# EXECUTIVE SUMMARY

**For**

## INTEGRATED SUGAR, DISTILLERY & CO-GENERATION POWER PLANT
## (Cane Sugar 5000 TCD, Molasses Based Distillery 60 KLPD, Grain Based Distillery 45 KLPD, Co-generation 29.5 MW & Other Units)

**Project Proponent**

## M/s Vitthal Refined Sugars Ltd.,
**A/p - Pande, Tal- Karmala, Dist- Solapur, Maharashtra**

**Prepared by**


## SGM Corporate Consultants Pvt. Ltd.
**NABET/QCI Accredited Consultant**
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**MARCH 2016**

## EXECUTIVE SUMMARY

### 1.0 Background

This is a proposal to establish a modern Integrated Sugar Complex by M/S Vitthal Refined Sugars ltd (VRSL) located A/p – Pande, Taluka – Karmala, District – Solapur, State – Maharashtra. The proposed Sugar complex consists of Sugar unit (5000TCD), Co-generation (29.5 MW), Molasses/ cane juice based distillery unit – 60 KLPD, Grain based distillery unit – 45 KLPD), Malt spirit – 5 KLPD & grape spirit – 5 KLPD, Carbon-di-oxide ($CO_2$) recovery plant – 50 TPD, Cyclodextrin plant – 2.5 TPD, IMFL bottling – 1Lakh cases/Month, Country liquor – 2Lakh cases/Month.

**About Vitthal Refined Sugars Ltd.**

**VRSL** is a Public Limited Company registered under the Companies Act, 1956 (No.1 of 1956) on the 4th February 2010 with Corporate Identity Number – U15421 PN2010PLC135465. Its mailing address is Vitthal Refined Sugars Limited, A/p – Nimgaon, Taluka –Madha, Dist – Solapur 413 208, Maharashtra, India.

Its Board of Directors is as follows –

- **Mr. Vikramsinh Babanrao Shinde, Chairman**
- **Mr. Santosh Vyankatesh Garad, Director**
- **Mr. Nitin Dattatray Shinde, Director**

  The Chairman and members of Board of Directors have wide experience of setting up of sugar unit, primary credit societies, Educational Institutions, operating co-operative banks and financial institutions.

### 2.0 INTRODUCTION

**M/s. Vitthal Refined Sugars Ltd. (VRSL)** has proposed to establish a fully integrated sugar complex at A/p - Pande, Taluka – Karmala, Dist. – Solapur, Maharashtra.

**Table 2.1: The project consists of following units**

| Sr. No. | Unit | Production Capacity |
|---|---|---|
| 1 | Sugar unit | 5000 TCD |
| 2 | Bagasse based co-gen sugar power plant | 29.5MW (26 MW from Co-gen & 3.5 MW from spent wash incineration boiler) |
| 3 | Molasses/ Sugarcane juice based distillery unit | 60 KLPD |
| 4 | Grain based distillery | 45 KLPD |
| 5 | Malt spirit | 5 KLPD |
| 6 | Grape spirit | 5 KLPD |
| 7 | Distillery $CO_2$ recovery plant | 50 TPD |
| 8 | Cyclodextrin plant | 2.5 TPD |
| 9 | IMFL bottling | One Lac cases/ Month |
| 10 | Country liquor bottling | Two Lac cases/ Month |

**1.1 Land Requirement**

The land requirement for different applications for the proposed industry consisting of sugar, power and distillery units

| | |
|---|---|
| Total Plot Area | – 44.33 Ha |
| Own land in name of VRSL | – 20.80 Ha |
| Land on lease (33years lease) | – 23.53 Ha |
| Built up area | – 27.71 Ha |
| Green Belt area | – 14.98 Ha |

**3.0 PROJECT DESCRIPTION**

**3.1 Justification**

Man needs sugar, electricity as well as ethanol for day to day purpose. The sugar requirement is increasing in proportion to population of country as well as world. According to FAO Report, 4% growth in sugar consumption is expected. The Government policy is also favorable. India has not exploited its huge potential like other countries like Hawaii, Mauritius etc. where co-generation of power from sugar mills has become a dependable source for supply of power. Producing alcohol for various downstream chemicals (like ethyl acetate, ethylene oxide, butanol, vinyl acetate monomer, ethylene glycol, styrene etc.), for potable (IMFL & CL) and medicinal liquor and for admixing ethanol in petrol. Government of India has already taken steps to blend 10 per cent ethanol in petrol all over country.

**3.2 Scope of the Study**

Expert Appraisal Committee (EAC), MoEF for the Environmental Appraisal of its 28$^{th}$ meeting held during December 1-2, 2014, has issued ToR for the preparation of the EIA report, based on the documents submitted and presentation made by the project proponent. ToR issued by MoEF as per vide letter no. J-11011/107/2014 – IA II (I) as per the EIA notification dated 14$^{th}$ September 2006 of the Ministry of Environment & Forests (MoEF), New Delhi EIA report is prepared. VRSL entrusted SGM Corporate Consultants Pvt. Ltd., Pune to carry out EIA/EMP studies as per CPCB & MoEF Norms.

**3.3 Project Location**

The proposed project is located at Gat No 247, 248, 252, 254 & 256 A/p – Pande, Taluka – Karmala, Dist. – Solapur, Maharashtra. The site is located adjacent to State Highway no. 67, 4 Km towards west direction from the proposed integrated project site.

