ENVIRONMENT CLEARANCE

(FORM IA)

For

Redevelopment of Gomti Nagar Railway Station

At

Gomti Nagar, Lucknow, U.P.

By

NBCC (India) Limited

Environment Consultant-

M/s Amaltas Enviro Industrial Consultants (AEC).Ltd.
NABET/EIA/1518/IA 0017

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FORM I A

APPENDIX II

(See Paragraph -6)

CHECKLIST OF ENVIRONMENTAL IMPACTS

(Project proponents 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)

1.1. Will the existing land use get significantly altered from the project that is consistent with the surroundings? (Proposed land use must conform to the approved Master Plan/Development Plan of the area. Change of land use, if any and the statutory approval from the competent authority are submitted). Attach Maps of (i) site location, (ii) surrounding features of the proposed site (within 500 meters) and (iii) the site (indicating levels & contours) to appropriate scales. If not available attach only conceptual plans.

- No. As the site is already earmarked for the public utilities purposes and is allotted for setting up a transport facility, the project still exists within the same premises, it is now proposed for a redevelopment.
- Gomti Nagar Railway Station has planned to redevelop the existing project. Site is having plot area of 1,61, 874.3 m^2. The proposed redevelopment involves construction of station and commercial facility etc. It is anticipated that the construction activities at the site area will not have an adverse effect on the land use of project area.
- This project is being developed by NBCC (India) Limited, this is a Central Government owned project. The geographical co-ordinates of the site are **26°51'38.50" N and 81°0'13.98"E.**

Annexure 1-Surrounding features of the proposed site (within 500 meters)

- 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.
- Land Area: Site is having plot area of 1,61,874.3 m2
- Built UP Area Details are given in below tables.

Table 1: Area Details of the Proposed Building

S. No.	Particulars	Area (in m^2)
1.	Total Plot Area	1,61,874.3
2.	Proposed site area to be developed	40,873.25
3.	Permissible Ground Coverage (@ 35% of plot area to be developed)	14,305.64
4.	Proposed Ground Coverage • North and South terminal • Retail • Utilities	**14,935** 6,180 5,330 3,425
5.	Permissible FAR (@ 2 of plot area to be developed)	**81,746.5**
6.	Proposed FAR (@1.29 of plot area to be developed) • Station • Commercial (Retail 1 &2)	**52,900** 19,455 33,445
7.	Basement Area • Upper Basement Area • Lower Basement Area	**29,440** 14,860 14,580
8.	Service Area STP area Pump room ESS AC plant room Compost plant & garbage room HSD	**3,640** 600 490 1,050 1,000 400 100
9.	Built Up Area (6+7+8)	85,980
10.	Existing Builtup area (to be demolished) • South Side existing Platform • FOB at platform 1-3 • Railway Quarters	**5,925** 80 300 4,845
11	Landscape Area (@ 30% of the plot area)	48562.3
12.	Maximum Height of Building	8 m

- **Water Consumption**

Construction Phase

During the construction phase the water requirement will be met from Private water or treated wastewater from Nearby STP. No ground water will be extracted for construction activities.

Operational Phase

Total water requirement for proposed project is approx. 550 KLD. The main sources fresh water will be

- Municipal supply/ Bore-well

However the secondary sources of the water are

- Tanker supply (For Emergency Use only)
- Treated Effluent from an external centralized sewage treatment Plant

Total quantity of wastewater generation will likely to be 441 KLD. The generated sewage will be collected and treated in the in-house Sewage Treatment Plant of 600 KLD capacity. The treated wastewater will be re used for DG cooling, HVAC, and flushing and horticulture purposes. Water Balance diagram during Non Rainy season and Rainy season are shown below.

Figure 1-Calculation for Daily Water Demand

Description	**Population**	**Rate of Water Demand (lpcd)**	**Total water requirement (KLD)**	**Flushing Water (KLD)**	**Fresh Water (KLD)**	**Waste Water** (80% of fresh+ 100% flushing)
Retail Building-1						
Ground floor	705	15	10.6	7.1	3.5	9.9
First to Fourth floor	1,632	15	24.5	16.3	8.2	22.8
Staff	572	45	25.7	11.4	14.3	22.9
Retail Building -2						
Ground floor	1,070	15	16.1	10.7	5.4	15.0
First to fourth floor	2,764	15	41.5	27.6	13.8	38.7
Staff	825	45	37.1	16.5	20.6	33.0
Terminal building concourse Passenger	40,000 considering 50% usage	15	300.0	200.0	100.0	280.0
Staff	468	45	21.1	9.4	11.7	18.7
			476.5	**299.0**	**177.5**	**441.0**
Landscape area		6liters/m2 /day	50.0	-	-	-
HVAC & DG cooling		10 L/TR/HR	300.0	-	-	-
Cleaning of coaches, trains		20 ,000	20.0	-	-	-
Watering of train on	500 Coaches	200 liters/ coach	100.0	100	-	-

platform						

* For Fire fighting One time water will be required 2*200 KLD tanks are proposed.
(Source for flushing and fresh water requirement for staff and visitor: Part 9, Table 1,Clause 4.1.2, XIV, Page No.12 , National Building Code of India 2016)

** HVAC will be operational for 8 hours.
* D.G. sets will be operational for 6 hours

Wastewater Details

Total Water Requirement • Rainy season • Non rainy season	671 KLD (178+20+100+202)= 500 (178+20+100+252)=550
• Domestic (staff @20 lpcd+ visitors@ 5lpcd)	178 KLD
• Flushing (staff @ 25 lpcd+ Visitors@ 10 lpcd)	299 KLD
Waste water Generated (80% Domestic + 100% flushing)	(142.4+ 299) = 441 KLD

Power Details

- The power shall be supplied by SEB state grid The total demand load for the project will be 5736 kVA. It is proposed to install 03 Electrical Subs- Stations.

D. G. Sets Details

- In case of power failure, there will be 3 Nos. of D.G. sets of capacity 4500 kVA will be provided. The location of DG rooms shall be either at the ground or in Basement.

Connectivity

Site is well connected to transport facilities as well as surrounded by populated areas. Gomti Nagar Railway Station in itself is a connectivity boon for the city of lucknow and nearby areas, with confluence of many people reaching their places of travel, work, etc through it.

