</td>
<td>X</td>
</tr>
<tr>
<td>3.0</td>
<td>Baseline Environmental scenario</td>
<td>X</td>
</tr>
<tr>
<td>3.1</td>
<td>Micro –Meteorological data</td>
<td>XI</td>
</tr>
<tr>
<td>3.2</td>
<td>Land Environment</td>
<td>XI</td>
</tr>
<tr>
<td>3.3</td>
<td>Ambient Air Quality Study</td>
<td>XI</td>
</tr>
<tr>
<td>3.4</td>
<td>Noise Environment</td>
<td>XII</td>
</tr>
<tr>
<td>3.5</td>
<td>Water Environment</td>
<td>XII</td>
</tr>
<tr>
<td>3.5.1</td>
<td>Surface water quality</td>
<td>XIII</td>
</tr>
<tr>
<td>3.5.2</td>
<td>Ground water quality</td>
<td>XIII</td>
</tr>
<tr>
<td>3.6</td>
<td>Soil Quality</td>
<td>XIV</td>
</tr>
<tr>
<td>3.7</td>
<td>Biological Environment</td>
<td>XIV</td>
</tr>
<tr>
<td>3.8</td>
<td>Depth to ground water level</td>
<td>XV</td>
</tr>
<tr>
<td>3.9</td>
<td>Traffic Study</td>
<td>XV</td>
</tr>
<tr>
<td>3.10</td>
<td>Socio economic environment</td>
<td>XVI</td>
</tr>
<tr>
<td>4.0</td>
<td>Anticipated Impact and Mitigation Measures</td>
<td>XVI</td>
</tr>
<tr>
<td>4.1</td>
<td>Land Environment</td>
<td>XVI</td>
</tr>
<tr>
<td>4.2</td>
<td>Air Environment</td>
<td>XVI</td>
</tr>
<tr>
<td>4.3</td>
<td>Noise Environment</td>
<td>VII</td>
</tr>
<tr>
<td>4.4</td>
<td>Water Environment</td>
<td>XVII</td>
</tr>
<tr>
<td>4.5</td>
<td>Solid waste</td>
<td>XVIII</td>
</tr>
<tr>
<td>4.6</td>
<td>Socio economic aspects</td>
<td>XVIII</td>
</tr>
<tr>
<td>4.7</td>
<td>Biological Environment</td>
<td>XIX</td>
</tr>
<tr>
<td>5.0</td>
<td>Environment Monitoring Programme</td>
<td>XX</td>
</tr>
<tr>
<td>6.0</td>
<td>Additional studies</td>
<td>XX</td>
</tr>
<tr>
<td>6.1</td>
<td>Risk Assessment and Disaster Management Plan</td>
<td>XX</td>
</tr>
<tr>
<td>6.2</td>
<td>R&amp;R action Plan</td>
<td>XX</td>
</tr>
<tr>
<td>7.0</td>
<td>Project Benefits</td>
<td>XXI</td>
</tr>
</tbody>
</table>
## Executive Summary of Draft EIA & EMP report for Fab city and e-city manufacturing clusters, Maheswaram, Ranga Reddy district

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.0</td>
<td>Environment Management Plan</td>
<td>XXI</td>
</tr>
<tr>
<td>8.1</td>
<td>Land Environment</td>
<td>XXI</td>
</tr>
<tr>
<td>8.2</td>
<td>Air Pollution Management</td>
<td>XXI</td>
</tr>
<tr>
<td>8.3</td>
<td>Noise Pollution Management</td>
<td>XXII</td>
</tr>
<tr>
<td>8.4</td>
<td>Water Pollution Management</td>
<td>XXII</td>
</tr>
<tr>
<td>8.5</td>
<td>Waste Management</td>
<td>XXII</td>
</tr>
<tr>
<td>8.6</td>
<td>Biological Environment</td>
<td>XXIII</td>
</tr>
<tr>
<td>8.7</td>
<td>Green Belt Development</td>
<td>XXIII</td>
</tr>
<tr>
<td>8.8</td>
<td>Human Health and Safety Management Plan</td>
<td>XXIII</td>
</tr>
<tr>
<td>9.0</td>
<td>Conclusion</td>
<td></td>
</tr>
</tbody>
</table>

### Tables

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Area Statements of Proposed Fab City and e-City</td>
<td>III</td>
</tr>
<tr>
<td>2.1</td>
<td>Technology for the manufacturing support facilities</td>
<td>VII</td>
</tr>
<tr>
<td>2.2</td>
<td>Proposed Manufacturing Support Technologies at Non SEZ</td>
<td>VIII</td>
</tr>
</tbody>
</table>
Executive Summary

1.0 Introduction

The Government has initiated several initiatives for the development of Fab and electronics sector in the country. The Government has recently approved National Policy on Electronics (NPE). One of the important objectives of the NPE is to achieve a turnover of about USD 400 Billion by 2020 involving investment of about USD 100 Billion and employment to around 28 million by 2020. This inter alia includes achieving a turnover of USD 55 Billion of chip design and embedded soft ware industry, USD 80 Billion of exports in the sector. Moreover, the policy also proposes setting up of over 200 Electronic Manufacturing Clusters. Another important objective of the policy is to significantly upscale high-end human resource creation to 2500 PhDs annually by 2020 in the sector.

Reasons for Electronics in India:

- Inadequate infrastructure, stringent tax structures, limited R&D etc. are impediments to growth of Electronics sector in India.
- In order to ensure desired growth in the sector with the objective of meeting the demand domestically,
- The Semiconductor Policy is aimed at proposing fiscal incentives to boost semiconductor manufacturing in India and to make India a preferred destination for the manufacture of semiconductors and other high technology IT products like flat LCD/OLED/Plasma panel Displays and storage devices.
- Government of India (GoI) proposes to offer incentives to attract domestic & global investments into Electronics System Design and Manufacturing (ESDM) sector with Electronic Hardware Manufacturing Clusters (EMC) as a means and issued notification on EMC Scheme Dt.22/10/2012 and December, 2012.

GoI vision is to transform India into a global hub for ESDM to meet domestic and global demand as well.