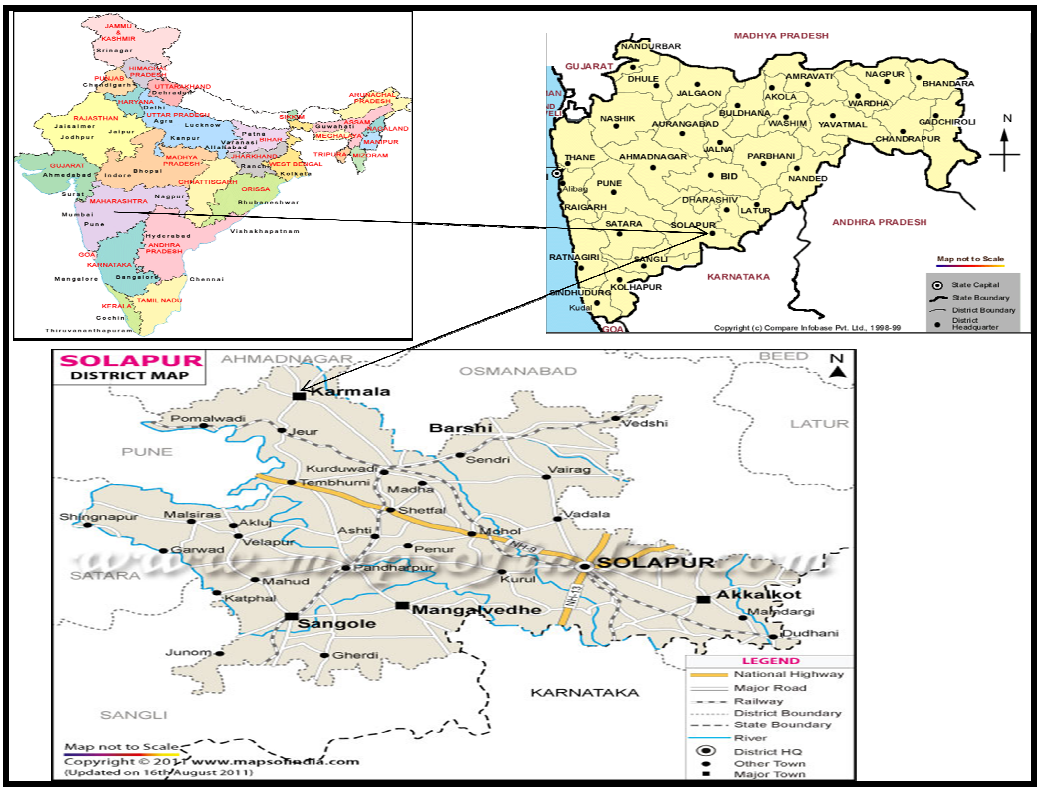


**Fig. 3.1 Location of the Project Site**

**Table 3.1 Location features of the project site**

| Sr. No. | Particulars | Details |
|---|---|---|
| 1 | Latitude | $18^0$ 24'17.91" N |
| 2 | Longitude | $75^0$ 13'02.69" E |
| 3 | Elevation above MSL | 552 m above Mean Sea Level |
| 4 | Climatic Conditions | Maximum Temperature : $42^0$C<br>Minimum Temperature : $28^0$C<br>Mean Rainfall (Last 15 years rainfall Data) : 488 mm |
| 5 | Present land use at the proposed site | Barren land |
| 6 | Transport Connectivity | Road |
| A | Nearest Highway | State Highway no. 67 – 4 Km |
| B | Nearest Railway Station | Jeur Railway station – 20 Km |
| C | Nearest Road | Karmala – Pande road 1 Km |
| 7 | Social Aspect | |
| A | Nearest School | Annasaheb Jagtap Vidyalaya – 4 Km |
| B | Nearest Hospital | District Hospital Karmala – 5 Km |
| 8 | Nearest Water Body | Sina River – 5 Km<br>Mangi lake – 7.5 Km |

| Sr. No. | Particulars | Details |
|---|---|---|
| 9 | Hills/Valleys | There are no hills / valleys within 10 km radius of the project site |
| 10 | Ecologically sensitive zones within 15 – km distance | There are no ecologically sensitive zones within 10 km radius distance from the project site |
| 11 | Historical/ Archaeological places | There are no historical / Archeological places within 10 km radius of the project site |
| 12 | Nearest Defense and other Establishments | Nil |

**Table 3.2 Salient Features of proposed Units of Integrated Sugar Complex by VRSL.**

| Sr. No. | Particulars | Details | | |
|---|---|---|---|---|
| 1 | New/expansion/ modernization | New project | | |
| 2 | Constitution of the organization | Public Limited Company | | |
| 3 | No. of working days in a year | Sugar Plant : 160 Days/ annum<br>Cogeneration Power Plant : 160 Days/ annum<br>Molasses/ cane juice Based Distillery : 300 Days/ annum<br>Grain Based Distillery : 300 Days/ annum | | |
| 4 | Products & capacity of industry | **Products & Co-products** | **Unit** | **Quantity** |
| | | Sugar Unit (5000 TCD) | | |
| | | Sugar (sugar recovery @11.5%) | TPD | 575 |
| | | Molasses | TPD | 200 |
| | | Press Mud | TPD | 200 |
| | | Bagasse Generation | TPD | 1500 |
| | | Total Power Plants Capacity (29.5 MW) | | |
| | | Co-generation / Spent wash Incineration Boiler | MW | 26/3.5 |
| | | Molasses based distillery Unit (60 KLPD) | | |
| | | R S & IS / ENA & TA /Fuel Alcohol | KLPD | 60 |
| | | Fusel oil | KLPD | 0.18 |
| | | Grain based distillery Unit (45 KLPD) | | |
| | | Rectified Spirit & IS/ENA &TA | KLPD | 45 |
| | | Fusel oil | KLPD | 0.135 |
| | | DDGS | TPD | 33 |
| | | Malt Spirit | KLPD | 5 |
| | | Grape Spirit | KLPD | 5 |
| | | Distillery $CO_2$ Recovery Plant | TPD | 50 |
| | | Cyclodextrin Plant | TPD | 2.5 |
| | | IMFL Bottling plant | Cases/M | One lac |
| | | Country liquor bottling plant | Cases/M | Two lac |