Nearest Railway Station: Malhour Railway Station (Approx. 3.76 km, ESE)

Nearest Airport: Chaudhary Charan Singh International Airport (Approx.16.06 km, SW)

Parking Facility

Adequate provision will be made for car/vehicle parking at the project site. There shall be adequate parking provisions for visitors so as not to disturb the traffic and allow smooth movement at the site.

Proposed project will have an open parking. The parking space criteria and area requirement provided are summarized in the table below. Parking details are designed as per Local Building Bye Laws. Adequate provision will be made for car/vehicle parking at the project site. There shall also be adequate parking provisions for visitors so as not to disturb the traffic and allow smooth movement at the site.

Parking Proposed:

Parking Required:

(i) As per MoEF

Commercial	= 2 ECS/100 sq.m. FAR
	= 33445/50
	= 669 ECS
Total Parking required	**= 670 ECS**

(ii) As per State bye-laws:

Retail and commercial	=	3 ECS/100 sq.m. FAR
	=	3x 33,445/100
	=	1003 ECS
Total Parking required	**=**	**1,003 ECS**

Parking Proposed for Non railway development:

Area proposed for surface parking	=	4,600 m^2
Area required for 1 ECS of surface parking	=	23 m^2
Parking proposed for surface parking	**=**	**200 ECS**
Area proposed for basement parking	=	26,496 m^2
Area required for 1 ECS of basement parking	=	32 m^2

Parking proposed for basement parking = 828 ECS

Total Parking proposed = 1,028 ECS

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 land use and disturbance to the local ecology).

- Impact on Existing Facilities

The proposed project is to be developed in an area of 1,61,874.3sqm. The site has been designated for public utilities (transport) use as per the Lucknow Master Plan. The project will involve station, green areas, open spaces, commercial spaces etc. With these upcoming structures, it is expected that the land use pattern of the area will be enhanced without compromising on the socio-economic status of the local people.

- Impact on Land Use

✓ The site is located in an urban landscape. The development of the project will lead to a positive change in aesthetics and visual appeal of the region. No change in land use will occur due to redevelopment of the site.

- Impact on Ecology

✓ It is redevelopment of existing area which will involve new construction and no cutting of existing flora.

✓ Out of the total plot of 1,61,874.3 m2, an area of 48562.3 m2 (app.30% of Plot area) is still under horticulture/landscape area.

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

- There will be no land disturbance resulting in erosion, subsidence and instability. The soil type is sandy clay loam and the project area possesses fairly plain terrain, the contour survey of the site is carried out, slope stability analysis not required to carry out. Chances of ground subsidence are negligible groundwater level is more than 10 mbgl so no dewatering shall not be done. The project will develop proper green and paved area which will not cause soil erosion. The site falls under the zone IV as per the Indian standard seismic map of India and indicating moderate damage risk zone. The project will be earthquake resistant taking into account the latest provisions of Indian Standards Codes.

1.3. Will the proposal involve alteration of natural drainage system? (Give details on a contour map showing the natural drainage near the project site).

- The project does not intersect any natural drainage route. No perennial or non-perennial drainage system is found to exist in the project area or being obstructed by the project. The surroundings comprise an urbanized stretch. Well planned storm water drainage has been designed to take care of internal storm water drainage. Thus, no impact on the natural drainage system is anticipated.

Annexure 2 : Storm Water management Plan

1.4. 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?

- During construction phase of area, some amount of excavation material will be carried out in order to provide foundation of basement.
- During excavation works, approx. 200000 cum of earth shall be excavated, in this quantum of excavated soil; Excavated soil will be stored within the premises and shall be re use for leveling and for landscaping at the site.
- Top soil of 5-30 cm shall be stored separately and will be reuse for landscaping unusable soil shall be disposed as per the local authority norms.
- The Contractor shall be deemed to have taken into account the quantum of excavation involved and that the surplus excavated earth remaining after use in operations such as Horticulture/Landscaping, Gardening, backfilling etc. and to be disposed-off by contractor.

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

- **Water Supply During Construction Phase:**

During the construction phase the water requirement (approx. 40 KLD) will be met from Private water or treated wastewater from Nearby STP. No ground water will be extracted for construction activities.

- **Sewage Generation and Disposal During Construction Phase**

The quantity of sewage generation during the construction phase will be approx. 13.54 KLD. Thus the sewage will be treated by providing small septic tanks, soak trenches and sulabh shauchalaya type mobile toilets.

- **Waste Handling During Construction Phase:**

The solid waste expected to be generated during the construction phase will comprise of excavated materials, used bags, bricks, concrete, MS rods, tiles, wood etc. The following steps are proposed to be followed for the management solid waste:

C & D waste of Existing Buildings

- Construction and demolition waste of the site shall be keep within the premises.
- The waste shall be mainly comprising of concrete, RCC, brick work, flooring, finishes, pavement, doors, windows and ventilators, roofing, electrical, water supply, sanitary installations, rain water pipe with all fittings and fixtures etc.
- As inert it shall be used to fill material for low -lying areas, landscaping, Road Making etc.
- Construction yards are proposed for storage of construction materials.
- The excavated material such as topsoil and stones will be stacked for reuse during later stages of construction.
- Excavated top soil will be stored in temporary constructed soil bank and will be reused for landscaping during operational phase of the site.
- Remaining soil shall be utilized for refilling / road work / rising of site level at locations/ etc. Construction waste management is shown in Figure 2

