# FORM – I A

(Only for construction projects listed under item 8 of the schedule)

**CHECKLIST OF ENVIRONMENTAL IMPACTS**

(Project proponent are required to provide full information and wherever necessary attach explanatory notes with the form and submit along with proposed environmental management plan & monitoring program)

**1. LAND ENVIRONMENT**

(Attach panoramic view of the project site and the vicinity)

*Kindly Ref. Aerial view of the site is enclosed with application*

1.1. Will the existing land use get significantly altered from the project that is not consistent with the surroundings? (Proposed land use must conform to the approved master plan/ development plan of the area. Change of the land use if any and the statutory approval from the competent authority should be submitted). Attach maps of (i) site location, (ii) surrounding features of the proposed site (iii) the site (indicating levels and contours) to appropriate scales. If not available attach only conceptual plans.

*No, As per the Taleigao Outline Development Plan, the project site is designated as commercial one C1. The proposed project is a modification for the approval obtained from MoEF. Taleigao Outline Development Plan is enclosed with application.*

1.2. List out all the major project requirements in terms of the land area, built up area, water consumption, power requirement, connectivity, community facilities, parking needs etc.

| ***Sl. No.*** | ***Particulars*** | | | ***Details*** |
|---|---|---|---|---|
| *1.* | *Total land area* | | | *82,220 Sq.mt* |
| *2.* | *Height of the Building* | | | *Maximum – 24 m* |
| *3.* | *Total built up area* | | | *64348.38 Sqmt.* |
| *4.* | *Project cost* | | | *30 Crores* |
| *5.* | *Total water consumption* | *Construction Phase* | *For Domestic* | *7 KLD* |
| | | | *For Construction* | *15 KLD* |
| | | *Operation Phase* | | *Fresh water requirement- 214 KLD* |
| *6.* | *Power Requirement* | *During Construction* | *Power* | *150 kVA* |
| | | | *DG* | *250 kVA* |
| | | *During Operation* | *Power* | *2631 kW* |
| | | | *DG* | *2 x 320 kVA& 2X150KVA* |
| *7.* | *Parking Needs* | *Required* | | *664 cars* |
| | | *Provided* | | *677 cars* |

1.3. What are the likely impacts of the proposed activity on the existing facilities adjacent to the proposed site? (Such as open spaces, community facilities, details of the existing Landuse, disturbance to the local ecology)

*The proposed project may cause interferences to the visibility around the site. Due to good architectural views and well designed landscape, the project is expected to enhance the aesthetics of the surroundings. Project site is situated in the neighborhood of other residential developments, hence does not alter the local ecosystem.*

1.4. Will there be any significant land disturbance resulting in erosion, subsidence & insatiability? (Details of soil type, slope analysis, vulnerability to subsidence, seismicity etc may be given)

*The project will not lead to any erosion, subsidence & instability. The project site is in Seismic Zone – II i.e., low seismic zone and hence no possibility of such impacts. Detailed geotechnical investigations have been carried out for the project to find out the soil suitability w.r.t. its bearing capacity, vulnerability towards liquefaction etc. and to support the foundation for the proposed structures. Recommendations of this study will be adhered to avoid any such risk mentioned above. It is proposed to develop professionally designed landscaping to avoid the erosion of the texturally disturbed soil.*

1.5. Will the proposal involve alteration of natural drainage systems? (Given details on a contour map showing the natural drainage near the proposed project site)

*No. As per the site scenario project site is sloping towards West direction. The runoff from the project site will be managed within the site to the maximum extent and excess will be routed to existing external storm water drain.*

1.6. What are the quantities of earthwork involved in the construction activity- cutting, filling, reclamation etc. (Give details of the quantities of earthwork involved, transport of fill materials from outside the site etc.)

*The total quantity of excavation from the proposed 13500 $m^3$; the quantity of excavated earth generated from the activity is proposed to reuse within the project site for backfilling, for formation of building & road. Excavated top soil will be stored for reusing for landscaping. During the excavation, the surrounding area will be kept wet, so that there is no dust pollution in the air.*

1.7. Give details regarding water supply, waste handling etc during the construction period.

*Construction water requirement and domestic water needs for the labourers are met by the external authorized tanker water suppliers.*

***Water Requirement:***

*Construction purpose:*

*The total water requirement for construction purpose is expected to be 15 KLD, which will be obtained from treated water from tankers.*

*Domestic Use- Source of water: External authorized suppliers.*

***Solid Waste:***

*The construction stage solid waste will comprise mainly of massive & inert waste such as soil, sand, gravel, bricks, concrete, metals etc., and this waste shall be used within the site as much as possible and shall be segregated for further reusability /disposal.*

*Municipal Solid waste generated at Construction Site: Considering 0.25 kg/day/person*

*Total solid waste generation = 0.25 x 150 = 38 kgs/day*

*Municipal solid waste generated during construction phase will be collected & properly disposed. Biodegradable waste will be handed over to local body for further processing and non-biodegradable waste will be handed over to authorized vendors for recyclers.*

1.8. Will the low lying areas & wetlands get altered? (Provide details of how low lying and wetlands are getting modified from the proposed activity)

- *No –*

1.9. Whether construction debris & waste during construction cause health hazard? (Give quantities of various types of wastes generated during construction including the construction labour and the means of disposal)

*Construction debris & waste during construction will not cause any health hazard due. Construction waste is generally bulky and heavy and mostly unsuitable for disposal by incineration or composting and hence reused as filling materials for internal roads and pavements.*

**2. WATER ENVIRONMENT**

2.1. Give the total quantity of water requirement for the proposed project with the breakup of requirements of various uses. How will the water requirement met? State the sources & quantities and furnish a water balance statement.