<table>
<tr><td>5</td><td>List of Raw Material</td><td>
<table>
<tr><th>#.</th><th>Raw Material</th><th>Unit</th><th>Qty</th></tr>
<tr><td rowspan="5">1</td><td>Sugar Unit</td><td></td><td></td></tr>
<tr><td>Sugar cane</td><td>TPD</td><td>5000</td></tr>
<tr><td>Lubricant(oil & grease)</td><td>Kg/d</td><td>150</td></tr>
<tr><td>Lime</td><td>TPD</td><td>8</td></tr>
<tr><td>Sulphur</td><td>TPD</td><td>2.50</td></tr>
<tr><td rowspan="4">2</td><td>Power generation Unit</td><td></td><td></td></tr>
<tr><td>Bagasse for co-gen. unit</td><td>TPD</td><td>1387.20</td></tr>
<tr><td>Concentrated Spent wash (55%)for incineration boiler</td><td>TPD</td><td>175</td></tr>
<tr><td>Coal for incineration boiler</td><td>TPD</td><td>138</td></tr>
<tr><td rowspan="4">3</td><td>Molasses based distillery Unit</td><td></td><td></td></tr>
<tr><td>Molasses (FS- 42%)</td><td>TPD</td><td>243</td></tr>
<tr><td>Nutrient</td><td>Kg/D</td><td>60</td></tr>
<tr><td>TRO</td><td>Kg/D</td><td>120</td></tr>
<tr><td rowspan="4">4</td><td>Grain based distillery Unit</td><td></td><td></td></tr>
<tr><td>Grains –Maize, jawar, broken rice etc ( 68 % starch)</td><td>TPD</td><td>104</td></tr>
<tr><td>Alpha – Amylase</td><td>Kg/D</td><td>56.25</td></tr>
<tr><td>Gluco – amylase</td><td>Kg/D</td><td>56.25</td></tr>
<tr><td>5</td><td>Barley for malting</td><td>TPD</td><td>13</td></tr>
<tr><td>6</td><td>Grapes for grape spirit</td><td>TPD</td><td>78</td></tr>
</table>
</td></tr>
<tr><td>6</td><td>Manpower</td><td>During Construction: 200 Nos.<br>During Operation : 460 Nos.</td></tr>
<tr><td>7</td><td>Transportation</td><td>During Construction – Construction material such as Gravels, sand, boulders, bricks etc. will transport to the construction site through covered trucks and lorries.<br>During Operation – Raw materials (sugarcane, molasses, grains, grapes, barley), fuels (coal) will be procured from various locations and transported to the factory through Lorries/ Trucks. Similarly sugar/alcohol/ $CO_2$ produced in the factory will be transported to various consumers through Truck and tankers.</td></tr>
<tr><td>8</td><td>Boiler capacity Sugar & Co-gen sugar unit, Distillery unit</td><td>Boiler – 150 TPH - For Sugar & Co-generation Unit<br>Incineration Boiler – 35 TPH – For Molasses /cane juice based & grain based Distillery Units</td></tr>
<tr><td>9</td><td>Boiler fuel<br>1. 150 TPH Boiler<br>2. 35 TPH concentrated spent wash incineration Boiler</td><td>Co-gen Boiler (150 TPH), Bagasse – 1387.20 MT/Day (2,21,952 MT/annum)<br>Incineration Boiler (35 TPH), Concentrated Spent Wash – 175 TPD + Coal – 138 TPD<br>D.G. Set (500 KVA) – HSD – 65 lit/hr.</td></tr>
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<tr><td>10</td><td>Steam Generation</td><td>
<table>
<tr><td>Item</td><td>Unit</td><td>Value</td></tr>
<tr><td colspan="3">Co-gen Unit</td></tr>
<tr><td>Steam through 18 MW BP</td><td>TPH</td><td>112.27</td></tr>
<tr><td>Steam through 8 MW DEC</td><td>TPH</td><td>30.50</td></tr>
<tr><td>Distillery Boiler Unit</td><td>TPH</td><td>35</td></tr>
</table>
</td></tr>
<tr><td>11</td><td>Steam Requirement</td><td>
<table>
<tr><td>Sr. No.</td><td>Particular</td><td>Steam (TPH)</td></tr>
<tr><td>1</td><td>Sugar Unit (5000 TCD)</td><td>112.27</td></tr>
<tr><td>2</td><td>Co-generation / Incineration Boiler (Cap.- 26 / 3.5 MW )</td><td></td></tr>
<tr><td rowspan="2">2a</td><td>Cogeneration- steam to sugar</td><td>102.27</td></tr>
<tr><td>Auxiliary Unit</td><td>10.00</td></tr>
<tr><td>2b</td><td>Cogeneration Distillery</td><td></td></tr>
<tr><td>3</td><td>Distillery Units</td><td></td></tr>
<tr><td>3A</td><td>Molasses based (60KLPD) (ENA, Evaporator & ethanol)</td><td>13.80</td></tr>
<tr><td>3B</td><td>Grain based (45 KLPD) (liquefaction , evaporator, dryer, ENA)</td><td>13</td></tr>
<tr><td>4</td><td>Malt Spirit (5KLPD)</td><td>1.05</td></tr>
<tr><td>5</td><td>Grape Spirit (5KLPD)</td><td>0.875</td></tr>
<tr><td>6</td><td>$CO_2$ Plant (50 TPD)</td><td>3 TPD (alternate day)</td></tr>
<tr><td>7</td><td>Cyclodextrin Plant (2.5 MT/day)</td><td>6.25 TPD</td></tr>
</table>
</td></tr>
<tr><td>12</td><td>Bulk Storage Facility</td><td>1. Storage yards for storage of 30,000 Tons surplus Bagasse, 4,500 Tons coal (one months’ storage) and 12,000 Tons press mud (2 months’ storage) and 6292 Tons boiler ash (2 months storage)<br>2. Sugar godown for storage of 40,000 T of sugar<br>3. Molasses storage tanks – 3no’s, each of 7500 T capacity<br>4. Grain storage system – 3000 T<br>4. Ethanol storage tanks – 12 no’s, both for molasses and grain based distillery units – total 6,300 m3 capacity<br>5. For concentrated spent wash storage tank – 1 no., impervious in nature, for 15 days storage – 2187.50 CuM.<br>6. Water reservoir – 10,000 CU.M.</td></tr>
<tr><td>13</td><td>APC measures for boiler</td><td>1. For 150 TPH boiler: ESP & 58 m stack<br>2. For 35 TPH spent wash boiler: ESP and 70 m stack</td></tr>
<tr><td>14</td><td>Turbine for Co- Gen</td><td>Turbine Capacity & Type –<br>1. 18 MW – Back Pressure<br>2. 8 MW – Double Extraction cum condensing</td></tr>
</table>