In this direction, Fab city and e-city is intended to be a most advance technology park for manufacturing semiconductors, electronics and hundreds of other related products in India. Furthermore, necessary logistics, transportation systems, supply chain management system and all other aspects of the ecosystem for this purpose will also be developed to attract the best local and global companies to this Fab city and e-city.

Telangana State Industrial Infrastructure Corporation Ltd. (TSIIC) proposes “Fab city and E-city Manufacturing Clusters” at Raviryal, Srinagar and Immamguda villages,
Executive summary for Proposed EIA/EMP project of FAB and E-city Manufacturing Clusters, Ranga Reddy district, Telangana

Maheshwaram Mandal, Ranga Reddy district. Telangana State to emerge as a preferred destination for Manufacturing and assembling of electronic parts with International standards, ensuring easy accessibility and high quality of amenities for employees, safe environment and a distinct character and image.

1.1 Categorization of proposed project

As per EIA Notification of Sept.14, 2006 issued by MoEF & CC and subsequent amendments thereof the proposed projects falls under Category “B1” in Item 7 (C) of the schedule. In order to obtain prior environmental clearance from statutory authorities, EIA study has been carried out as per approved Terms of Reference (ToR) by Ministry of Environment & Forests and Climate Change (MoEFCC).

1.2 Description of the Project

The proposed Fab city and e-City Manufacturing Cluster will include plants manufacturing of Semiconductor chip and Advanced Semiconductor Plants like Photosolar cell Fab, PV solar module Assembly line, Thin Film Solar and system integration of solar energy solutions, solar photovoltaic panels, PCB manufacturing. Further Photovoltaic Module Design Manufacturing and Research & Development (R&D) facilities namely Assembling, Testing, Marking and Packing plant (ATMP) are also proposed to come up in this cluster. SEZ area in the cluster is majorly focused on manufacturing of Electronic SMPS transformers, UPS, stabilizers, antistatic and thermostatic equipments etc. Non SEZ area includes manufacturing of cartons/boxes, Bullet Proof Jackets, Bullet Proof Helmets and electronic accessories, Pulverized and grinding plants and Emesco books publishing & Printing of books.

The project proponent TSIIC will act as the facilitator for the development of infrastructure facilities like basic infrastructural facilities, common infrastructural facilities and environmental infrastructural facilities.

1.3 Selection Criteria for Project Location

Telangana State Industrial Infrastructure Corporation (TSIIC) has allotted a suitable land to the extent of 1169.77 acres at Raviryal, Srinagar and Immamguda Villages, Ranga Reddy District. The location has been selected considering various factors such as:

- The city is endowed with excellent infrastructure facilities like International Airport, 162 km Outer Ring Road (ORR) encircling the city,
- Asia’s longest (11.2 km) PVNR elevated expressway that connects Central Business District (CBD) of Hyderabad with Rajiv Gandhi International Airport, number of radial roads connecting ORR from all directions to the Internal Ring...
Executive summary for Proposed EIA/EMP project of FAB and E-city Manufacturing Clusters, Ranga Reddy district, Telangana

Road (IRR) and to the city centre facilitates easy mobility.

- The upcoming 71 km long Metro Rail Transport System (MRTS) along the three prime corridors of the city enhances the city inter linkages.
- No habitation
- No resettlement and rehabilitation

1.4 Manpower Requirement

The proposed Fab city and E-city manufacturing clusters requires various categories of manpower such as skilled, semi-skilled, unskilled workers, technicians, engineers, managers during the construction and operation phase. The manpower employed during construction phase will be as per the requirement from near by villages.

The manpower required for working in manufacturing and assembling units of EHP should be skilled, unskilled and supervisory. The estimated direct employment in the Fab City and e-City will be about 67000 persons while the expected indirect employment will be around 4.08 lakh persons.

2.0 Project Location

The geographic location of the proposed site is 78° 29’ 33.87" and 78° 30’ 22.20” East and 17° 12’ 22.77” and 17° 10’ 48.46” North. The study area falls under Survey of India (SOI) topo sheet No: 56K12NW, 56K11SW, 56K8NE, 56K7SE.

2.1 Land Breakup of Project

The proposed project will be developed by TSIIC as Fab city SEZ in an extent of 366.81 acres, e-city manufacturing cluster in an extent of 579.79 acres and the remaining extent of 223.17 acres is proposed as general industrial park for Fab and e-hardware units. The project will be developed in two phases. The total land available with TSIIC for the proposed Fab city and e-city Manufacturing clusters and percentage wise distribution of land break up for Fab city and E-city manufacturing clusters is shown in Table 1.1. The land break up for industrial activity, common facilities and green belt is drawn from the master plan.

Table: 1.1 Area Statements of Proposed Fab City and e-City

<table>
<thead>
<tr>
<th>Land use</th>
<th>Area in acres</th>
<th>Percentage of area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plotted area</td>
<td>785.58</td>
<td>67.16</td>
</tr>
<tr>
<td>Roads area</td>
<td>163.40</td>
<td>13.97</td>
</tr>
<tr>
<td>Open space/Green belt</td>
<td>122.83</td>
<td>10.50</td>
</tr>
</tbody>
</table>
Executive summary for Proposed EIA/EMP project of FAB and E-city Manufacturing Clusters, Ranga Reddy district, Telangana

<table>
<thead>
<tr>
<th>Land use</th>
<th>Area in acres</th>
<th>Percentage of area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common facilities</td>
<td>97.96</td>
<td>8.37</td>
</tr>
<tr>
<td><strong>Total Area of Processing Zone</strong></td>
<td><strong>1169.77</strong></td>
<td><strong>100.00</strong></td>
</tr>
<tr>
<td>Number of plots</td>
<td>No.</td>
<td>167</td>
</tr>
<tr>
<td>Number of plots</td>
<td>No.</td>
<td>78</td>
</tr>
</tbody>
</table>

An extent of 1169.77 acres is in possession of TSIIC for developing of Fab city and e-city Manufacturing clusters with about 245 plots is allotted for EMC and Green Industrial park

2.2 Physical Features

The proposed project area is at an altitude of 600 m above the mean sea level with few hillocks upto 641 m above mean sea level.