*<u>Construction:</u>*

1. *Water Requirement for construction activities: 15 KLD*
   *(Proposed to be sourced from treated water from tankers)*
2. *Domestic water requirements (labourers) : 7 KLD*
   *(Proposed to be sourced from external authorized suppliers)*

*<u>Operation:</u>*

1. *Total net fresh water requirement : 214 KLD*
2. *Source of water : PWD*

*Water demand details and water balance are provided in **Annexure 2a***

2.2. What is the capacity (dependable flow or yield) of the proposed sources of water?

*Water will be sourced from PWD and daily fresh water requirement will be 214 KLD*

2.3. What is the quality of water required, in case, the supply is not from municipal source? (Provide physical, chemical, biological characteristics with class of water quality)

*NA, since the water demand for the project will be met by PWD.*

2.4. How much of the water requirement can be met from the recycling of treated wastewater? (Give the details of quantities, sources and usage)

*During operation stage tertiary treated water from the STP to the tune of about 262 KLD. Out of this, 105 KLD shall be used for flushing of toilets, about 105 KLD shall be used for gardening, & 52 KLD will be used for HVAC purposes.*

2.5. Will there be diversion of water from other users? (Please assess the impacts of the project on other existing users and quantities of consumption)

*- No -*

2.6. What is the incremental pollution load from w/w generated from the proposed activity? (Give details of the quantities and composition of w/w generated from the proposed activity)

*The details of wastewater generated from the project are as below:*

| | |
|---|---|
| *Quantity, KLD* | *276* |
| *$p^H$* | *6.5-8.5* |
| *Total Suspended Solids, mg/lt* | *300-400* |
| *$BOD_5$, mg/l* | *250-350* |
| *COD, mg/l* | *500-600* |

2.7. Give details of the water requirements met from water harvesting? Furnish details of the facilities created.

*These details are enclosed in the **Annexure – A2 (a)***

2.8. What would be the impact of the land use changes occurring due to the proposed project on the runoff characteristics (quantitative as well as qualitative) of the area in the post construction phase on a long term basis? Would it aggravate the problems of flooding or water logging in any way?

*Project site is sloping towards west direction. The terrace rain water will be collected in roof rain water collection tank of capacity 90 cum and the same will be used after prior treatment. Internal*

*storm water drain will be provided within the site in order to carry out the storm water from landscape and hardscape into the recharge pits, to recharge the ground water which will be provided with perforated pre-cast cover all along the site boundary as well as in walk way & pavements. Hence it won't cause any flooding or water logging problems.*

2.9. What are the impacts of the proposal on the G/W? (Will there be tapping of g/w; give the details of g/w table, recharging capacity, and approvals obtained from competent authority, if any)

*Source of water is from PWD and the acknowledgement copy of application submitted to obtain approval has been attached along with the application. No G/W tapping.*

2.10. What precautions or measures are taken to prevent the runoff from construction activities polluting land and aquifers? (Give details of quantities and the measures taken to avoid the adverse impacts)

*The following are the management measures suggested to protect water quality,*

- *Avoid excavation during monsoon season. Care would be taken to avoid soil erosion.*
- *Community toilets shall be constructed on the site during construction phase in order to prevent wastewater from entering the water bodies.*
- *Any area with loose debris/soil within the site shall be fully planted by local plant species.*

2.11. How is the storm water from within the site managed? (State the provisions made to avoid flooding of the area, details of the drainage facilities provided along with a site layout indication contour levels)

*There will be no impact on the runoff characteristics from the proposed project. Site is sloping towards west direction.*
*The terrace rain water will be collected in rain water collection tank of capacity 90 cum and the same will be used after prior treatment.*
*Internal storm water drain will be provided within the site in order to carry out the storm water from landscape and hardscape into the recharge pits, to recharge the ground water which will be provided with perforated pre-cast cover all along the site boundary as well as in walk way & pavements.*

2.12. Will the deployment of construction labourers particularly in the peak period lead to unsanitary conditions around the project site (Justify with proper explanation)
*Measures will be taken to avoid unsanitary conditions around the project site in an environment friendly manner by providing toilets & other facilities.*
2.13. What on-site facilities are provided for the collection, treatment & safe disposal of sewage? (Give details of the quantities of w/w generation, treatment capacities with technology & facilities for recycling and disposal)

*The sewage generated is about 276 KLD during operation phase. This sewage will be treated in Sewage Treatment Plant of capacity 1X105 KLD and 1X175 KLD. The treated water will be utilized for secondary purposes like gardening, flushing. The sewage shall be treated to the stipulated GSPCB standards.*

2.14. Give details of dual plumbing system if treated waste is used for flushing of toilets or any other use.

*In order to minimize the water consumption, proponents are intended to use treated wastewater for secondary purposes such as flushing of toilets, gardening.*

**3. VEGETATION**

3.1. Is there any threat of the project to the biodiversity? (Give a description of the local ecosystem with its unique features, if any)

*The project site is surrounded by other similar residential activities. Hence there were no long established biodiversity and therefore there won't be any threat to the biodiversity.*

3.2. Will the construction involve extensive clearing or modification of vegetation? (Provide a detailed accountant of the trees & vegetation affected by the project)

*No.*

3.3. What are the measures proposed to be taken to minimize the likely impacts on important site features (Give details of proposal for tree plantation, landscaping, creation of water bodies etc., along with a layout plan to an appropriate scale)?