<table>
<tr><td>15</td><td>Power Requirement</td><td>
<table>
<tr><th>Sr. No.</th><th>Particular</th><th>Power</th></tr>
<tr><td>1</td><td>Co-gen Unit capacity</td><td>26 MW</td></tr>
<tr><td>2</td><td>Cogeneration – power to sugar unit</td><td>5 MW</td></tr>
<tr><td>2a</td><td>Cogeneration – power to grid</td><td>20 MW</td></tr>
<tr><td>2b</td><td>Spent wash based Co gen. Capacity for Distillery units</td><td>3.50 MW</td></tr>
<tr><td>3</td><td>Distillery Units</td><td></td></tr>
<tr><td>3A</td><td>Molasses based (60KLPD) (ENA, Evaporator & ethanol)</td><td rowspan="2">2.8 MW</td></tr>
<tr><td>3B</td><td>Grain based (45 KLPD) (liquefaction , evaporator, dryer, ENA)</td></tr>
<tr><td>4</td><td>Malt Spirit (5KLPD)</td><td rowspan="2">150 KW</td></tr>
<tr><td>5</td><td>Grape Spirit (5KLPD)</td></tr>
<tr><td>6</td><td>$CO_2$ Plant (50 TPD)</td><td>450 KW</td></tr>
<tr><td>7</td><td>Cyclodextrin Plant (2.5 MT/day)</td><td>75 KW</td></tr>
<tr><td>8</td><td>IMFL Bottling plant (One Lac cases/Month)</td><td>40 KW</td></tr>
<tr><td>9</td><td>Country liquor bottling (2 Lac cases/ Month)</td><td>60 KW</td></tr>
</table>
</td></tr>
<tr><td>16</td><td>Exportable power from co-gen sugar power unit</td><td>Season: a) Power generation capacity: 26 MW<br>b) Exportable Power : 20 MW</td></tr>
<tr><td>17</td><td>Fresh water requirement Source: Sina Kolegaon Dam & Mangi Talav (1812.44 Cu.M/day)</td><td>1.5000 TCD Sugar plant & Co-gen Unit : 517.44 $m^3$/day<br>2.Molasses based (60 KLPD ) (ENA, Evaporator & ethanol) & Country liquor bottling plant (2 lac cases/month) : 517 $m^3$/day<br>3.Grain based (45 KLPD) (Liquefaction, evaporator, dryer, ENA) & IMFL Bottling plant (one lac cases/ Month ): 406 $m^3$/day<br>4. Malt Spirit based (5 KLPD) : 75 $m^3$/day<br>5.Grape spirit based (KLPD) : 60 $m^3$/day<br>6.$CO_2$ Plant (50 TPD): 12 $m^3$/day<br>7.Cyclo dextrin plant (2.5 MT/day): 25 $m^3$/day<br>8. Domestic Use – 200 $m^3$/day</td></tr>
<tr><td>18</td><td>Effluent Treatment facility</td><td>1. Sugar unit: Primary clarifier & two stages ASP (Activated Sludge Process) treated to irrigation standards.<br>2 Distillery units: Spent wash concentration in evaporator and then mixed with Bagasse/husk and utilization as fuel in boiler.</td></tr>
<tr><td>19</td><td>Project cost</td><td>Rs. 305.86 Crores</td></tr>
<tr><td>20</td><td>Investment towards pollution control & environmental protection measures</td><td>Rs. 12.95 Crores</td></tr>
</table>

| | | |
|---|---|---|
| 21 | Category of project according to EIA notification dated 14th September 2006 and as Amended? | a) Sugar industry: 5(j) – B<br>b) 60 KLPD molasses based distillery & 45KLPD grain based distillery: 5(g) – A<br>c) 29.5 MW cogeneration Plant: 1(d) – A |

**4.0 DESCRIPTION OF THE ENVIRONMENT**

The description of existing environment conditions of the study area with respect to the prominent environmental attributes. The data was collected from both primary and secondary sources. Primary data was collected through environmental monitoring & survey in the study area. The environmental influence due to the project is likely to be restricted to 10 km region around the factory site which covers 28 villages. Proposed site area covers the 10 km radial study area in Survey of India (SOI) toposheet no. 47 J. The studies were conducted during the post-monsoon period of the 1st Dec 2014 – 1st February 2015.

**4.1 Baseline Environment**

The Region enjoys a tropical monsoon climate, the hot scorching summer from March onwards yet to the rainy monsoon in early June. Seasonal variation in temperature quite large from March onwards is a period of continuous increase in day temperature, the night remaining cool. Relative Humidity is Moderate to dry. The climate of Karmala is characterized with hot summers and dry winters. The cold season which last to February, the air is dry and invigorating. It is too hot in summer. Karmala summer highest day temperature is $42.3^0$C.The Mean Maximum and Minimum temperature of Karmala Taluka is $37.78^0$C & $17.81^0$C respectively. Annual Rainfall for the year 2014 is 384.6 mm

**Table 4.1: Summary of Sampling**

| Sr. No. | Particulars | No. of stations | Parameters | Frequency |
|---|---|---|---|---|
| 1 | Surface Water | 8 | 33 | Once in study period |
| 2 | Ground Water | 8 | 31 | Once in study period |
| 3 | Ambient Air | 8 | 5 | Twice in a week, 12 weeks |
| 4 | Ambient Noise | 5 | 1 | Once in study period |
| 5 | Soil | 5 | 22 | Once in study period |

**4.2 Air Environment**

The meteorological data was collected at the site by installing an automatic weather monitoring station (AWS) during study period (1st December 2014 – 28th February 2015). It shows that predominant wind direction is North (i.e. South to North). During study period maximum wind blow 4-6 Kmph from NNE, NE, East and SE directions. In study period, 20.7 % calm wind found.