The site is at about 20 Km (aerial distance) south of state capital Hyderabad. The river Musi is flowing in North of the project at around 20 Km. The nearest major water bodies are Himayat sagar in NW at around 15 Km and Osman sagar in NW at around 20 Km. The nearest water body is Raviryal Cheruvu in North at about 1.5 Km. The nearest Railway line is Hyderabad to Mahbubnagar SCR broad gauge at around 10 Km NW.

2.2.1 Infrastructure Availability.

The major external infrastructure that is required for the proposed Fab City and e-City are:

- Strengthening and widening of the approach connector road from Srisailam Highway.
- Carriage way of 9m to 14m with central median since the RoW of 45m is proposed to the cluster.
- 33/11kV HT Line from proposed 220 kV Substation at Fab city and e-city to the proposed cluster.
- Water supply pipeline for transfer of allocated water to the proposed EHMC consisting of Fab City and e-City.

2.2.2 Water requirement

Considering the plotable area in the park and plot size of each industry, water requirement for Fab city and E-city manufacturing clusters is estimated as 17 MLD. The source of water is from Hyderabad Metropolitan Water Supply and Sewage Board (HMWS&SB).
2.2.3 Power requirement

The total electrical power requirement for the entire Fab city and E-city Manufacturing clusters is estimated as 125 MVA. The total required power will be supplied by Telangana State Central Power Distribution Company Limited (TSPDCL) of TS Transmission Corporation Limited (TSTRANSCO) is responsible for undertaking distribution and bulk supply of power in this area.

A 220/132 KV substation was proposed at Maheshwaram to ensure dedicated, uninterrupted power supply to the proposed EMC.

Power backup:

The emergency backup power requirement will be met through DG sets. Each individual industry will install the DG set based on their requirement. The CPCB approved low sulphur fuel generators will be recommended with stacks as per CPCB norms. It is also proposed to use solar power as alternative source of energy.

2.2.4 Solid waste

The waste from the units will be recovered/ segregated and hazardous waste will be sent to Hazardous waste disposal site for land filling.

The hazardous waste generation from the Fab city and e-city is very minimum. It is the responsibility of individual industry to send the waste to the Treatment, Storage and Disposal Facility (TSDF) plant at Dundigal for safe disposal. Apart from this, the sludge generated from the proposed CETP will be disposed to TSDF.

Effluent waste

The industries in Fab City and e-City which proposes to establish their own Effluent Treatment Plant (ETP) in their premises will treat the effluent and domestic sewage to meet on land discharge standards strictly as per the norms of TSPCB and the treated waste water will be utilized for greenbelt development, toilet flushing, floor cleaning etc.

In line with this approach, Infra-structure Leasing & Finance Services has constructed CETP with 1.1 MLD capacity and the same was upgraded to 10 MLD.
2.3 Semiconductor and Electronic Manufacturing Industries - Technology and Process

2.3.1 Semiconductors and Electronic Manufacturing industries

The electronics industry includes- the manufacture of: passive components (resistors, capacitors, inductors); semiconductor components (discretes, integrated circuits); printed circuit boards (single and multilayer boards); and printed wiring assemblies.

Semiconductors: Semiconductors are produced by treating semiconductor substances with dopants such as boron or phosphorous atoms to give them electrical properties. Important semiconductor substances are silicon and gallium arsenide. Manufacturing stages include: crystal growth; acid etch and epitaxy formation; doping and oxidation; diffusion and ion implantation; metallization; chemical vapor deposition; die separation; die attachment; post-solder cleaning; wire bonding, encapsulation packaging; and final testing, marking and packaging. Several of these process steps are repeated several times so that the actual length of the production chain may well exceed one hundred single processing steps. Between the repetitions a cleaning step which contributes to the amount of effluent produced by the process is often necessary. Production involves carcinogenic and mutagenic substances and therefore production should be carried out in closed systems.

Printed circuit board (PCB) manufacturing: There are three types of boards: single sided boards (circuits on one side only); double sided boards (circuits on both sides); and multilayer boards (three or more circuit layers). Board manufacturing is accomplished by producing patterns of conductive material on a non-conductive substrate by subtractive or additive processes (the conductor is usually copper; the base can be pressed epoxy, teflon, or glass). The subtractive process is the preferred route and the steps include: cleaning and surface preparation of the base; electroless copper plating; pattern printing and masking; electroplating; and etching.

Printed wiring assemblies: Printed wiring assemblies consist of components attached to one or both sides of the printed circuit board. Attachment may be by ‘through hole’ technology where the ‘legs’ of the components are inserted through holes in the board and are soldered (solder is usually a tin-lead alloy) in place from underneath, or by ‘surface mount’ technology (SMT) where components are attached to the surface by solder or conductive adhesive. PCBs of all types may require that drilled holes be copper-plated to ensure interconnections between the different copper layers. SMT allows much denser packing of components, especially when components are mounted on both sides. It also offers higher speed performance and is gaining importance over ‘through-hole’ technology.
2.3.2 Technology