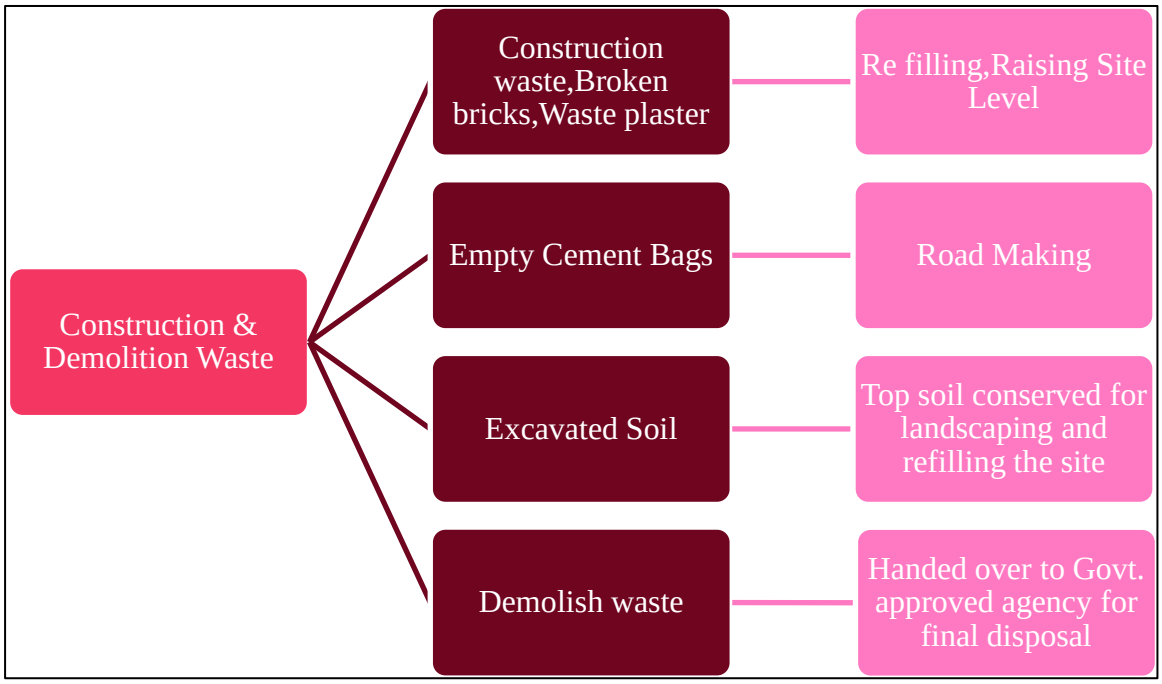

Figure 2: Solid Waste Management for Construction Phase

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

- No. The site area is a flat land and the surroundings are characterized by an urbanized stretch. No low lying areas or wetlands are found in the region.

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

- No health hazards are expected during the construction phase. The laborers will be provided with face masks to minimize dust inhalation.
- A significant portion of the construction waste and wood scrap generated will be used on the site. The remaining waste will be transported to a government approved dumping site.
- The quantity of domestic waste generated will be very little, as mostly local laborers will be employed. However, the wastes generated will be collected and disposed by an authorized agency.

Table 2- Quantification of different construction waste generated(typical)

S.No.	Constituents	Quantity of Waste generated (tones/annum)
1.	Soil, sand and gravel	4.2-5.14
2.	Bricks and Masonary	3.6-4.4
3.	Concrete	2.4-3.67
4.	Metals	0.6-0.73
5.	Bitumen	0.25-0.30
6.	Wood	0.25-0.30
7.	Others	0.1-0.15

2. WATER ENVIRONMENT

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

- **Water Requirement and its break up for various use:**

Description	**Population**	**Rate of Water Demand**	**Total water requirement**	**Flushing Water**	**Fresh Water**	**Waste Water** (80% of

		(lpcd)	**(KLD)**	**(KLD)**	**(KLD)**	fresh+ 100% flushing)
Retail Building-1						
Ground floor	705	15	10.6	7.1	3.5	9.9
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Staff	468	45	21.1	9.4	11.7	18.7
			476.5	**299.0**	**177.5**	**441.0**
Landscape area		6liters/m2 /day	50.0	-	-	-
HVAC & DG cooling		10 L/TR/HR	300.0	-	-	-
Cleaning of coaches,		20 ,000	20.0	-	-	-

trains						
Watering of train on platform	500 Coaches	200 liters/ coach	100.0	100	-	-

* For Fire fighting One time water will be required 2*200 KLD tanks are proposed.

(Source for flushing and fresh water requirement for staff and visitor: Part 9, Table 1,Clause 4.1.2, XIV, Page No.12 , National Building Code of India 2016)

Total water requirement for proposed project is approx. 550 KLD. The main sources fresh water will be

- Municipal supply/ borewell

However the secondary sources of the water are

- Tanker supply (For Emergency Use only)

Total quantity of wastewater generation will likely to be 441 KLD. The generated sewage will be collected and treated in the in-house Sewage Treatment Plant of 600 KLD capacity. The treated wastewater will be re used for flushing and gardening. Water Balance diagram during Non Rainy season and Rainy season are shown below.

Wastewater Details

441KLD of waste water will be generated will be generated from the project. A collective STP of 600 KLD has been proposed to treat the sewage respectively. This treated water will be recycled for flushing, dg cooling, HVAC, and horticulture purposes.