*The project planning includes extensive plantations of native or adapted trees and plants. The greenery absorbs heat, helping to improve the comfort level of the occupants and lowering ambient temperatures.*

**4. FAUNA**

4.1. Is there likely to be any displacement of fauna- both terrestrial and aquatic or creation of barriers for their movement? Provide the details.
*No.*

4.2. Any direct or indirect impacts on the avifauna of the area? Provide details.
*No.*
4.3. Prescribe measures such as corridor, fish ladders etc to mitigate adverse impacts on fauna.
*No.*

**5. AIR ENVIRONMENT**

5.1. Will the project increase atmospheric concentration of gases & result in heat islands?

(Give details of background air quality with predicted values based on dispersion models taking into account the increased traffic generation as a result of the proposed constructions)

*The major sources of air pollution from the project are from*
*(a) DG Sets*
*(b) Additional Vehicular Traffic*
*The DG sets shall be procured strictly on their compliance with the applicable regulatory norms. They will also be provided with stack with sufficient height as per the norms for the proper dispersion of pollutants.*
*It is expected that there will be a marginal increase in the pollutant levels due to vehicular emissions from operational traffic. However, the occupants shall be encouraged to use mass transit system and optimal use of vehicles.*
*The impacts from the proposed project is marginal, hence doesn't cause heat island effect.*

5.2. What are the impacts, on generation of dust, smoke, odorous fumes or other hazardous gases? Give details in relation to all the meteorological parameters.
*The major gaseous emissions come from the DG sets and the additional vehicular traffic due to the project. The impacts due to DG sets would be minimal as the gaseous emissions shall be kept within the limits as per CPCB standards and sufficient stack height will be provided for proper dispersion of pollutants and mass transportation will be encouraged to the staff to avoid the load on traffic.*

5.3. Will the proposal create shortage of parking space for vehicles? Furnish details of the present level of transport infrastructure and measures proposed for improvement including the traffic management at the entry & exit to the project site.
*No, the proposed project won't create shortage for parking space, sufficient parking space will be provided. Over all car parking details is provided in the below table.*

***Table: Car Parking Details***

| | TYPE BUILDING | NUMBER OF UNITS | NO OF CAR PARKING REQUIRED |
|---|---|---|---|
| Sector -1 | RESIDENTIAL | 364 | 453 |
| Sector-IIIc | RESIDENTIAL | 11 | 13 |
| | | | |
| Sector -IV | RESIDENTIAL | 106 | 178 |
| Sector -IV | SHOPS/COMMERCIAL | | 20 |
| **TOTAL REQUIRED** | | | **664** |
| **TOTAL PROVIDED** | | | **677** |

5.4. Provide details of the movement patterns with internal roads, bicycle tracks, pedestrian pathways, footpaths etc., with areas under each category.

*Adequate parking facilities have been proposed for the project as per the norms.*

5.5. Will there be significant increase in traffic noise & vibrations? Give details of the sources and the measures proposed for mitigation of the above.

*No. During construction period there will be a traffic movement due to transport of construction materials, tools and tackles, required for construction. However this is only a temporary phenomenon that exists only during the construction phase of the project. Conservatively it can be estimated that there would be an additional traffic of approximately 664 No's four wheelers after the construction is completed.*

*Mitigation measures are:*

- ✓ *Periodic maintenance of vehicles.*
- ✓ *Periodic emission check for vehicles.*
- ✓ *Clean fuel will be used for the vehicles.*
- ✓ *High noise generating units such as DG set will be provided with pre-manufactured acoustic enclosures. Tree plantation on the project boundary will further act as noise barrier and helps in attenuation of noise.*

5.6. What will be the impact of DG sets & other equipment on noise levels & vibration & ambient air quality around the project site? Provide details.