**Table 4.2: Description of Ambient Air Quality Monitoring Stations**

| Sr. No. | Name of location | Distance in Km w.r.t Project Site | Direction w.r.t Project Site |
|---|---|---|---|
| 1 | Project site | 0 | 0 |
| 2 | Pande | 2.4 | SE |
| 3 | Mangi | 8.4 | NW |
| 4 | Bhalewadi | 7.0 | NE |
| 5 | Deolali | 5.6 | SW |
| 6 | Pothare | 5.3 | N |
| 7 | Karmala | 2.5 | NW |
| 8 | Gulsadi | 6.6 | S |

**Table 4.3: The monitored values are within the limits specified by MoEF (as per the notification dated 16th November 2009 for industrial, residential & rural areas).**

| Location | $PM_{10}$ (µg/m$^3$) | | | | $PM_{2.5}$ (µg/m$^3$) | | | | $SO_2$(µg/m$^3$) | | | | NOx (µg/m$^3$) | | | | CO (mg/m$^3$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | 98 % | Avg. | Min | Max | 98 % | Avg. | Min | Max | 98 % | Avg. | Min | Max | 98 % | Avg. | Min | Max | 98 % | Avg. |
| At plant site | 35.4 | 47.2 | 46.96 | 41.4 | 11.3 | 19.3 | 19.14 | 15.08 | 3 | 7 | 6.92 | 4.80 | 11.2 | 15.2 | 15.12 | 13 | 0.11 | 0.22 | 0.218 | 0.157 |
| Pande | 43.5 | 49.8 | 49.67 | 46.68 | 12.4 | 18.7 | 18.57 | 15.67 | 3 | 7.8 | 7.704 | 5.16 | 11.1 | 15.9 | 15.80 | 13.26 | 0.118 | 0.286 | 0.283 | 0.187 |
| Mangi | 44.4 | 51.8 | 51.65 | 47.52 | 13.7 | 19.7 | 19.58 | 16.54 | 3 | 7.5 | 7.41 | 5.20 | 11.5 | 15.9 | 15.81 | 13.61 | 0.12 | 0.289 | 0.286 | 0.194 |
| Bhalewadi | 45.5 | 53.8 | 53.63 | 49.45 | 15.3 | 22.2 | 22.06 | 19.04 | 4 | 7.8 | 7.724 | 5.67 | 13 | 16.9 | 16.82 | 14.65 | 0.152 | 0.298 | 0.295 | 0.21 |
| Deolali | 44.5 | 55.8 | 55.57 | 49.71 | 10 | 19.9 | 19.70 | 14.5 | 3 | 6.7 | 6.626 | 4.60 | 16.5 | 20.1 | 20.03 | 18.02 | 0.101 | 0.22 | 0.218 | 0.153 |
| Pothare | 48.1 | 55.2 | 55.06 | 52.02 | 13.5 | 20.8 | 20.65 | 17.54 | 3 | 7.5 | 7.41 | 5.16 | 13.1 | 17.7 | 17.61 | 15.3 | 0.227 | 0.31 | 0.308 | 0.268 |
| Karmala | 51.4 | 61.8 | 61.59 | 55.37 | 16.4 | 29.5 | 29.24 | 23.14 | 13.5 | 18.2 | 18.106 | 16..0 | 13.8 | 20.7 | 20.56 | 17.31 | 0.253 | 0.303 | 0.302 | 0.276 |
| Gulsadi- | 43.5 | 49.8 | 49.67 | 47.17 | 12.6 | 19.5 | 19.36 | 16.73 | 3 | 6.1 | 6.038 | 4.20 | 9.6 | 12.9 | 12.83 | 10.9 | 0.108 | 0.268 | 0.265 | 0.188 |

The existing ambient air quality status (AAQ) has been monitored for $PM_{10}$, $SO_2$ and NOx at each station at IST 8.30 hr. and IST 17.30 hr as per the approved methods of Central Pollution Control Board (CPCB). In general, the average values of Particulate Matter $PM_{10}$ & $PM_{2.5}$ ranging from 41.4 µg/m$^3$ to 55.37 µg/m$^3$ and 23.14 µg/m$^3$ to 14.5 µg/m$^3$ respectively which is within NAAQ. The monitored values of ambient gases $SO_2$, NOx and CO average, in the 10 Km radius of the proposed project remain at 16.27 µg/m$^3$ to 4.20 µg/m$^3$, 18.02 µg/m$^3$ to 10.9 µg/m$^3$ and 0.276 mg/m$^3$ to 0.153 mg/m$^3$ respectively. Hydrocarbon concentration found below detection level.

- **Mathematical Modeling**

Prediction of impacts on air environment has been carried out by employing a mathematical model. In the present case, **Industrial Source Complex Short-Term (ISCST3)** dispersion model based on steady state Gaussian plume dispersion, designed for multiple point sources for short term has been used for predicting the ground level concentrations. The computations deal with major pollutants like Sulphur dioxide and Suspended Particulate Matter and Oxides of Nitrogen.

The simulations were done to evaluate $PM_{10}$, $SO_2$ and $NO_X$ likely to be contributed by the proposed plant. For the short term simulations, the concentrations were estimated around 1200 receptor points chosen to obtain an optimum description of variations in concentrations over the site in 10-km radius covering 16 directions.