Table 2.1. Technology for the manufacturing support facilities

<table>
<thead>
<tr>
<th>Type of Equipment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDA Design Suite (Mentor Graphics, Cadence, Synopsis &amp; Multisim)</td>
<td>Electronic Design tools are used to develop Electronic System level designs of IC’s, SOC’s, Transistor designs etc.. These tools have the comprehensive capabilities to do system level designs, Electrical &amp; wire Harness designs, FPGA &amp; ASIC designs, Functional verification of all semiconductor systems, IC design, Mechanical Analysis, PCB design, Silicon Test &amp; Yield Analysis, System modeling, Power analysis etc..</td>
</tr>
<tr>
<td>High Frequency Circuit Design (ADS &amp; AWR)</td>
<td>The wireless revolution that brought smart phones and wifi-enabled everything to you, is largely thanks to the RF software is what microwave and RF engineers use to design wireless products from base stations to cell phones to satellite communications. In a powerful and easy-to-use interface, these tools pioneers the most innovative and commercially successful technologies, such as X-parameters* and 3D EM simulators, used by leading companies in the wireless communication &amp; networking and aerospace &amp; defence industries. For WiMAX™, LTE, multi-gigabit per second data links, radar, &amp; satellite applications, these tools provides full, standards based design and verification with Wireless Libraries and circuit-system- EM co-simulation in an integrated platform.</td>
</tr>
<tr>
<td>First Silicon Design Verification System</td>
<td>In the semiconductor design process, after the software design, the design is sent to a Fab for developing a Silicon Wafer (prototype), which is validated using the 1st silicon verification system to check the correctness of the design and the design iterations are done and changes are implemented in the software design.</td>
</tr>
<tr>
<td>Semiconductor Design Hardware Lab (Bench top &amp; Automated Design Checks)</td>
<td>In the Silicon prototype design validation apart from the 1st silicon validation tests done using Automated Equipment, most of the design engineers are used to debug the simpler and smaller changes using the Bench Top systems which are very common in the design Lab. These will include a High Speed &amp;</td>
</tr>
</tbody>
</table>
Executive summary for Proposed EIA/EMP project of FAB and E-city Manufacturing Clusters, Ranga Reddy district, Telangana

<table>
<thead>
<tr>
<th>Type of Equipment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth Mixed Signal Oscilloscopes, Spectrum Analyzers, Signal Generators and Precision Power Measurement Units.</td>
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</tr>
</tbody>
</table>

Table 2.2 Proposed Manufacturing Support Technologies at Non SEZ

<table>
<thead>
<tr>
<th>Type of Equipment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td></td>
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<tr>
<td>Antenna &amp; Impairment Modelling Suite (FeKo, Antenna Magus, ADI)</td>
<td>This is a Antenna design and Modeling software which is used extensively in Tele- Communication Systems, RF systems and any high frequency system.</td>
</tr>
<tr>
<td>Rf &amp; Embedded Software development Suite (C,C++,Java,.NET, MatLab, LabVIEW)</td>
<td>Used to develop the embedded applications in all industry segments and also used to deploy these applications on multiple different hardware platforms with compilers. These tools are design tools, which can be sued to do system level design or core low level design.</td>
</tr>
<tr>
<td>Mixed Signal Embedded Electronics Design &amp; Validation Suite (Lab with all Equipment)</td>
<td>During the design phase on the hardware, multiple debugging tools for verification of the design and changing the design are used by most of the embedded engineers in all the sectors. These will include Digital Oscilloscopes, Signal Generators, Power Supplies, Logic Analyzers Etc.</td>
</tr>
<tr>
<td><strong>Prototype</strong></td>
<td></td>
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<tr>
<td>Embedded Design Prototyping Board on Micro-controllers, Processors, FPGA &amp; ASIC's. (TI, Free scale, ARM, Micro chip, AD, Xilinx, Altera, Intel &amp; Atmel)</td>
<td>After the software design or the system level design the embedded engineers, use various different embedded hardware platforms for prototyping their applications. These will work on multiple operating systems like Linux, Windows Embedded, Ubuntu, Android, Windriver, uS, QNX, Nucleus etc.)</td>
</tr>
<tr>
<td>RF &amp; Telecom Protocol Emulator (PXI RF System)</td>
<td>In the telecom space, Most of the wireless protocols like WiFi, WIMAX, LTE, GSM, etc are written in software and then deployed on to hardware or the chipsets are directly used for system development. The prototype station, will be useful in developing new Wireless telecom standards and prototype them using this generic software defined platform, which can generate any type of RF signal as defined by the protocol.</td>
</tr>
<tr>
<td>Medical Signal Simulator Lab</td>
<td>All the embedded medical equipments are validated in the prototype stage using the signal simulators before any human or animal tests. These are mandatory part of</td>
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</tbody>
</table>
### Type of Equipment

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<thead>
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<tr>
<td>Medical Electronic Bench for Prototyping</td>
<td>This is an embedded hardware setup which has the prototype boards with processors and IO’s specific to the medical segment, for prototyping the some low end medical devices like ECG, EEG, monitors etc. The high end system to monitor ultrasounds, and high bandwidth data IO’a are also configured as an add on system.</td>
</tr>
<tr>
<td>PCB Fabrication &amp; Verification</td>
<td>After the system design and PCB design, the PCB design is given to the PCB manufacturing unit for developing a prototype of the multi layered PCB. Most of the applications today use a minimum of 4 Layered to 30 Layered PCB’s. Most of the Telecommunications boards are 12 to 30 layered PCB’s.</td>
</tr>
<tr>
<td>SMT (Surface Mount Technology &amp; Through Hole Technology)</td>
<td>After the PCB is designed the components are mounted on the PCB using SMT or Through hole technology. These will have automated Pick and Place and solder systems, which will give the final prototypes with components and PCB’s as a system.</td>
</tr>
</tbody>
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#### 2.3.3 Cleaner Technologies

- Organic solvent losses can be reduced by conservation and recycling, through closed loop delivery systems, hoods, fans, and stills. Installation of activated carbon systems can achieve up to 90% capture and recycle of organic solvents used in the system.
- All solvents and hazardous chemicals (including wastes) require appropriate safe storage to prevent spills and accidental discharges.
- All tanks, pipe work and other containers should be situated over spill containment trays whose dimensions are large enough to contain the total volume of liquid over it.
- Containment facilities must resist all chemical attack from the products. In lieu of containment facilities, the floor and walls, to a suitable height, may be treated (e.g., by an epoxy product, where chemically suitable) to prevent the possibility of leakage of accidental spills into the ground (untreated cement or concrete or grouted tile floors are permeable), with suitable door sills.
- It is unacceptable to have a drain in the floor of any shop where chemicals of any description are used or stored, except where such a drain leads to an adequate water-treatment plant capable of rendering used or stored chemicals in its catchment area.
2.4 Transport Connectivity

Road

The project site has excellent road network connecting Outer Ring Road (ORR), Srisailam Road, NH 44 and NH 65.