*Impacts on Air Quality due to DG Sets*

- *Impacts on ambient air during operation phase would be due to emissions from the stacks attached to backup DG sets only during grid power failure.*

*Mitigation Measures for Impacts of DG Sets on Ambient Air Quality*

- *Back up DG sets will comply with the applicable emission norms.*
- *Adequate stack height for DG sets will be provided as per norms.*
- *Back up DG sets will be used only during non-availability of Goa Electricity Board.*
- *Monitoring of emissions from DG sets and ambient air quality will be carried out as per norms.*

*Noise Control Measures for DG sets:*

- *DG room will be provided with acoustic lining / treatment to ensure insertion loss as per the regulations.*
- *Adequate exhaust mufflers will be provided as per norms to limit the noise.*

*During operation phase vehicular movement and operation of DG sets are the major sources of noise pollution. But both these activities- DG set and vehicular movement will not have any significant impact on the people residing in the area. Since DG set will not be operational continuously and moreover it will be enclosed with suitable enclosures, hence no or minimal impact will be anticipated. It is envisaged that the movement of the motor vehicles will be restricted to designated paths.*

## 6. AESTHETICS

6.1. Will the proposed construction in any way result in the obstruction of a view, scenic amenity or landscapes? Are these considerations taken into account by the proponents?
*Though the high rise buildings obstruct the visibility along the project site, there are no scenic amenities or landscapes in the surroundings of the project. Hence doesn't cause any adverse impacts. And due to good architectural view and well planned landscape, the artistic beauty of the surrounding area is going to increase.*

6.2. Will there be any adverse impacts from new construction on the existing structures?

*This will be entirely new construction on a proposed land. No adverse impact on the existing structures of the area is envisaged.*

6.3. Whether there are any local consideration of urban form & urban design influencing the design criteria? They may be explicitly spelt out.

*All norms on ground coverage, FAR, height, setbacks, fire safety requirements, structural design and other parameters will be strictly followed according to the local land use Norms.*

6.4. Are there any anthropological or archaeological sites or artifacts nearby? State if any other significant features in the vicinity of the proposed site have been considered.

*No, project site is surrounded by other similar residential and commercial developments.*

## 7. SOCIO-ECONOMIC ASPECTS

7.1. Will the proposal result in any changes to the demographic structure of local population? Provide the details.

*There is no or little impact on the demographic structure of the area due to the proposed project. The city is already developed in terms of education, employment, Socio-economic status. Hence most of the work force for the proposed project will be engaged from the local areas. Hence migration of population is not envisaged.*

7.2. Give details of the existing social infrastructure around the proposed project.

*Around the project site many residential apartments, educational institutes & industries are existing. The project site mainly composes middle class and upper middle class people. However, Goa is a tourist hotspot and economically diversified city and hence employment of all cadres is available in the city.*

7.3. Will the project cause adverse effects on local communities, disturbance to sacred sites of cultural values? What are the safeguards proposed?

*There is no impact from this project on sacred sites of cultural values & sensitive places in the vicinity of the project.*

## 8. BUILDING MATERIALS

8.1. May involve the use of building materials with high-embodied energy. Are the construction materials produced with energy efficient processes? (Give details of energy conservation measures in the selection of the building materials and their energy efficiency)

*The proposed project construction materials are selected to conform the building energy efficiency norms and as well as Energy Conservation Building Code Guidelines.*

***Energy conservation measures.***

- ✓ *Energy efficient appliances will be installed inside the building.*
- ✓ *Efficient LED's will be used for all internal and external areas.*

8.2. Transport and handling of the materials during construction may result in pollution, noise & public nuisance. What measures are taken to minimize the impacts?

*There will be vehicular movement due to transport of construction materials, tools and tackles, required for construction. However this is only a temporary phenomenon that exists only during the construction phase of the project. Optimal routes shall be planned for the transportation of construction materials. The traffic will be scheduled to operate during lean traffic hours.*

***Mitigation Measures for Air Pollution during Construction Stage***

- *Construction materials will be suitably covered with tarpaulin cover etc during transportation.*
- *Water sprinkling will be done on haul roads where dust generation is anticipated.*
- *Raw material storage and handling yard will be closed from all sides.*
- *To minimize the occupational health hazard, proper personal protective equipments i.e. mask shall be provided to the workers working in the dust prone areas.*

***Mitigation Measures for Noise Pollution during Construction Stage***

- *Administrative as well as engineering control of noise will be implemented.*
- *Isolation of noise generation sources and temporal differentiation of noise generating activities will ensure minimum noise at receiver's end.*
- *To prevent any occupational hazard, earmuff / earplug shall be given to the workers working around construction plant & machinery emitting high noise levels.*
- *Careful planning of machinery operation and scheduling of operations shall be done to minimize impact.*

8.3. Are recycled materials used in roads & structures? State the extent of savings achieved?

*Any construction waste generated on-site like construction debris, sand and gravel will be reused as fillers for internal roads as base course layer within the project site.*

8.4. Give details of the methods of collection, segregation & disposal of the garbage generated during the operation phases of the project.

***Operation Phase***

*The solid waste generated from the project during operation will be mainly Organic & Inorganic waste. The total solid waste generated from the entire project 661 Kg/day. Out of which 500 Kg/day will be Organic waste & 161 Kg/day will be Inorganic waste.*

*The domestic solid wastes will be segregated into organic and inorganic wastes at the source itself in which organic waste will treated in organic waste convertor and inorganic wastes will be given to the recyclers. Sludge from STP will be around 5.25 Kg/day, will be used as manure for in-house landscaping.*

## 9. ENERGY CONSERVATION

9.1. Give details of the power requirements, source supply, back up source etc. what is the energy consumption assumed per square foot of built up area? How have you tried to minimize energy consumption?