The predicted incremental Ground Level Concentrations (GLCs) for $PM_{10}$, $SO_2$ and NOx likely to be contributed by the proposed plant are presented in **Table – 5.7**

The maximum incremental GLCs due to the proposed project for $PM_{10}$, $SO_2$ and $NO_X$ are superimposed on the maximum baseline $PM_{10}$, $SO_2$ and NOx concentrations recorded during the study period in the downwind direction to arrive at the likely resultant concentrations during the same period after implementation of the proposed project. The cumulative concentrations (baseline+ incremental) after implementation of the project are tabulated in **Table – 5.1**. The isopleths for pollutants $PM_{10}$, $SO_2$ and NOx are presented in **Figure – 5.2** to **Figure-5.3**

**4.3 Noise Environment**

A sound level meter was used for measuring the noise level at one hour interval continuously for 24 hrs at 1.5 m above ground level for 5 stations. The noise levels in the study area vary between 33.12 – 45 dB (A) during night time & 36.56 – 51.93 dB (A) during day time. It has been observed that the maximum noise levels at all the locations are within the limits specified for residential areas. Refer **Annexure XVI** for Noise Level Monitoring Report.

**3.4 Water Environment**

Water parameter analyzed as per the procedure specified in standard methods for examination of water and wastewater published by American Public Health Association and Bureau of Indian Standards (APHA/BIS).

The water requirement for the proposed integrated sugar complex will be sourced from Mangi Lake & Sina Kolegaon Dam.

The physico -chemical quality of the surface and ground water sources( 8 stations each) at and around the plant site have been analyzed, which indicates that almost all the parameters except total hardness in case of ground water (as $CaCO_3$) analyzed are within "Maximum Acceptable Limits As per IS: 10500-2012.

Refer **Annexure XVI** for Surface water and Ground water Quality Monitoring Reports.

**4.5 Land Environment**

Karmala Taluka falls under Western Zone of Solapur District. Shallow and poor type of soil, not retentive of moisture marks this part. The region has Scanty and uncertain rainfall. The agriculture land in Karmala Taluka is 525 $km^2$. which is 33 percent of the total geographical area. Karmala Taluka is noted for jowar, sugarcane, groundnut, safflower, wheat, maize, gram, bajara, tur and fruits combination.

**4.6 Socio – Economic Environment**

The information collected from the secondary sources is from the district census statistical hand books 2001. The Study area covers total 28 nos. of Villages. Total Population of the study area is found to be 58457, out of which 30245 no. of male (51.73%) and 28212 no. of female (48.27%). The sex ratio of the study area on an average has 925 females per 1000 males. Population Density area works out to about145 persons per $km^2$. The literacy rate found 62.10% of total population in the study area. SC and ST Population observed as 15.54% and 1.58% respectively of total population in the study area. Workers (Main & Marginal) observed 46.71% of the total population in the study area and Non Workers (include students, house wives, and children above 6 years also) 53.30 % indicating that the problem of unemployment in the region.

**4.7 Ecology**

There is no endangered species of flora and fauna noticed in this area. The area does not shelter any specific wildlife. The study area mostly comprises of un-urbanized area. The area includes few villages comprising of agricultural and barren land where most of the vegetation is aggregated on agricultural bunds and open area. Apparently it is covered by vegetation of Kadu Neem, Teak and Acacia species. The agricultural land in the study area, mainly cultivation is sugarcane, bajara, jowar, groundnut, maize etc.
The faunal species found in the study area are of domestic type such as cow, buffalo, and cattle.

**5.0 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURE**

Prediction of impacts depends on the nature and size of activity being undertaken and also on the type of pollution control measures that are envisaged as part of the project proposal. However, the good management practices would be followed to ensure that the environmental pollutants concentrations remain within the limits. The proposed plant may cause impact on the surrounding environment in two phases.

- During construction phase
- During Operation phase

**5.1 Social Aspects**

- This project is very necessary in view of production of sugar, power generation especially renewable power, producing Ethanol, a useful foreign exchange saver.
- The candidate site is suitable from availability of water, power, raw material, Filler Material and Market is assured.
- Full precautions for Pollution Control, Resource Conservation and Environmental Protection
- The project will generate employment opportunities during operational phase.
- The standard of living of local people due to employment is likely to be better, so we may say that it is positive socio-economic impact.

- Farmers will get better price to their produce.
- This is cost effective and Sustainable Development.

## 6.0 ALTERNATIVES FOR TECHNOLOGY & PROJECT SITE

Any proposed human activity is never a simple straightforward matter. A number of decisions are required to be taken and for each step a number of alternatives are available. Selection is thus all the more critical in an industrial development where time, money and natural resources are in stake.

Although the present case is not a production of such chemicals, pharmaceuticals, pesticides etc. which will threaten by mammalian toxicity and toxicity to fish, VRSL decided to undertake an Alternative Analysis (AA) for this project. The various alternatives were:

- Raw Materials
- Technology
- Engineering & hardware
- Site
- No Project

## 7.0 ENVIRONMENTAL MONITORING PROGRAMME

The environment, safety and health-monitoring programme in the factory shall be implemented as follows:

- Regular monitoring of stack emissions
- Daily monitoring of water and wastewater
- Quality monitoring of ambient air, noise and work place air
- Monitoring of occupational safety

The project management, being aware and conscious of its responsibilities to environment, is committed that the project operations will be made keeping in line with the internationally accepted sustainable measures/practices and methods thus leaving negligible adverse impacts on any segment of environment due to proposed activity.

## 8.0 ADDITIONAL STUDIES

### 8.1 RISK ASSESSMENT

An industry with its complex nature of activities involving various plant machineries, raw materials, products, operations, intermediates and environmental discharge has a number of associated hazards. A minor failure can lead to major failure resulting into a disaster causing heavy losses to life, property and environment. Risk assessment studies are being conducted to ensure safety and reliability of any new plant, through systematic and scientific methods to

Identify possible failures and prevent their occurrences before they actually cause disasters and production loss.

### 8.2 FIRE FIGHTING FACILITIES IN ETHANOL PLANT

#### 8.2.1 Possible Fire Hazards

- Fire in fuel/bio-mass storage yard.
- Fire in alcohol storage tanks electric, static electricity and consequent fire accident.