Rail Connectivity

There are three main railway terminals, viz. Hyderabad or Nampally, Secunderbad and Kachiguda. Secunderbad Station is located in the central part of the city, which is the main railway station. The city has several other railway stations for local trains. Broad-gauge South Central Railway line connecting Hyderabad and Bangalore passes at a distance of about 18 km towards the west of the project site. The nearest station is located at Timmapur which is about 19 km from the project site.

Air Connectivity

The nearest airport to the project site is Rajiv Gandhi International Airport located at Shamshabad.

2.5 Ecological Sensitive Areas

No ecologically sensitive sites, Archaeological Sites/Protected monuments/Precincts of Archaeological importance have been sited within the boundary of the Fab city and e-city manufacturing cluster.

2.6 Socio Economic Environment

As per 2011 census of Telangana, the district recorded a total population of 52.96 lakhs from 12,35,341 households of which 3,49,140 rural and 8,86,201 urban, with a rural population of 15.77 lakhs and 37.19 lakhs urban. The study area falls in Maheshwaram village, revenue mandal of Maheshwaram, Ranga Reddy district of Telangana State.

3.0 Baseline Environmental Scenario

Environmental Baseline Monitoring (EBM) is a very important stage of EIA. EIA Report contains a description of the existing environment that would be or might be affected directly or indirectly by the proposed project. On one hand EBM plays a very vital role in EIA and on the other hand, it provides feedback about the actual environmental impacts of a project.
Base line environmental status of the project area has been monitored for various environmental attributes within 10 km radius of the study area for post monsoon i.e., September, 2015 to December, 2015. The major environmental attributes covered in the EIA/EMP include ambient air quality, water quality (surface & ground) noise levels, soil quality, traffic study, biological, land use and hydrogeology, and socio economic conditions.

As the immediate impact due to the project activities is considered in 10 km of the project site, the intensive monitoring was conducted in the post monsoon season within 10 km radius from the project site.

3.1 Micro – Meteorological data

The meteorological data was recorded on hourly basis for the study during the period, 1st September 2015 to 30th November 2015, for the parameters of wind direction, wind speed, temperatures, relative humidity and rainfall. Automatic meteorological stations were installed at project site for monitoring of micro-meteorology in Fab city and E-city project.

The predominant wind direction is blowing from North East (NE) followed by South West (SW) direction and Calm conditions prevailed is 42.99 % during the season. The maximum wind speed recorded was 22.0 m/s. The maximum temperature recorded was found to be 37.1 °C, while the minimum temperature was 17.1 °C and the average temperature is 25.1 °C. The total rainfall is 182.3 (mm).

3.2 Land Environment

Based on the scale and the satellite resolution the Land Use/Land Cover classification can be made. Level III classification has been adopted while carrying out the analysis. Digital image processing is carried out to delineate various land use / land cover categories viz, built up land, built-Upland (Layouts), Industrial area, built-up land – I.E., Crop land-double, Crop land-single., Fallow Land., Agriculture plantations., Dense/closed Forest, open/ forest, forest blank, forest plantations, scrub forest, Mining Quarry, Scrub Land, Salt affected Land, river/canal/drain, water bodies and Rock area. The delineation is based on tone, texture, size, and shape pattern and location information. The interpreted land use classification was verified on ground at limited points and final land use/ land cover map was prepared.

3.3 Ambient Air Quality Study

The ambient air quality was monitored in the study area as per MoEF/CPCB guidelines.
The prime objective of the study was to assess the existing ambient air quality of the proposed Fab city and e-City study area. The ambient air quality monitoring was carried out at 10 locations within 10 kms radius of the study area during during post monsoon season

The summary of ambient air quality data generated for the post monsoon season for the study indicates that the observed concentrations for the monitored parameters are well within the National Ambient Air Quality Standards (NAAQS) as notified by CPCB, 2009.

3.4 Noise environment

Baseline noise levels have been monitored within the study zone, using a high precision sound level meter. At random noise level measurement locations were identified for assessment of existing noise level status, keeping in view the land use pattern, existing industries, vehicular traffic, residential areas in villages, schools and bus stands, etc., the day levels of noise have been monitored from 6 am to 10 pm and the night levels during 10 pm to 6 am.

A detailed survey on noise environment was carried in and around the project site at 6 locations to study the hourly equivalent noise levels as per IS: 4594 – 1968. Spot noise levels were measured for 24 hours on hourly basis by using a high precision sound level meter within the study area. Summary of the noise quality data generated during the study period is observed that the noise levels in terms of Leq Day and Leq Night are well within the stipulated standards for residential area.

3.5 Water Environment

The impact of the proposed project on the water environment was assessed by studying the quality of groundwater and surface water bodies in the study area. The sampling locations were selected considering their proximity to the project site. A total of 20 water samples i.e., 8 samples from surface water and 12 samples from groundwater were collected and analyzed for various physico-chemical and bacteriological parameters. The water quality results are compared with IS: 10500 standards of groundwater quality and surface water quality with IS 2296, 1982 and CPCB Water Quality Criteria, Class-A *(Drinking Water Source without conventional treatment but after Disinfection)*, Class-B (outdoor bathing (organized) and Class-C *(Drinking Water Source with conventional treatment and after Disinfection)*, Class-D propagation of wild life fisheries and Class-E *(Irrigation, Industrial cooling, controlled waste disposal)*. 
3.5.1 Surface Water quality

The analysis results of surface water samples are compared with IS: 2296-1982, and CPCB water quality criteria.

a. Comparison with CPCB water quality criteria

In accordance with CPCB water quality criteria, parameters studied were pH, DO, BOD and total coliforms. It was observed that all the surface water samples have DO values ranging from 4.6 mg/L to 5.8 mg/L and BOD was found to be above 3 mg/L at Raviryal (SW-1), Project site (SW-2), Turkayamjal (SW-5) and Between Immaguda & Saraswathiguda (SW-6), and they fall under the Class – E of CPCB water quality criteria.

The surface water samples collected from the locations Baghmnkal (SW-3), tukkuguda (SW-4), Chenduguda (SW-7) & Thimmapur (SW-8), fall under the Class – C of CPCB water quality criteria, where total coliforms are above 500 MPN/100mL.

From the analytical results it can be observed that the surface water samples collected from all the locations require suitable treatment to make them potable.