*Power Requirement & Primary Source of Energy:*

*Source : Goa Electricity Board*

*Operational Phase : Total Energy requirement of 2631 KVA*

*Energy Back Up:*

*Construction Phase: DG set of 150 kVA Capacity*

*Operation Phase: DG sets 2X150 KVA and 2 x 320 kVA*

9.2 What type of, and capacity of, power back-up do you plan to provide?

*Diesel engine driven generators of 2 x 320 kVA will be proposed as a source of backup power along with the existing DG of capacity 2X150 KVA.*

9.3. What are the characteristics of the glass you plan to use? Provide specification of its characteristics related to both short wave and long radiation?

- *Windows are appropriately shaded to avoid glare to 100% of the occupants throughout the year*

- *Double glass windows with spectrally selective glass to minimize heat gains and bring in natural light*
- *Walls & roof will be insulated to minimize heat gains*
- *Maximum allowable peak envelope heat gain is 0.75 W/sqft.*

9.4. What passive solar architectural features are being used in the building? Illustrate the applications made in the proposed project.

*The buildings are designed to harvest the natural solar lighting as far as possible by providing appropriate fenestrations. The buildings are provided with thermal insulation materials, Sun shades and dense vegetation.*

9.5. Does the layout of streets & buildings maximize the potential for solar energy devices? Have you considered the use of street lighting, emergency lighting and solar hot water systems for use in the building complex? Substantiate with details.

*Yes, as the passive solar architectural features are being used in the building planning, the layout of streets & buildings maximize the potential for solar energy devices. The proposed residential sector will comprise of solar street lightings in common area, landscape area, hence utilizing maximum solar energy.*

9.6. Is shading effectively used to reduce cooling/heating loads? What principles have been used to maximize the shading of walls on the east and the west and the roof? How much energy saving has been effected?

*Yes. Shading requirements vary according to climate and building orientation.*
***Principles to maximize the shading of walls and the Roof:***

- *Use external shading devices with lighter-colors over openings which reflect more heat*
- *Planting of trees to shade the building, particularly windows, to reduce unwanted glare and heat gain*
- *Advanced glazing solutions such as solar films and tinted glass may be appropriate as a secondary measure on east and west elevations*
- *Avoid using tinted glass on north facing windows designated to let in winter sun*
- *By keeping area of glazing on east and west elevation to be minimum where possible*

9.7. Do the structures use energy-efficient space conditioning, lighting and mechanical systems? Provide technical details. Provide details of the transformers and motor efficiencies, lighting intensity and air-conditioning load assumptions? Are you using CFC and HCFC free chillers? Provide specifications.

*Lighting and mechanical systems is being proposed for this project and there is a provision of Air Conditioning facility.*

9.8. What are the likely effects of the building activity in altering the micro-climates? Provide a self assessment on the likely impacts of the proposed construction on creation of heat island & inversion effects?

*Along with the measures considered in Item 9.6, sufficient set back will be provided in accordance with the height of the building.*
*Additionally, good landscape features with greenbelt vegetation are also intended to abate the impact of heat island & inversion effects.*

9.9. What are the thermal characteristics of the building envelope? (a) roof; (b) external walls; and (c) fenestration? Give details of the material used and the U-values or the R values of the individual components.

*Thermal characteristics of the materials used for building envelop viz, roof & external walls will be provided in accordance with energy conservation building codes. Such as providing single insulation window panel, painting external wall with high reflective paints etc.*

9.10. What precautions & safety measures are proposed against fire hazards? Furnish details of emergency plans.

*The proposed project is a residential development & the maximum height of the building is 24m. Fire fighting system in the proposed project consists of fire detection system and fire fighting system as per IS: 2189. Automatic fire detection Fire fighting system and alarms with adequate supply has been introduced to the implement with the specification attached. The control room / security room with communication system to all floors is provided and facility for receiving messages from different floors shall be provided at entrance on ground floor. The materials used for construction of the building shall be of non-combustible. Non-combustible materials shall only be used for the construction / erection of false ceiling including all fixtures and used for its suspension / erection etc. and shall be of low flame rating. The standby electric generator shall be installed to supply power to staircase and corridor lighting circuit, ventilation and smoke extraction system, lifts, exit signs and fire pump in case of failure of normal electric supply.*

9.11. If you are using glass as wall materials, provide details and specifications including emissivity and thermal characteristics.

*Glass will not be used as wall material.*

9.12. What is the rate of air infiltration into building? Provide details of how you are mitigating the effects of infiltration.

*Air infiltration will be 5-10% of the building area volume. Building shall be completely closed and covered with external glazing glass.*

9.13. To what extent the non-conventional energy technologies are utilized in the overall energy consumption? Provide details of the renewable energy technologies used.