**8.2.2 Fire Fighting Facilities**

a. Water hydrant system
b. Fire extinguishers
c. Fire protective appliances
d. Fire brigade facilities available at Karmala will be utilized whenever need arises.

**8.3 DISASTER MANAGEMENT PLAN (DMP)**

A comprehensive DMP that will be implemented in the industry as presented below.

**8.3.1 Objectives**

• To localize the emergency
• To minimize the consequences
• To ensure that following concepts are considered, namely rescue, first aid, evacuation, rehabilitation, spreading the information.

**8.3.2 Elements of On-Site Emergency Plan**

• Assess the size of event
• Plan formulation and liason
• Actions like: Raise alarm, communication within and outside
• Appoint key personnel and deploy. Appoint Controller.
• Emergency Control Center
• Action on site
• Action off-site.
• Alarm and visual signals at strategic points, first alert sent to Incidence Controller.

**9.0 PROJECT BENEFIT**

Proposed integrated sugar complex will result in considerable growth of stimulating the industrial and commercial activities in the Karmala tehsil of Solapur district. VRSL will be beneficial in reducing the existing and ever escalating demand of electricity to some extent.

In operation phase, the proposed plant would require considerable work-force both technical and non-technical persons. Migration of experienced persons with better education will result in increase of population and literacy in surrounding villages.

- Improvement in the Physical Structure
- Improving the Economy of Farming Community
- Improvement in the Social Infrastructure
- Employment Potential

**10.0 ENVIRONMENTAL COST BENEFIT ANALYSIS**

In proposed integrated sugar complex, various environmental cost beneficial techniques will be used for water conservation, to improve performance of sugar plant, co-gen power plant.

## 11.0 ENVIRONMENTAL MANAGEMENT PLAN

### 11.1 CORPORATE ENVIRONMENTAL POLICY (CEP)

VRSL commit to improve our Environmental Management System and minimize the impact of our manufacturing activity on the environment, on continual basis, by:

• complying with applicable environmental laws and regulations,

• Establishing systems and processes which minimize /prevent pollution and foster conservation of resources.

• Improving efficiency of all the operations through our proactive efforts in environmental management and incorporating cleaner technologies in the projects.

• Establishing objectives and targets and the review of policy.

• Enhancing the skills and competence of our employees to ensure sound environmental management.

**VRSL** will be set up a high power watch dog committee which will have a power of sudden spot inspection, checking of documents and listening of complaints if any. This committee will supervise over the monitoring and environmental management cell as may be necessary, generally over the following facets of works:

1. Permit management
2. Construction management
3. Treatment and emission management
4. Transport management
5. Disposal management
6. Monitoring

### 11.2 EMP for Construction Phase

Increase in $PM_{10}$, Sulphur di-oxide ($SO_2$), Oxides of Nitrogen (NOx), & Carbon Monoxide (CO) levels in environment due to construction activities and movement of vehicles. Frequent water sprinkling in the vicinity of the construction sites will be undertaken. During construction phase SVSSKL will be taken care to provide all necessary facilities to construction workers such as water supply, sanitary facilities, temporary housing, sewage treatment facilities, drainage facilities and domestic fuels; to nullify adverse impact on environment. The impacts will be localized in nature and the areas outside the project boundary are not likely to have any major adverse impact with respect to ambient air quality.

### 11.3 EMP for Operation phase

#### 11.3.1 Air Environment

- The major pollutants from boilers during operation phase are $PM_{10}$ & $PM_{2.5}$, $SO_2$ (Sulphur dioxide) and NOx (Oxides of Nitrogen).These pollutant will be nullify by adopting following measure.
- Stack emissions will be regularly monitored by SVSSKL/external agencies on periodic basis to check the efficiency of air polluting control devices and necessary action.
- To control of the airborne fugitive emissions from the ash handling area will be achieved through regular water sprinkling in this area.
- Avenue plantation and green belt development will be undertaken in the operation phase.
- The air pollution generation from the proposed project is given in table below:

**Table 11.1: Air Pollution generation & its mitigation measures**

| # | Area of Operation | Air Pollution Mitigation Measures |
|---|---|---|
| 1. | Boiler – 150 TPH | Stack height – 60 M, As per CPCB with ESP |
| 2. | Incineration Boiler – 35 TPH | Stack height – 70 M, As per CPCB with ESP |
| 3. | D.G. Set (1000 & 500 KVA) | Adequate stack height will be provided as per CPCB norms |

### 11.3.2 Noise Environment

- All rotating items will be well lubricated and provided with enclosures as far as possible to reduce noise transmission. Vibration isolators will be provided to reduce vibration and noise wherever possible
- Manufacturers and suppliers of machine/equipment like compressors, STG turbines and generators will be manufactured as per OHSAS/MoEF guidelines.
- The personnel safety such as ear muffs, ear plugs and industrial helmets shall be provide to workers which act as noise reducers

### 11.3.3 Water Environment

The total fresh water requirement for the proposed activity will be 1812.44 $m^3$/ day. And waste water generation will be 765 $m^3$/ day. The continuous efforts will be made to reduce the water consumption and thereby reduce wastewater generation. Flow meters will be installed on all major water inlets and the flow rates will be continuously monitored. Periodic water audits will be conducted to explore the possibilities of minimizing water consumption.

The wastewater generated from the different units such as cooling tower blow down, boiler blow down, DM plant, sugar process unit waste and sanitary waste of proposed activity shall be treated in existing ETP having capacity 1000 $m^3$/day.

**Effluent Treatment**

- The effluents generated from sugar unit, co-gen, distillery and other auxiliary units are treated in an ETP Comprising of anaerobic digestion followed by aeration system treated effluent will be recycled / reused within factory premises.
- The RO plant will be installed in the Sugar & co-gen plant. After RO treatment, the DM water will be used in Boiler. RO reject water is send to Kardali plantation.
- The spent wash from molasses based distillery will be concentrated in Multiple Effect Evaporators and incinerated in incineration Boiler (35 TPH) to achieve zero discharge.
- Domestic effluent will be treated in Soak Pit & Septic Tank will be provided at the site.