3.5.2 Ground water Quality

The groundwater samples analysis results were compared with IS:10500 desirable and permissible limits, which are stipulated for water to be fit for drinking purpose with ground water as source.

- pH values were in the range between 6.9 to 7.5 in the groundwater samples collected within the study area. The turbidity values were well within the permissible limits.
- The total alkalinity concentration for the samples collected at all the locations were below the permissible limit of 600 mg/L, except for the sample collected at Nadargal GW-8 (681mg/L).
- The TDS concentration was observed to be below the permissible limit of 2000 mg/L for all the locations. The total hardness concentration was observed to be within the permissible limit of 600 mg/L for all the locations, except for the samples collected at Jannaiguda at site (GW-1), Sardarnagar (GW-2), Nadargal (GW-8) and Patelguda (GW-12).
- The calcium concentration is below the permissible limit of 200mg/L at all the locations, except for the sample collected at Turkayamja (GW-9) (216 mg/L) and magnesium concentration at all the locations were below the permissible limits of 100 mg/L, except for the samples collected at Srinagar (GW-4) (131mg/L), Kongarkala Tanda (GW-5) (108 mg/L).
The nitrates concentration is above the permissible limit of 45 mg/L, for the locations Sardarnagar (GW-2) (86 mg/L), Kongarkala Tanda (GW-5) (119 mg/L), Bamandlakunta Tanda (GW-6) (175 mg/L), Nadargal (GW-8) (50 mg/L), Turkayamjal (GW-9) (309 mg/L), Manneguda (GW-10) (164 mg/L), Thimmapur (GW-11) (72 mg/L) and Patelguda (GW-12) (107 mg/L). The sulphates concentration in all the groundwater samples observed to be below the permissible limit of 400 mg/L. The fluoride concentration in all the groundwater samples observed to be well within the permissible limit of 1.5 mg/L, except for the samples collected at Raviryal (GW-3) (1.76 mg/L), Srinagar (GW-4) (1.57 mg/L), Kongarkala Tanda (GW-5) (1.50 mg/L).

The concentrations of heavy metals, Iron (as Fe), Cadmium (Cd), Manganese (as Mn), Copper (Cu), Lead (Pb), Zinc (as Zn), Arsenic (as As), were either below the detection limits or below the permissible limits.

3.6 Soil Quality

The soil sampling locations were selected to assess the existing soil conditions and geological features in the study area. The soil quality monitoring was carried out at 4 locations within 10 kms radius of the study area Post monsoon seasons. The soil quality i.e. physical, chemical and nutrient status of study area in post monsoon season is discussed below.

The textural classifications of soils are sandy clay, silty clay, sandy clay and clay loam. The soils have good moisture and nutrient retention capacity and moderate in permeability. The Nitrogen value ranged from 113 to 150 kg ha\(^{-1}\) reflecting that the values are observed to be in good category. The minimum value was observed at project site, Raviryal village and the maximum value was observed at Kongarkala Tanda. The Phosphorus value ranged from 7 to 16 kg ha\(^{-1}\) indicating that the values varied from very less to less category. The Potassium value ranged from 383 to 426 kg ha\(^{-1}\) indicating that values are observed to more than sufficient category. The maximum value was found at Project site and the minimum value was observed at Kongarkala Tanda.

3.7 Biological Environment

Floral Diversity

The study was aimed at enumeration of the available plant resources including endangered species and obtaining a broad representation of the existing floristic variations in the project lease area and surrounding project site. The core and buffer areas of the proposed project site was surveyed through criss-cross walking and collected plant specimens for the study of floristic diversity and inventorized the floral
resource. The core zone has total 92 species comprising of 20 trees, 22 shrubs, 42 herbs and 8 climbers. The common tree species encountered were *Pongamia pinnata*, *Carissa spinarum*, *Erythroxylum monogynum*, *Acacia nilotica* and *Azadirachta indica*. Out of the 92 species encountered, 47 species were found to be medicinally important. There are no rare, threatened or endemic plant species found in the study area.

**Faunal Diversity:**

The faunal diversity in the core zone and buffer zone around 10 km was enlisted through a Rapid Faunal multi species Inventory. Literature search (Classical / other works on reported faunal resources / studies) on occurrence, distribution and faunal composition for core and with in 10 kms radius of the proposed sites was done. Further the survey was made in confirming availability of potential endemic and or endangered faunae, if reported, and the likely impact of the fab city and e-city manufacturing clusters activity in the site.

**Results of Floral and faunal Diversity**

From the Flora-Fauna survey, it can be seen that, the core zone of the proposed Fab city & E-city Cluster does not have any endangered species of Flora or Fauna.

**3.8 Depth to Ground water level**

Hydro geomorphologically the proposed site (with in the 10km radius of study area) mostly covered with Shallow weathered pediplains, moderately weathered pediplains, Pediment inselbergs complex and Residual hills. Based on the water level data collected on December 2015, post monsoon the depth to water level is due to undulatory nature of the terrain and different geological setup with complex type of hydrogeomorphological structures present in the Fab city.

The deficit rainfall during 2011 to 2013 has resulted in over exploited conditions in Mahesswaram, Kandukur mandals and this scenario has gradually changed from 2014 for immediate replenishment of resources in aquifers. The deeper aquifers in hard rocks are tapped by bore wells of 60 to 120m depth. Depth of bore wells level indicates that in general the water level is deep particularly in the Rachalur (40.00m), Sultanpur (35.50m) Nadargul Reddy colony (32.85).

**3.9 Traffic Study**

The traffic density study has been conducted near Fab City entrance (outer ring road junction to Fab City on Srisailam highway road) to study the impact on the existing traffic
conditions and recommendations for traffic management. The study has been carried out on four line highway road (NH44) on working day and Non working day for 24 hrs. The noise level from the traffic data survey is compared to the Noise Pollution (Regulation and Control) Rules, 2000 (industrial area) in terms of Leq Day and Leq Night is exceeding the stipulated standards.

3.10 Social Environment

The information on socio-economic aspects of the study area has been collected from various secondary sources, which include public offices, semi-government and government offices. The proposed project study area falls under Raviryal, Immamguda village, revenue mandal of Maheshwaram, Ranga Reddy district of Telangana.