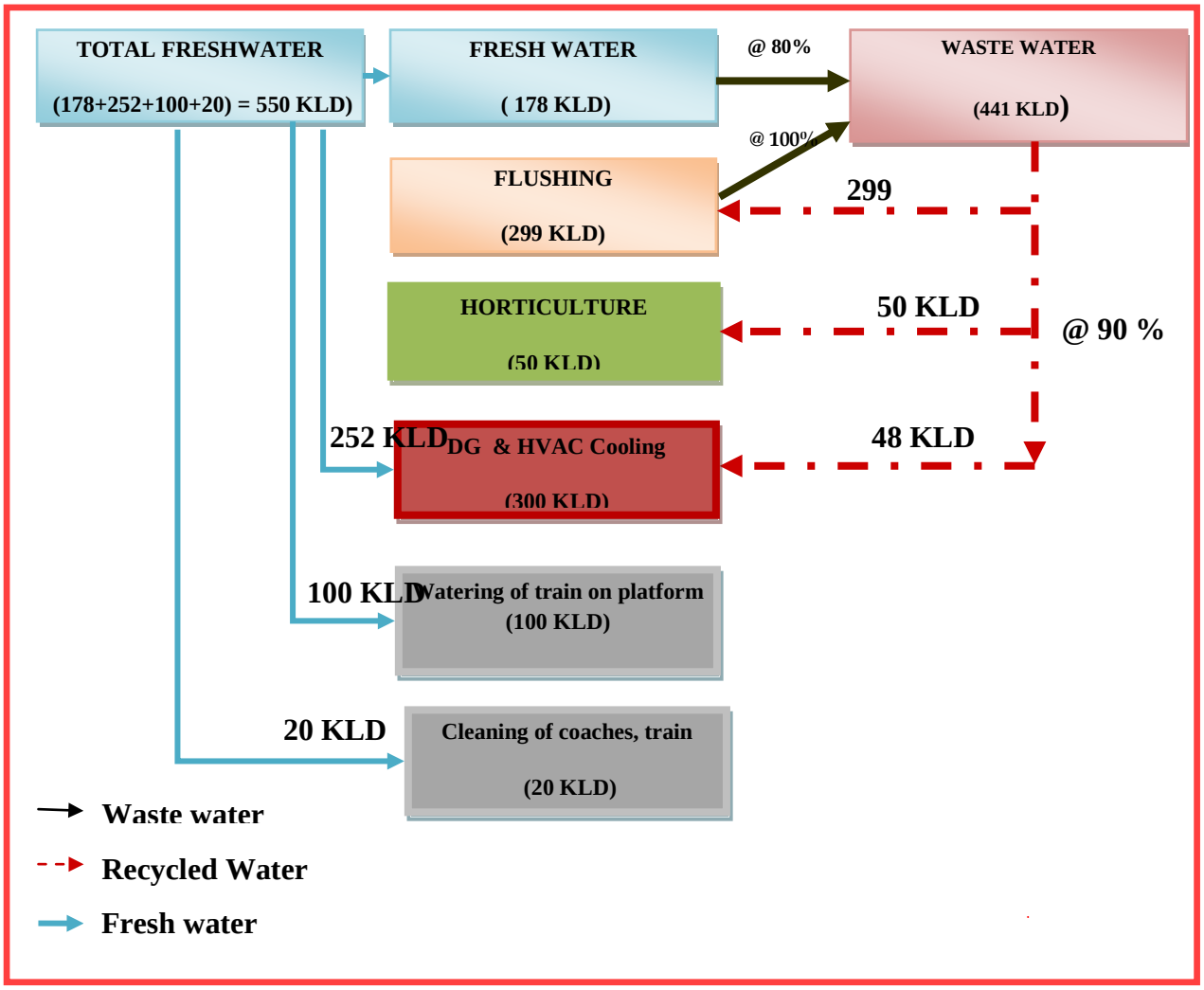

Fig-4 Water balance Diagram during non- monsoon season

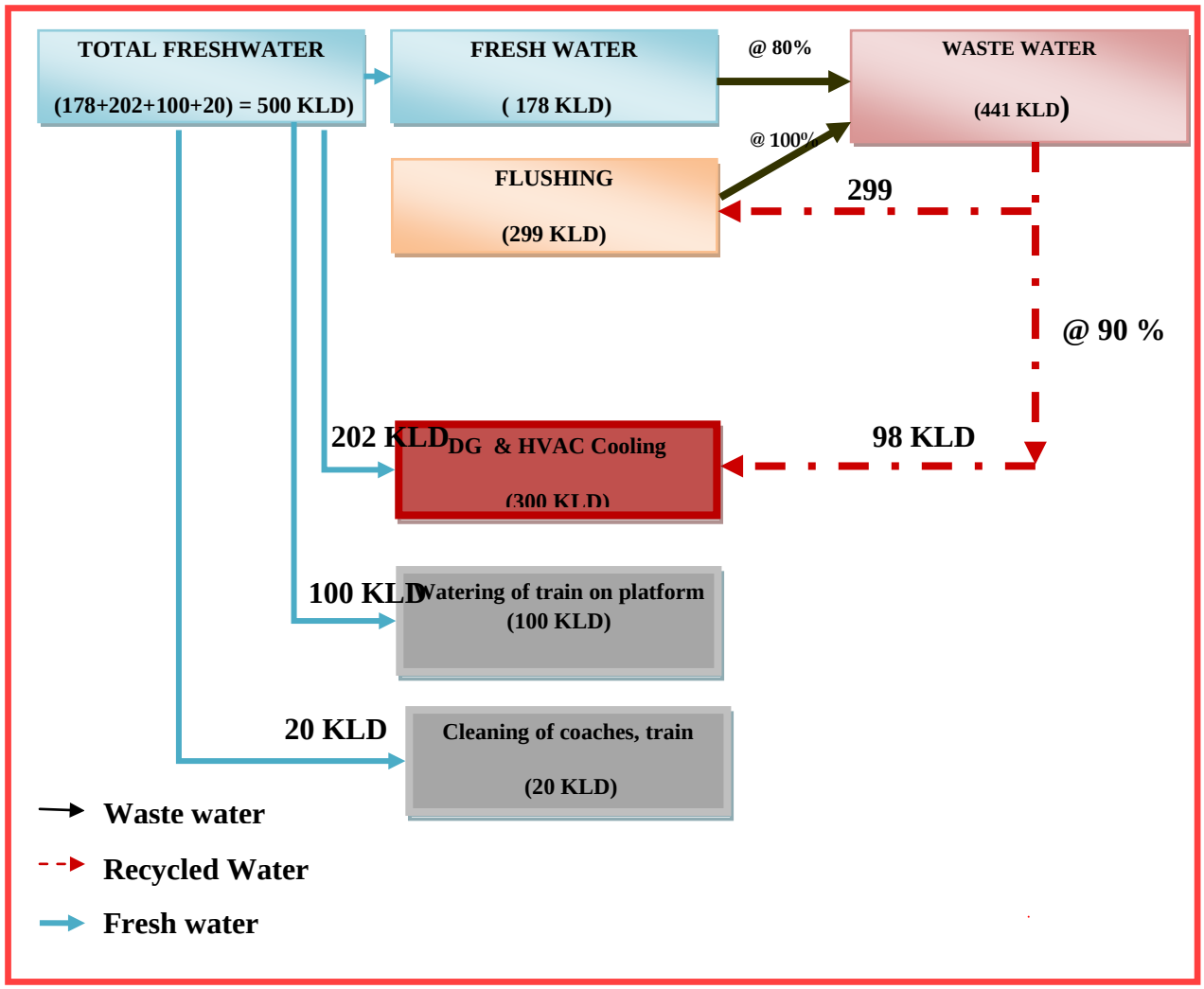

Fig5 Water balance Diagram during monsoon season

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

There will be ground water supply for the proposed project and it is a dependable source of water.

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

Main source of water supply shall be ground water; in that case water quality characteristics shall meet the water quality norms as prescribed in the Indian Standards for drinking, IS: 10500-1991 and CPWD specifications.