**Storm Water Management**

The Integrated sugar complex water management system will be designed to minimize the potential for storm water contamination occurring at the site. This will be achieved by incorporating the following features into the storm water management system:

- Run off from upstream areas will be diverted around the plant site;
- The quantity of contaminated run off generated will be minimized by diverting run off from areas external to the plant to storm water discharge points.
- Hazardous material and fuel storage areas will be bunded and drains will be provided around these facilities to prevent entering of runoff water ; and

- Runoff from area external to process areas of the plant will be contained within a storage system.

### 11.3.4 Solid Waste Management

**Table 11.2: Details of solid waste generation**

| Sr. No. | Particular | Solid waste |
|---|---|---|
| 1 | Sugar<br>5000 TCD | ETP sludge – 325 Kg/day |
| | | Oil & grease recovery – 146 Kg/day |
| 2 | Co-generation Unit (Cap.- 26 MW), DECC | Bagasse Ash-20.81 MT/day |
| 3 | Distillery Cogen Unit (Cap 3.5 MW, ECC) | *Coal and spent wash Ash from Incineration boiler-84.06 MT/day |
| **3** | **Distillery** | |
| 3A | Molasses based (60KLPD) (ENA, Evaporator & ethanol) | * Yeast sludge from molasses distillery – 15 MT/day<br>*Distillery ETP sludge-250Kg/day |
| 3B | Grain based (45 KLPD)<br>(liquefaction , evaporator, dryer, ENA) | |
| 4 | Malt Spirit based (5KLPD) | Residue as cattle feed-3.90 MT /day |
| 5 | Grape Spirit based (5KLPD) | Grape residue for composting -19.5MT/D |
| 6 | Cyclodextrane Plant<br>(2.5 MT/day) | Grain residue as cattle feed 750Kg/day |

Solid by-products such as bagasse, press mud and molasses are generated as process co- products (byproducts) from the industry. Press mud is supplied to member farmers for their used as bio–manure and molasses is used in own distillery for its use as raw material in manufacture of ethanol. Bagasse produced from the sugar factory is used as a fuel in the boilers for production of process steam. Solid wastes such as boiler ash & ETP sludge are also produced from the proposed unit. These are disposed to farmers for their use as soil conditioner in agricultural field.

For siting of an activity, "**Delphi *Technique"*** is advised by MOEF. The Government of India has recommended this technique in the book on Siting of Hazardous Waste Disposal Areas prepared by NEERI, Nagpur and published by the Ministry of Environment and Forest (MOEF) in 1991. The same is proposed to be used with due improvisation, *mutatis mutandis*, covering other media of environment.

### 11.3.5 Occupational Health & Safety

During operation stage, dust is the main health hazard. Other health hazards are due to gas cutting, welding, noise and high temperature and micro ambient conditions especially near the boiler and platforms which may lead to adverse effects (Heat cramps, heat exhaustion and heat stress reaction) leading to local and systemic disorders.

- Adequate arrangements for preventing generation of dust by providing the chutes at transfer points to reduce the falling height of material, preventing spillage of material by maintaining the handling equipment, isolating the high dust generating areas by enclosing them in appropriate housing and appropriately de-dusting through high efficiency bag filters
- All workers engaged in material handling system will be regularly examined through PFT (Pulmonary Function Test) tests for lung diseases.

### 11.4 Ecology

Flora and fauna inventories within the project area will be monitored on a twice yearly basis, as well as before and during the construction and early operating activities. This may involve the use of specific indicators, such as the occurrence of nests or nesting bird species of importance. It is intended that the implementation of the monitoring program will be conducted on a co-operative basis by the various stakeholders in the area

### 11.5 Green Belt Development

The total plot area is 110 acres (~44Ha). The green belt will be developed to the tune of 37.45 Acres (14.98 ha). There under, about 8000 no. of trees will be planted.

### 11.6 Budgetary Provision for Environmental management plan

- Cost of EMP is Rs. 1295.25 Lakh.

**Table 11.3: Details of Capital Cost and Recurring cost (in Rs.)**

| Sr. No. | Description of Item | Capital Cost, Lacs | Recurring Cost, Lacs/ A |
|---|---|---|---|
| 1 | Electrostatic precipitators | 500 | 15.00 |
| 2 | Stacks | 170 | 3.00 |
| 3 | Effluent treatment plants (ETP), Sewage collection, treatment & disposal (STP) | 450 | 12.50 |
| 4 | Fire fighting system | 75 | 2.25 |
| 5 | Noise Abatement | 0.25 | 0.10 |
| 6 | Env. Lab equipment & on line monitoring system | 50 | 5.00 |
| 7 | Rain water harvesting | 15 | 4.50 |
| 8 | Green belt | 35 | 5.00 |
| | **Total** | **1295.25** | **47.35** |

## 12.0 CONCLUSION

This industry will provide sugar, power as useful material for India, which will save foreign exchange in these days. This will not disturb the present landuse because our area occupied will be only small % of Influence zone 10 km. Compatible Architecture will be adopted and No Prime Agriculture Land will be put to this industrial use. Trees will be maintained and not razed down. No Rehabilitation is involved. The problematic waste materials of sugar mills like molasses, press mud and bagasse will be utilized within the existing project. People will get some jobs here and the sugar, power and organic compost generated here will be useful for farming and some incidental small employment like eatery, canteen, tyre repairs, garage too will become available to genuine people. This will be beneficial to the society. Due to this project, farmer will get more prices for sugarcane.

- This project is very necessary in view of converting waste bagasse, molasses into useful steam, power and foreign exchange saver product.
- The local people desire that this industry will be welcome in their area.
- The candidate site is suitable from general MoEF expectations.
- Water, power, Raw material and Market is assured and found available with ease.
- Full precautions will be taken for Pollution Control, Resource Conservation and Environmental Protection.
- This is cost effective and Sustainable Development.