4.0 Anticipated Impact and Mitigation Measures

Anticipated environmental impact prediction during construction and operation phase of the project shall include- air quality, noise, water quality, soil, Biological impact and socio-economic impacts.

4.1 Land Environment

Prior to construction, land will be developed by leveling and grading. During construction, the vegetation cover will be disturbed. There will be change in land use of the area. The major anticipated impacts would be;

- Compaction of soils by earth moving equipment
- Erosion and modification of surface

The present land use of the area falls under both barren and undeveloped. After proposed Fab city and e-city construction, land use will change to industrial category.

4.2 Air Environment

- Impacts

- Vehicular emissions are the major source of air quality impacts. The principal cause of air pollution during the construction phase is the diesel-powered vehicles used in haulage of aggregates, earth and other construction material. In addition, the construction yards are also one of the contributors to air pollution.
- Air quality could also be affected by dust and particulate matter arising due to site clearing, vehicular emissions, processing and handling of construction materials, common effluent treatment plant, secured landfill and other civil structures.
• Gaseous emissions like Sulphur Dioxide, Nitrous Oxide, CO and HC might be released from the vehicular movement and also from the statutory sources like compressors, DG sets etc.
• The impacts on the air quality during the operation phase of the Fab city and e-city will be mainly due to the emissions from the semiconductor & electronic manufacturing units.

**Mitigation Measures**

• The air quality will be affected due to the odour emanating from the process, effluent treatment plants, etc.
• The odour from the Fab city and e-city needs to be controlled such that the habitations surrounding the project site are not adversely affected.
• The green belt is a 10 meter wide greenbelt all along the boundary of the park will be developed. All the individual units would be urged to implement odour control technologies and implement good housekeeping practices.

4.3 Noise Environment

**Impacts**

• Generally the activities, which affect the air environment also, impact the noise environment. The issues related to air pollution during the construction phase also apply to noise pollution.

**Mitigation Measures**

• Protective devices like acoustic wool, earplugs and earmuffs will be provided to the workmen exposed to noise levels above 90-dB (A).

4.4 Water Environment

**Impacts**

• Runoffs from the construction yards and worker camps are some of the factors, which could affect the water environment. These runoffs if not properly collected, will affect the ecology of the nearby water bodies.
• Further there might be a possibility of formation of water puddles in low lying area which can create an environment conducive to disease carrying vectors and also affect the ground water quality. Considering the typical topographic features necessary controls to restrict the runoffs need to be provided.
• The water demand estimated for the Fab city and e-City is around 17 MLD. The
wastewater generation from the proposed project will be 85% of the total water demand. The wastewater from the Fab city & e-city will be collected and conveyed through the proposed Wastewater Collection system to the Common Effluent Treatment Plant (CETP) of 1.1 MLD capacity initially as per demand of the industry which opt for CETP rather than their own ETP. It is upgraded to 10 MLD as per industrial demand and EC was issued.

Mitigation Measures

- In order to negate the impacts on the water environment infrastructural facilities like provision of adequate storm water drains, effluent collection and conveyance including treatment and disposal are provided within the site.
- Underground sewers on the edge of the road corridor are provided for collection of storm water.
- The storm water collected from the Fab city and e-city is proposed to be harvested and used to recharge the ground water.
- Rainwater harvesting system will be part of the development plan.
- Ensure daily monitoring of effluent at the inlet of the CETP and outlet of the CETP

4.5 Solid waste

Impacts

The sources of solid waste from the site are the Industrial units, commercial blocks, employee hostel and wastewater sludge from the proposed CETP. The efficient solid waste management will include segregation of waste at source (into bio-degradable waste, non-biodegradable waste, recyclable waste). The collected solid waste will be handled by solid waste management society within the city.

Mitigation Measures

- The solid waste generated will be collected and disposed by GHMC.
- Ensure that the wastes are segregated prior to the disposal.

4.6 Socio –Economic Aspects

Impacts

- Enhancement in local revenues
- Creation of Primary and Secondary Employment Opportunities
No Rehabilitation and Resettlement issue involved
Possibilities of Up gradation of infrastructure levels in the region
No impact on the ground water in the absence of ground water extraction during construction and operational phases.
Opportunity of treated waste water infiltration during land application and improving the water table

Mitigation Measures

The operation phase of the Fab City and e-City will result in influx in population due to creation of direct and indirect employment opportunities. Also induced development leading to unauthorized human settlement along the boundary will give rise to new social problems. Therefore policy decisions will need to be taken to ensure the sanctity of the Fab city and e-city is not affected by declaring the area as Industrial zones and is precluded for human settlement.

4.7 Biological Environment

Impacts:

The study area does not have dense vegetation and it was observed that at certain areas there were agricultural lands cultivating seasonal crops. Any developmental activity will certainly affect the flora in and around the project site.

A total of 472 trees are to be felled for the project in the project area and the species they belong to are *Acacia chundra*, *Acacia nilotica* *Azadirachta indica Juss. Butea monosperma (Lamk.) Taub. Carissa spinarum L.e.t.c.*, *Protection measures need to be undertaken to minimize the impact. As the work progress, the ecological balance of existing flora and fauna present in and around the project site will get disturbed.*

The project zone is not very much isolated from the residential zone and will have adverse effects of pollution, mostly air pollution, noise and vibration. Secondly the nature of polluting substances depends on the nature of production of the plant in the industrial zone.

Mitigation Measures

- There should be no or minimal removal of vegetation and felling of trees.
- Revegetation should commence at the time when site clearing is being undertaken.
- Development of greenbelt in and around proposed project site to arrest the
effects of particulate matter and gaseous pollutants in the area besides playing a major role in environmental conservation efforts.

5.0 Environment Monitoring Programme

Environmental monitoring programme has been prepared for the proposed project for assessing the efficacy of implementation of Environment Management Plan and to take corrective measures in case of any degradation in the surrounding environment.