Drinking Water Standards of BIS (IS: 10500: 1991)

S.No	Parameters	Desirable limits mg/l	Permissible limits mg/l
Essential Characteristics			
1	Colour Hazen unit	5	25
2	Odour	Unobjectionable	-
3	taste	agreeable	-
4	Turbidity (NTU)	5	10
5	pH	6.5-8.5	No relaxation
6	Total Hardness, $CaCO_3$	300	600
7	Iron (Fe)	0.3	1.0
8	Chloride (Cl)	250	1000
9	Residual Free Chlorine	0.2	-
10	Fluoride (F)	1.0	1.5
Desirable Characteristics			
11	Dissolved Solids	500	2000
12	Calcium (Ca)	75	200
13	Magnesium (Mg)	30	100
14	Copper (Cu)	0.05	1.5
15	Manganese (Mn)	0.1	0.3
16	Sulphate (SO_4)	200	400
17	Nitrate (NO_3)	45	100
18	Phenolic compounds	0.001	0.002
19	Mercury (Hg)	0.001	No relaxation
20	Cadmium (Cd)	0.01	No relaxation
21	Selenium (Se)	0.01	No relaxation
22	Arsenic (As)	0.05	No relaxation
23	Cyanide (CN)	0.05	No relaxation
24	Lead (Pb)	0.05	No relaxation
25	Zinc (Zn)	5.0	15
26	Hexavelant Chromium	0.05	No relaxation
27	Alkalinity	200	600
28	Aluminum (Al)	0.03	0.2
29	Boron (B)	1.0	5.0
30	Pesticides	Absent	0.001

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

Quantity of sewage generated during operational phase shall be 441 KLD. Thus the sewage will be treated through sewage treatment plant of capacity 600 KLD. The treated sewage will be re used for flushing (299KLD) greenbelt development (50 KLD), HVAC and DG cooling (300 KLD).

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

No, there will not be any diversion of water from other users. Rise in water demand is a local phenomenon but the project would only involve spatial shifting of water demand within a region.

2.5 What is the incremental pollution load from wastewater generated from the proposed activity? (Give details of the quantities and composition of wastewater generated from the proposed activity

2.6 Quantity of sewage generated during operational phase shall be 441 KLD. Thus the sewage will be treated through sewage treatment plant of capacity 600 KLD. The treated sewage will be re used for flushing (299KLD) greenbelt development (50KLD) and HVAC & DG cooling (300 KLD). Wastewater details are given in below table

Table 3 : Wastewater Details

Particulars	Quantity	
Daily load	1610 KLD	
Duration of flow to STP	24 Hours	
Temperature	32°C	
	Inlet	Outlet (Treated Wastewater)
pH	6.0 – 9.0	7.0-8.0
T.S.S. (mg/l)	300-400	<20
BOD5 27° C (mg/l)	250-300	<10
COD (mg/l)	400-600	<50
Oil & grease ABS (mg/l)	<50	<10

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

A rainwater harvesting system comprises components of various stages -transporting rainwater through pipes or drains, filtration, and recharging the ground water through tanks. Percolation structures will be constructed for ground water recharge.

Runoff from the first spell of rain carries a relatively large amount of pollutants from the air and catchments surface so the system will be provided with a filtration pit consisting of layers of sand, gravel and pebbles of relevant sizes to remove impurities from the collected rainwater.

Need for Rainwater Harvesting

Surface water is inadequate to meet the daily demand and we have to depend on ground water.

- Due to rapid urbanization, infiltration of rain water into the sub-soil has decreased drastically and recharging of ground water has diminished.
- Rainwater harvesting prevents the flooding of low-lying areas in the site.

Efficacy of Rainwater Harvesting

The storm water disposal system for the premises shall be self-sufficient to avoid any collection/stagnation and flooding of water. The amount of storm water run-off depends upon many factors such as intensity and duration of precipitation, characteristics of the tributary area and the time required for such flow to reach the drains. The drains shall be located near the

carriage way along either side of the roads. Taking the advantage of road camber, the rainfall run off from roads shall flow towards the drains. Storm water from various areas/shall be connected to adjacent drain by a pipe through catch basins. Therefore, it has been calculated to provide 26 rainwater harvesting pits at selected locations, which will catch the maximum run-off from the area.

1) Since the existing topography is congenial to surface disposal, a network of storm water pipe drains is planned adjacent to roads. All building roof water will be brought down through rain water pipes.

2) Expansion of storm water system consists of pipe drain, catch basins and seepage pits at regular intervals for rain water harvesting and ground water recharging.

Rain water harvesting has been catered to and designed as per the guideline of CGWA. Peak hourly rainfall has been considered as 25 mm/hr. Inside the recharge pit, a recharge bore is constructed having adequate diameter with PVC slotted pipe up to a layer where sandy aquifers/ deeper aquifer permeable layers exist. The ground water level in the area is found at more than 10 mbgl. The bottom of the recharge structure will be kept 5 m above this level. At the bottom of the recharge well, a filter media is provided to avoid choking of the recharge bore. Design specifications of the rain water harvesting plan are as follows:

- Catchments/roofs would be accessible for regular cleaning.
- The roof will have smooth, hard and dense surface which is less likely to be damaged allowing release of material into the water. Roof painting has been avoided since most paints contain toxic substances and may peel off.
- All gutter ends will be fitted with a wire mesh screen and a first flush device would be installed. Most of the debris carried by the water from the rooftop like leaves, plastic bags and paper pieces will get arrested by the mesh at the terrace outlet and to prevent contamination by ensuring that the runoff from the first 10-20 minutes of rainfall is flushed off.
- No sewage or wastewater would be admitted into the system.
- No wastewater from areas likely to have oil, grease, or other pollutants has been connected to the system.