*The proposed project encompasses the usage of solar energy.*

## 10. ENVIRONMENTAL MANAGEMENT PLAN

*The environmental management plan would consist of all mitigation measures for each item wise activity to be undertaken during the construction, operation and the entire life cycle to minimize adverse environmental impacts as a result of the activities of the project. It would also delineate the environmental monitoring plan for compliance of various environmental regulations. It will state the steps to be taken in cause of emergency such as accidents at the site including fire.*

***Details enclosed as EMP.***

## ***Annexure – 1(a): Land Use details within the Project Site***

| Description of usage | Area in Sqmt | %usage |
|---|---|---|
| **Total site area** | **82,220** | |
| **Future Development** | **48724** | |
| | | |
| *Area considered for present development* | *33496* | 100 |
| *Ground coverage area* | *8923* | 26% |
| *Landscape area* | *17992* | 53% |
| *Driveway/ Ramp area* | *5731* | 17% |
| *Surface Parking area/ Service area* | *850* | 2.5% |

## ***Annexure 1(e): Waste Management (Solid Waste Generation)***

**CONSTRUCTION PHASE:**

Construction waste is generated during construction works. It mainly consists of earth, stones, bricks, inert and non-biodegradable material such as concrete, plaster, metal, wood, plastics etc. The retrievable items such as bricks, wood, metals are recycled; the construction earth and other wastes will be used for landscaping within the site premises.

| **Construction site:** | |
|---|---|
| Total quantity of solid waste generated | [150 no's labors/day X 0.25 kg] = 38 kg/day |
| Quantity of organic waste generated | 23 kg/day (60%) |
| Quantity of In-organic waste generated | 15 kg/day (40%) |

**OPERATION PHASE:**

The solid wastes generated during operation phase can be categorized under three types:

Wet garbage: Food waste, lawn mowing wastes etc

Dry garbage: Paper, plastic, bottles, E-wastes, etc.

Sludge from sewage treatment plant (STP)

Central Pollution Control Board (CPCB) has sponsored a survey to ascertain the status of municipal solid waste disposal in metro cities, Class-I cities and Class-II towns of India. As per the survey, the per capita generation of solid waste was found to vary from 0.019 kg/person/day to 0.747 kg/person/day. A nominal value of 0.45 kg/person/day has been considered for a residential development to estimate the quantity of domestic solid waste generated due to proposed project.

**Solid waste Generation:**

**Existing building:**

| SL No | Description of Module | No of person | Organic waste per capita considered(in kg/day) | Inorganic waste per capita considered(in kg/day) | Total Organic Solid Waste(in kg/day) | Total Inorganic Solid Waste(in kg/day) |
|---|---|---|---|---|---|---|
| 1. | Residential units: 364 | 1456 | 0.2 | 0.05 | 291 | 73 |
| | Total | 1136 | | | 291 | 73 |

**Proposed building**

| SL No | Description of Module | No of person | Organic waste per capita considered(in kg/day) | Inorganic waste per capita considered(in kg/day) | Total Organic Solid Waste(in kg/day) | Total Inorganic Solid Waste(in kg/day) |
|---|---|---|---|---|---|---|
| 1. | Retail | 189 | 0.05 | 0.2 | 9 | 38 |
| 2. | Restaurant | 247 | 0.2 | 0.05 | 49 | 12 |
| 3. | Residential units | 700 | 0.2 | 0.05 | 140 | 35 |
| 4. | Residential villa | 55 | 0.2 | 0.05 | 11 | 2.75 |
| | Total | 1191 | | | 209 | 87.75 say 88 |

Consolidated quantity after modification of the project.

Total quantity of solid waste generated - 661 kg/day

Total quantity of organic waste generated - 500 kg/day

Total quantity of inorganic waste generated - 161 kg/day

**Disposal:** The solid waste generated from the project is collected separately as organic and recyclable waste in the respective bins provided within the campus.

**Management:**

**Organic waste:** Organic wastes will be segregated & collected separately and will be processed in organic waste converter.

**Recyclable waste:** The recyclable portion like paper, plastics, glass, metals etc. will be given to the waste collectors for recycling for further processing.

**STP Sludge:** STP sludge will be used as manure for gardening within the site.

**Hazardous wastes:** Hazardous wastes like waste oil generated from the DG sets will be stored in barrels and handed over to the authorized waste oil recyclers / processors & the generated E-Wastes will be handed over to the authorized & approved by PCB E-waste processors.

## ***Annexure – 2(a): Water Demand***

**WATER DEMAND DURING CONSTRUCTION**

**For construction workers at site**

Average no. of laborers = 150 no.

Water demand/capita/day = 45 lpcd

Per day water consumption = **7 KLD**

**For construction purpose**

Average water requirement per day = **15 KLD**

Source of water: STP treated water for construction purpose & Tanker water for domestic purpose

Sewage generated at construction site will be treated in mobile STP

**Total water requirement during construction phase = 22 KLD**

**WATER REQUIREMENT DURING OPERATION**

Water during the operation phase will be met from PWD Water supply. Water conservation practices and rainwater harvesting plan will be implemented as per the guidelines to conserve the resources. Total fresh water requirement for proposed project will be 214 KLD. The detailed water requirement of the project and other facilities is estimated below along with water balance chart.