Different activities involved in the proposed project, and their impact on various environmental attributes have been taken in to account while designing a detailed environmental monitoring programme for the project. Regular monitoring of environmental parameters to assess the status of environment during project operation has been suggested in the chapter-5 in EIA Report with the knowledge of baseline conditions, the monitoring programme will serve as an indicator for any deterioration in environmental conditions during the operation of the project, to enable taking up suitable mitigatory steps in time to safeguard the environment.

6.0 Additional Studies

6.1 Risk assessment and Disaster Management Plan (DMP)

Risk Assessment studies for the construction and operation phase, the safety precautions that have to be taken during construction phase and the Disaster Management Plan and Emergency Preparedness plan Onsite and Offsite.

Disasters in general, can broadly be grouped under three categories viz. (i) Water and Climate related (ii) Geology / Geomorphology related and (iii) Accident related. Water / Climate related natural calamities in general can be in the form of cyclone, storm, flood, tornado / hurricane, cloudbursts, thunder & lightning, heat wave and drought while geology / geomorphology related hazards can be in the form of earthquake and tsunami. In addition, there can be accident related disasters from fire, oil spills, and chemical induced and vehicular / operational accidents. Secondary hazards like epidemics can also cause serious disruption in normal activities. The proposed EHP, all these industries will carry out the risk assessment individually and follow the guidelines of the Central and State level authorities.

6.2 R&R Action Plan

As the total land allocated for the Fab city and E-city manufacturing clusters belongs to TSIIC only, so R & R plan is not required.
7.0 Project Benefits

- Increase in employment opportunities and reduction in migrants to outside for employment
- Increase in literacy rate
- Growth in service sectors
- Increase in consumer prices of indigenous products and services, land prices house rent rates and labour wages.
- Improvement in socio-cultural environment of the study area
- Improvement in transport, communication, health and educational services.
- Increase in employment due to increased business, trade, commerce and other service sectors

8.0 Environmental Management Plan

Environmental Management Plan (EMP) will be established to monitor and to ensure the proper functioning of the Proposed FAB city and E-City Manufacturing Clusters.

8.1 Land Environment

- Recycled aggregate will be used for filler application, and as a sub-base for road construction within the proposed SEZ. Mixed debris with high gypsum, plaster, shall not be used as fill, as they are highly susceptible to contamination, and will be given to recyclers.
- Metal scrap from structural steel, piping, concrete reinforcement and sheet metal work shall be removed from the site by construction contractors. A significant portion of wood scrap can be reused on site. Recyclable wastes such as plastics, glass fiber insulation, roofing etc shall be sold to recyclers.

8.2 Air Pollution Management

The allowable emission rate would not be exceeded by individual plant as well as common utilities.

- Air pollution control technology would be incorporated at the design stage itself
- General housekeeping of each industry would be up to the mark
- Suitable air pollution control equipment would be installed by the plant as well as common utilities.
- Stack gas scrubbing, carbon adsorption (for toxic organics), and bag houses (for particulate matter removal) are applicable and effective technologies for minimizing the release of significant pollutants to air. In some cases, biological filters are also used to reduce emissions of organics.
Combustion is used for the destruction of toxic organics.

8.3 Noise Pollution Management

The noise quality levels may increase due to the vehicular movement and operation of equipments, DG sets and traffic. All point sources like DG sets will be provided acoustic enclosures. Also green belt proposed around the plant and on the road will dampen the affect of the noise levels.

8.4 Water pollution Management

- Development of water sources
- Minimizing water consumption
- Promoting reuse of water after treatment and development of closed loop systems for different water streams - Construction of CETP and STP.
- Use of water efficient plumbing fixtures (ultra flow toilets and urinals, low flow sinks, water efficient dishwashers and washing machines). Water efficient plumbing fixtures use less water with no marked reduction in quality and service.
- Leak detection and repair techniques.
- Regular inspection and cleaning of storm drains.
- Clarifiers or oil/water separators shall be installed in all the parking areas.
- Oil/water separators installed for parking areas and garages will be sized according to peak flow guidelines. Both clarifiers and oil/water separators must be periodically pumped in order to keep discharges within limits.
- Each unit should establish their own Effluent Treatment Plant (ETP) in their premises to treat the waste water generated in the unit or every occupier will be a member of that CETP depending upon their necessity.

8.5 Waste Management

Hazardous Waste

- Provide adequate hazardous waste storage facilities, hazardous waste collection containers are conveniently located, and designate hazardous waste storage areas are away from storm drains or watercourses.
- Segregate potentially hazardous waste from non-hazardous construction site debris.
- Clearly label all hazardous waste containers with the waste being stored and the date of generation.
- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
E-Waste Management

The society or the e-waste management contractor shall get registered and authorized by the concerned authorities as per the e-waste management rules, 2010. Necessary approvals from TSPCB shall also be obtained for the purpose.

8.6 Biological Environment

- Wherever possible do not disturb the flora and fauna
- If any flora is disturbed, uproot and plant in open land near by
- Do not kill any fauna, as it will alter the biodiversity
- A green belt should be developed with trees and shrubs to mitigate dust pollution from the project area. The green belt will act as a barrier to trap the suspended dust particle and support the air pollution control.
- Regeneration of grassland area and soil conservation measure.
- If the flora is conserved, the fauna will not get disturbed.

8.7 Green Belt Development

Green belt will be developed within the project premises covering a total area of about 246.52 acres of the total project area. Development of green belt and other forms of greenery shall also prevent soil erosion and washing away of topsoil.

8.8 Human Health and Safety Management Plan

- The primary concern on potential health risks for the construction workers and other employees on site during construction are associated with drinking water quality. The project would ensure safe potable water supply to the workers on-site.
- Adequate space needs to be provided for construction of temporary sheds for construction workers to avoid unhygienic conditions.
- Construction site will be provided with a readily available first aid kit including an adequate supply of sterilized dressing materials and appliances. Suitable transport to take injured or sick person to the nearest hospital will be immediately provided

9.0 Conclusion

The possible environmental aspects have been adequately assessed and necessary control measures have been taken into consideration to meet statutory requirements. Hence all the impacts are negated with appropriate implementable environmental management plan. In addition, Socio-economic benefits, on implementation of the project, will be positive.