250 Rain Water Harvesting pit has been proposed for artificial rain water recharge within the project premises.

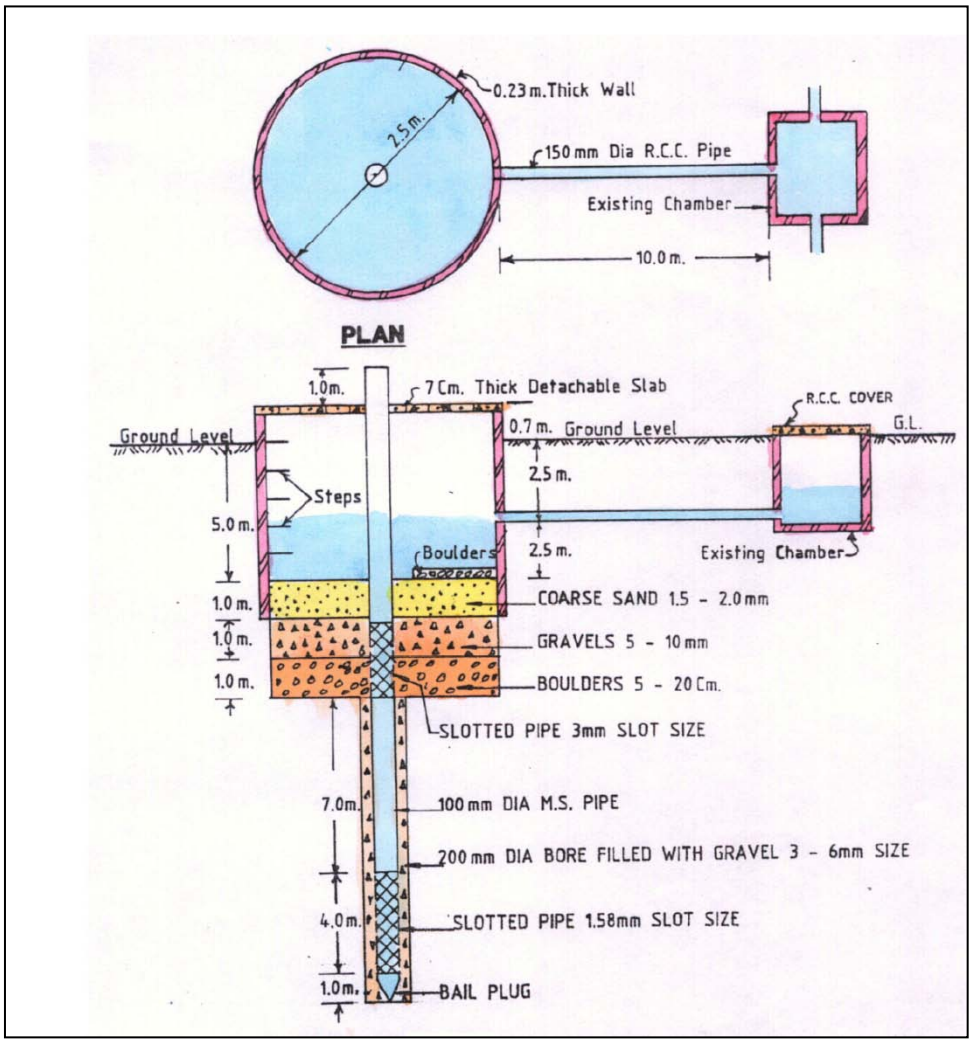

Figure -Typical design for RWH*

(Source: Central Ground Water Board, Manual on norms and standards for environment Clearance of large construction projects, MoEF&CC)

** Dimensions may vary*

2.8 What would be the impact of the land use changes occurring due to the 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?

The project will include paved areas and thus the runoff from the plot is expected to increase due to reduced infiltration. However, the increased runoff will not cause flooding or water logging as a well designed storm water drainage will be provided. The runoff will finally be collected into storage tank and will be reuse for various purposes e.g. recreational fountain, cooling etc. The quality of the runoff is expected to improve due to paved areas.

2.9 What are the impacts of the proposal on the ground water? (Will there be tapping of ground water; give the details of ground water table, recharging capacity and approvals obtained from competent authority, if any)

During the operational phase source of water will be municipal supply. So no groundwater will be extracted during construction as well as during operational phase. As per the hydro geological survey, the groundwater table of the project is more than 10 mbgl. However for groundwater recharge rainwater harvesting pits are proposed,

2.10 What precautions/ measures have been proposed to check the surface run-off, as well as uncontrolled flow of water into any water body?

The following management measures are suggested to protect the water quality are:

- Avoid excavation during monsoon season.
- Care would be taken to avoid soil erosion.
- Community toilets shall be constructed on the site during construction phase and the wastewater will be channelized to the septic tank 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.
- To prevent surface and ground water contamination by oil/grease, leak proof containers would be used for storage and transportation of oil/grease. The floors of oil/grease handling area would be kept effectively impervious.
- Collection and settling in the storm water, prohibition of equipment wash downs, and prevention of soil loss and toxic release from the construction site will be adhered to minimize water pollution.

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).

Most of the storm water produced on site will be stored in water bodies. Thus proper management of this resource is a must to ensure that it is free of contamination. A detailed Storm Water Management Plan will be developed which will consider the sources of storm water. The plan will incorporate best management practices which will include the following:

- Regular inspection and cleaning of storm drains.
- Installation of clarifiers or Oil/Water separators/traps system of adequate capacity around parking areas and garages as per requirement.
- Avoid application of pesticides and herbicides before wet season.

- Conducting routine inspections to ensure cleanliness.
- Preparation of spill response plans, particularly for fuel and oil storage areas. Provision of silt traps in storm water drains.

2.12 Will the deployment of construction laborers particularly in the peak period lead to unsanitary conditions around the project site (Justify with proper explanation).

- No, mostly local laborers will be employed during the construction phase and thus negligible quantities of wastes will be generated. Mobile toilets will be provided and the wastewater generated will be collected in septic tanks. All the operations will be confined within project premises.

2.13 What on-site facilities are provided for the collection, treatment & safe disposal of sewage? (Give details of the quantities of sullage generation, treatment capacities with technology & facilities for recycling and disposal).

- **Construction Phase**

The quantity of sewage generation during the construction phase will be approx. 13.54 KLD. Thus the sewage will be treated by providing small septic tanks, soak trenches and sulabh shauchalaya type mobile toilets.

- **Operational Phase**

2.14 Quantity of sewage generated during operational phase shall be 441 KLD. Thus the sewage will be treated through sewage treatment plant of capacity 600 KLD. The treated sewage will be re used for flushing (299 KLD) greenbelt development (50 KLD) and HVAC & DG cooling (300 KLD).

- Give Details of dual plumbing system if treated waste used for flushing of toilets or any other use.

Dual plumbing system that utilizes separate piping systems for freshwater and recycled wastewater will be adopted for the project. Treated water from the on-site STP is estimated at 600 KLD. The recycled water system shall utilize this treated wastewater and serve for non-contact uses such as flushing, horticulture, HVAC cooling etc.

3. VEGETATION

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

- Total area of the site is approx. 1,61,874.3 sqm. During the construction phase, no tress will be cut to continue the construction of the new blocks as the proposed area of construction is devoid of tress and is a vacant land, this will cause impact the

biodiversity, but out of the total plot area, an area of 48, 562.3 sqm. (app.30 % of Plot area) is still under horticulture/landscape area.