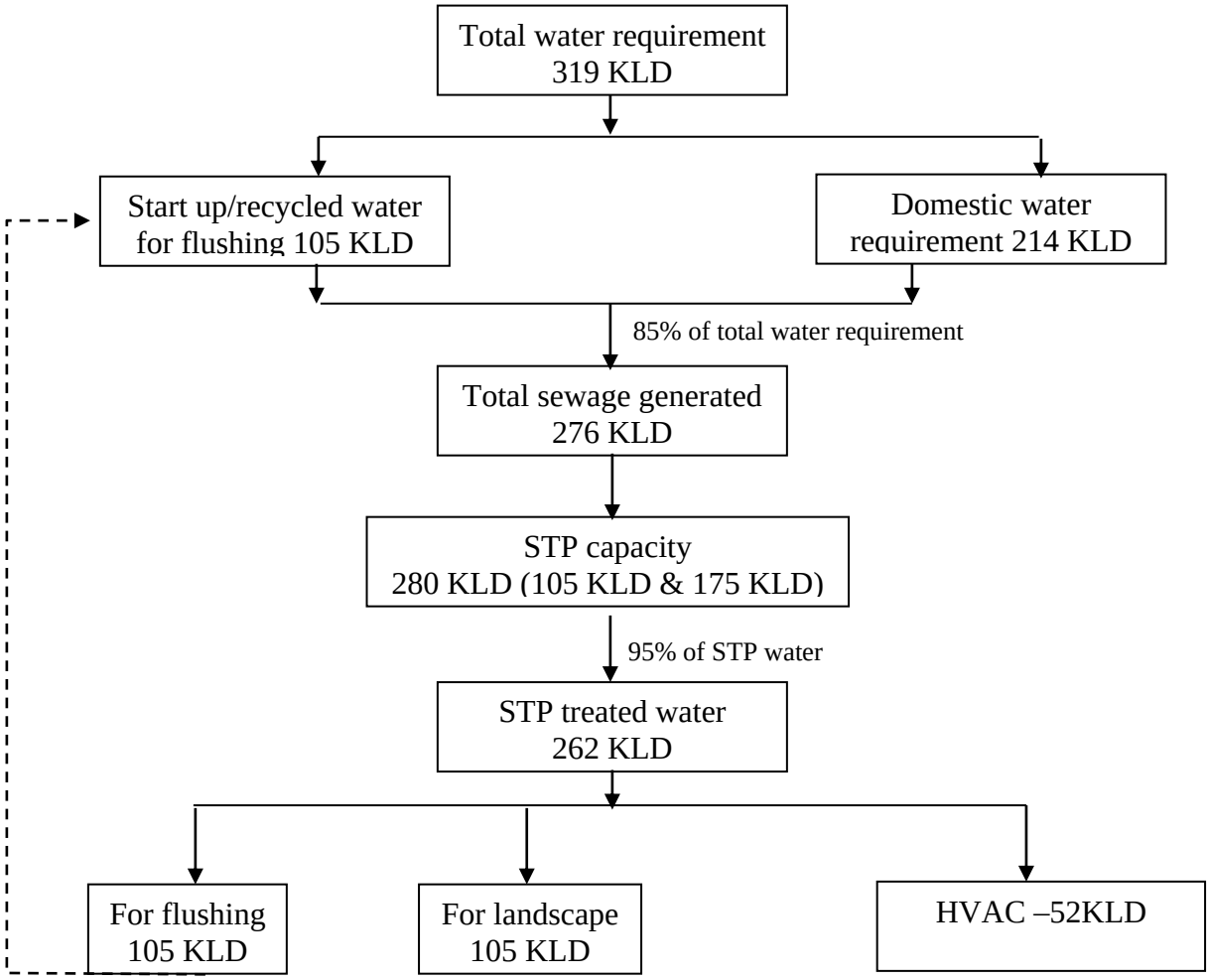
**Existing building:**

| Sl. No. | Description | Units | Occupants | Domestic water @90lpcd, in KLD | Flushing water @45lpcd, in KLD | Total water Demand @135lpcd, in KLD |
|---|---|---|---|---|---|---|
| 1 | Residential Apartment: | 364 | 1456 | 130 | 66 | 196 |
| 3 | Club house | -- | 50 | 2.25 @45 | 1.25 @25 | 3.5 |
| | **Total** | **364** | **1506** | **132.25** | **67.25** | **200** |

**Proposed buildings**

| Sl no | Description of Module | Area in Sqmt | No of Persons | Domestic water demand in lpcd | Flushing water demand in lpcd | Total water demand in lpcd | Domestic water reqt in liters/day | Flushing water reqt in liters/day | Total water reqt in liters/day | Sewage Generated in KLD |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ground floor( Retail) | 566 | 189 | 5 | 10 | 15 | 943 | 1887 | 2830 | 20 |
| 2 | Restaurant | 247 | 247 | 55 | 15 | 70 | 13585 | 3705 | 17290 | |
| | **Total** | **813** | **436** | | | | **14528** | **5592** | **20120** | |

| Sl no | Description of Module | Total unit | Rate of Occupancy | No of Persons | Domestic water demand in lpcd | Flushing water demand in lpcd | Total water demand in lpcd | Domestic water reqt in liters/day | Flushing water reqt in liters/day | Total water reqt in liters/day | Sewage Generated in KLD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 BHK | 14 | 7 | 98 | 90 | 45 | 135 | 8820 | 4410 | 13230 | 99 |
| 2 | 3BHK | 92 | 6 | 552 | 90 | 45 | 135 | 49680 | 24840 | 74520 | |
| 3 | CLUB HOUSE | | 0 | 50 | 70 | | 70 | 3500 | 0 | 3500 | |
| 4 | Swimming Pool Make-up water | | | | | | | 1500 | | | |
| 5 | Villas | 11 | 5 | 55 | 90 | 45 | 135 | 5000 | 2500 | 7500 | |
| | **TOTAL** | **117** | | **755** | | | | **68500** | **31750** | **98750** | |




**WATER BALANCE CHART**

**SEWAGE TREATMENT PLANT**

The sewage generated from the project is about 276 KLD i.e. 85% of the domestic water requirement. This raw sewage will be treated in the STP of capacity 280 KLD (105 KLD & 175 KLD) using SBR Technology. The treated water will be utilized for secondary purposes like flushing and for gardening.