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

- As the redevelopment of the site is being proposed, however as the proposed area of the site is vacant, so no clearance of the existing land as well as vegetation will be done.

3.3. What is the measure 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?).

- Total green area measures 48, 562.3 sqm (app.30 % of Plot area)

A diverse variety of indigenous evergreen and ornamental trees would be planted. As the project site for construction consists of trees, herbs and shrubs it will require cutting of trees for construction purpose.

- The plant species will be selected on the basis of Urban Standard Plantation norms and CPCB guidelines.
- Landscape Details are given in below table.

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.

- The site area is a flat land. The survey-area (extending up to 10 km from the boundary of the project site) having core zone and buffer zone.
- The breeding season of the birds shall be studied and it will be made sure that no cutting of trees will be done during the breeding season; trees will be cut majorly after the month of September/depending on the nesting season of the birds.
- Tree cutting will be done systematically, depending on the area of construction. A pile of brash and logs in the area shall be kept to develop alternate habitat in the area.
- Compensatory plantation shall be done

4.2 Are there any direct or indirect impacts on the avifauna of the area? Provide details

Details are given under section 4.1.

4.3 Prescribe measures such as corridors, fish ladders etc. to mitigate adverse impacts on fauna.

Details are given under section 4.1.

4. AIR ENVIRONMENT

5.1 Will the project increase atmospheric concentration of gases & result in heat islands? (Give details of background air quality levels with predicted values based on dispersion models taking into account the increased traffic generation as a result of the proposed construction).

Ambient air monitoring will be carried out at the project site. During the post construction phase Vehicular emissions and DG sets emission will be major sources of air pollution from building construction projects. Ground Level Concentration of pollutants (as added by the project) will depend upon the following:

- Emission of pollutants from additional traffic on the roads due to the project.
- Meteorological conditions.
- Emission sources from D.G. Sets.

PM, NO_2, SO_2 and CO will be the main pollutants of primary concern released from traffic movement and DG sets. Assuming that under cross wind condition perpendicular to the road, the dispersion of vehicular emissions would be confined within limited distance from the road and concentration will decrease with the increase in distance from road as worked out by the line source model. It was anticipated that the contribution of vehicular emissions from the exhaust in ambient air quality will be moderate with mitigation measure as suggested by traffic analysis report. Ground Level Concentration (GLC) of pollutants is found to be well within the stipulated National Ambient Air Quality Standards due to traffic movement and vehicles used inside the premises. DG sets will be main source of Air Pollution in the project. CPCB/ MoEF approved USEPA dispersion model -ISCST3 was used for prediction of impacts caused by DG sets. Stack & emission data was used as per design value provided by standard make and stipulated standards. Other primary data used as input for model were hourly meteorological data of Wind speed & direction, temperature, cloud amount and mixing height. Mixing height used in the model was taken from secondary data source "Atlas of Hourly Mixing Height Assimilative Capacity of Atmosphere in India published in 2008 by IMD, Patna". Hourly meteorological monitored at site during study period data was compared with long term data available from the nearest India Meteorological station or any other authorized source/Govt. agencies.

Meteorology - Hourly Meteorological data of wind speed & direction, temperature, cloud amount and rainfall will be monitored at site for 3 months for the dispersion model.

Model details and Frame work of Computation:

The predictions for air quality during operation phase will be carried using CPCB/MoEF approved "USEPA, Industrial Source Complex (Version - ISCST3)" Dispersion model developed by the US Environmental Protection Agency (USEPA) for prediction of pollutants dispersion from single or multiple point sources using emission and hourly meteorological data of the study period. Assumptions used in the model were as follows:

- The plume rise is limited to that of the mixing layer as published by IMD in the Catalogue of Atlas of Mixing Heights in India for the site
- Stack down-wash is not considered.
- Flat terrain is used for computations;
- It is assumed that the pollutants do not undergo any physico-chemical transformation.
- Chemical and scavenging process occurred in the atmosphere in the pollutants released at the stack exit is not considered.
- Prediction is based on single/multiple point sources, pollution released at stack exit and dispersed on the ground under influence of local meteorological conditions during the season.

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.

- Dispersion modeling of pollutants from DG sets using ISCST3 software, resultant GLC for various airs will be carried out .The DG sets will be equipped with acoustic enclosure to minimize noise generation and adequate stack height for proper dispersion. This will cause emissions of PM, S_{O2}, N_{O2} and CO. However, the D.G. Sets will be operational only during power failure and low sulphur diesel will be used. Adequate stack heights of D.G. Sets will be provided as per the stipulated guidelines of Central Pollution Control Board (CPCB) to facilitate natural dispersion of exhaust gases as given below considering height of the building:

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 and exit to the project site.

- No, there will be no shortage in parking space after coming up this project as adequate provision will be made for car/vehicle parking at the project site. There shall be adequate parking provisions as not to disturb the traffic and allow smooth movement at the site

Proposed project will be consists of basement, stilt, podium and open parking. The parking space criteria and area requirement provided are summarized in table below. Parking details are designed as per Local Building Bye Laws. Detail traffic analysis report shall be submitted with EIA/EMP Report. Adequate provision will be made for car/vehicle parking at the project site. There shall also be adequate parking provisions for visitors so as not to disturb the traffic and allow smooth movement at the site.

Parking Proposed:

Parking Required:

(i) As per MoEF

Commercial	= 2 ECS/100 sq.m. FAR
	= 33445/50
	= 669 ECS
Total Parking required	**= 670 ECS**

(ii) <u>As per State bye-laws:</u>

Retail and commercial	=	3 ECS/100 sq.m. FAR
	=	3x 33,445/100
	=	1003 ECS
Total Parking required	**=**	**1,003 ECS**

<u>Parking Proposed for Non railway development:</u>

Area proposed for surface parking	=	4,600 m^2
Area required for 1 ECS of surface parking	=	23 m^2
Parking proposed for surface parking	**=**	**200 ECS**
Area proposed for basement parking	=	26,496 m^2
Area required for 1 ECS of basement parking	=	32 m^2
Parking proposed for basement parking	**=**	**828 ECS**
Total Parking proposed	**=**	**1,028 ECS**

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

Internal roads of 6 mtrs width, footpaths/pedestrian pathways have been well planned for the project.

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.