The sewage generated is about 276 KLD. This sewage is treated in a Sewage Treatment Plant with a designed capacity of 280 KLD (105 KLD & 175 KLD) respectively. Sufficient area for this plant has been earmarked in the layout plan. The treated water will be utilized for secondary purposes like gardening, flushing etc. The sources of wastewater are from toilets, washbasins etc and therefore domestic in nature. This report details the following from the proposed facility viz Collection, Treatment and disposal of domestic effluents.

**Table: Raw Sewage Characteristics**

| | |
|---|---|
| Quantity, KLD | 276 |
| $p^H$ | 7-10 |
| Suspended Solids, mg/l | 150 |
| BOD, mg/l | 250-350 |
| COD, mg/l | 500-600 |

TREATMENT METHODOLOGY:

The methodology adopted for treatment of domestic sewage is based on SBR Technology and preliminary treatment for screening, followed with tertiary treatment by filtration & Disinfection.

Design details of Sewage treatment plant is enclosed along with the application.

## ***Annexure – A2 (a): Storm Water Management***

As the project location is blessed with fairly good rainfall, it is planned to collect the storm water at different gradients of the location. There will be rainfall runoff from building roof-tops, roads, pavements and greenbelt area. Necessary provision will be made to collect the quantity of rainfall runoff during the most rainy day of season. Necessary rain harvesting pit / recharge pit at regular intervals have been envisaged. Internal garland drain with RCC precast perforated cover and a RCC precast recharge pit will be provided around the periphery of property.

**Rainwater Harvesting Facilities:**

As the growth of Bengaluru city is far ahead of the rate at which the water supply system is being upgraded, it becomes necessary to think of alternative source of water for the daily needs for secondary purposes like washing, gardening etc. In these lines, rain water harvesting is gaining importance and has been a part of building by-laws. The facilities to be established for rainwater harvesting include carriage (piping) system, pre-treatment unit (filtration) and a storage tank.

| **DESIGN DETAILS** | | | |
|---|---|---|---|
| Land Area in Sqm | = | 8330.00 | Sqm |
| Terrace Area in Sqm for | = | 3118.00 | Sqm |
| Green area | = | 1346.00 | Sqm |
| Other / Podium / Hardscape / Driveways | = | 3866.00 | Sqm |
| **Total Run-off : ROOF TOP** | | | |
| Q = Runoff | 0.049 | | m3/sec |
| I = Intensity of rainfall | 60.00 | | mm/hr |
| A = Drainage area in hectares. | 0.312 | | Ha |
| C = Co-efficient of run off | | | 0.95 |
| Volume of rainwater available for harvesting is | **89** | | **Cum** |
| This run-off is being diverted to roof top rain water collection sump, which shall be used for domestic purposes after the necessary treatment. | | | |
| **Total Run-off : HARDSCAPE & DRIVEWAY** | | | |
| Q = Runoff | 0.045 | | m3/sec |

| | | |
|---|---|---|
| I = Intensity of rainfall | 60.00 | mm/hr |
| A = Drainage area in hectares. | 0.387 | Ha |
| C = Co-efficient of run off | | 0.70 |
| Data assumed: | | |
| Considering 30 min of rainfall | | |
| Volume of rainwater available for harvesting is | **81** | **Cum** |

| | | |
|---|---|---|
| **Total Run-off : GARDEN AREA** | | |
| Q = Runoff | 0.004 | m3/sec |
| I = Intensity of rainfall | 60.00 | mm/hr |
| A = Drainage area in hectares. | 0.135 | Ha |
| C = Co-efficient of run off | | 0.20 |
| Data assumed: | | |
| Considering 30 min of rainfall | | |
| Volume of rainwater available for harvesting is | **8** | **Cum** |
| **Therefore the total Run-off from the site is** | **89** | **Cum** |
| **Recharge Pit Calculation** | | |
| Data assumed: | | |
| Infiltration rate is 10 cms/hr | 0.1 | m/hr |
| Recharge pit of 1.2 m diameter is considered | 1.2 | mtr |
| Area of bottom surface of Recharge pit | 1.13112 | Sqm |
| Area of wetted perimeter of Recharge pit (3m depth considered) | 11.3112 | Sqm |
| Total area of per Recharge pit | 12.44232 | Sqm |
| Total water permeability/pit/hour | 1.244232 | Cum/hr |
| Total number of Recharge pits required | 8 | Nos |
| Total number of Recharge pits provided | 8 | Nos |
| Amount of water perculating through the Recharge pits | 99.54 | Cum |
| No Excess water , Hence zero discharge from site | - | Cum |