Sources of Noise Pollution during Construction Phase

During the construction phase of the site, the sources of noise pollution are expected mainly from:

- Construction equipments and machinery engaged for construction as well as demolition activities (such as excavation, grading, erecting equipment, piling, etc) such as air compressors, backhoe, concrete mixer, concrete mixer, cranes, dump-truck, pile driver, radial arm saw, DG set etc. The operation of heavy equipment is likely to temporarily increase the ambient noise levels of the area.
- An increase of 1 to 3 dB (A) noise levels of is expected in the adjoining area during day time during peak construction activities.

Anticipated Impact

- Noise generated can cause disturbance to the local population and can even lead to sleep disorder.
- Workers working close to high noise area can be exposed to occupational hazards of noise depending on the duration of exposure.

Mitigation Measures

The project management agency shall ensure that the EPC contractors should implement the following:

- The construction areas shall be provided with sheet barriers or temporary walls along the boundary close to any habitations;
- Rubber padding shall be provided in the construction machinery for vibration control.
- No noise generating activity shall be permitted from 22:00P.M-6:00 AM.
- The EPC contractors will adopt measures such as regular maintenance of its vehicles and repair of its equipment/ machinery.
- Construction workers working near high noise generation shall be provided with ear plugs/ ear muffs to limit exposure to occupational hazards.

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

During operation, 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 placed away from residential settlements and 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 carriageways only.

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 power failure.

- Monitoring of emissions from DG sets and ambient air quality will be carried out as per norms.

Noise Control Measures for DG sets:

- DG sets will be installed in the basement to minimize the impact on ambient noise.
- DG room will be provided with acoustic lining / treatment to insure 25 dB (A) insertion loss as per the regulations.
- Adequate exhaust mufflers will be provided as per norms to limit the noise.

5. 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?

- The site lies in an urbanized settlement and is well planned. Thus, no obstruction of view or scenic beauty or landscape is anticipated. Furthermore, the construction will be planned in such a way that the organized open spaces and landscaped areas will render the plot aesthetically appealing.

6.2 Will there be any adverse impacts from new constructions on the existing structures? What are the considerations taken into account?

- No impacts anticipated. As the expansion of the existing site shall be done in accordance with local building bye laws.

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

- The project will strictly follow the Area Building Regulation of NBC. All norms on Ground Coverage, FAR, Height, Setbacks, Fire Safety Requirements, Structural Design and other parameters will be strictly adhered to.

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

- It is expansion of an existing institutional site. There is no archaeological or anthropological significant site in the vicinity of the project site. But there will be no adverse impact due to the proposed site, as it is building construction project and does not involve any manufacturing or production, however permission will be obtained if required.

6. SOCIO-ECONOMIC ASPECT

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

- No such changes anticipated.

- **Construction phase:** Since local labourers will be engaged during construction phase, alteration to the existing demographic profile of the area is not anticipated.
- **Operation phase:** The changing demography in the area is another impact that needs attention. The project will mainly lead to spatial redistribution of local population and hence no considerable influx of population is envisaged owing to the project.

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

- The area around the project is surrounded by local land area. Areas occupied by sensitive man-made land uses like schools, places of worship, community facilities including the good infrastructure facilities.

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

- The project will not cause any adverse effects on the local communities as proposed site is will be developed to the well constructed project. There will be no disturbance to the sacred places as well as to the cultural values. The site is being developed for residential activities and also developing facilities for society such as schools, shops, banquet halls, religious buildings etc.

7. BUILDING MATERIAL

8.1 This 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 building materials and their energy efficiency)

- The proposed expansion has been planned incorporating green building principles and ECBC (Energy Conservation Building Code) standards. The project will include eco-friendly design, energy efficient systems, state of the art technology and compliance to all statutory regulations. It has been proposed to incorporate solar passive techniques in a building design to help minimize load on conventional systems such as heating, cooling, ventilation & light. Following will be considered to achieve a solar passive building design:
- The project will incorporate green vegetated roofs on the commercial office buildings
- The project can discharge around 20% of the total heat to the ground using geothermal wells. The ambient air ventilated through this tunnel will get cooled in summer and warmed in winter.
- 30% extra fresh air over minimum requirements of ASHRAE 62 for well-being of occupants in exhibition halls, commercial and hotel buildings
- Optimized insulation will be done in building envelope (walls & roof) to reduce external heat gain for better energy efficiency and reduced air-conditioning loads;

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

Mitigation Measures for Air Pollution during Construction Stage:

- Construction materials as well as demolition debris will be suitably covered with tarpaulin cover etc during transportation.
- Water sprinkling shall be done on haul roads where dust generation is anticipated.
- Raw material storage and handling yard will be enclosed from all sides.
- To minimize the occupational health hazard, proper personal protective gears 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.
- Use of such plant or machinery shall not be allowed during night time. Careful planning of machinery operation and scheduling of operations shall be done to minimise such impact.

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

- Yes, Recycled materials will be bought from outside sources and will be used as fillers in base and sub-base of the carriageway, footpaths pavements or pedestrian way, as needed.

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

Following arrangements will be made at the site in accordance to Municipal Solid Wastes (Management and Handling) Rules, 2000 and amended Rules; 2016.

Collection and Segregation of waste

For Domestic Waste

- A door to door collection system will be provided for collection of domestic waste in colored bins from every unit.
- The local vendors will be hired to provide separate colored bins for dry recyclables and Bio-Degradable waste.
- For waste collection, adequate number of colored bins (Green and Blue & dark grey bins– separate for Bio-degradable and Non Bio-degradable) are proposed to be provided at the strategic locations of the area.
- Litter bin will also be provided in open areas like parks etc.

Treatment of Waste

Domestic Waste

Bio degradable Waste

- Bio-degradable waste will be subjected to the compost/resultant will be used as manure.
- STP sludge is proposed to be used for horticultural purposes as manure.
- Horticultural Waste is proposed to be composted and will be used for gardening purposes.

Recyclable Waste

- The cropped grass will be spread on the green area. It will act as manure after decomposition.
- Recyclable wastes like paper, plastic, metals etc. will be sold off to recyclables.

Disposal

Recyclable and non-recyclable wastes will be disposed through Govt. approved agency. Hence, the Municipal Solid Waste Management t will be conducted as per the guidelines of Municipal Solid Wastes (Management and Handling) Rules, 2000 and amended Rules, 2016. Solid waste management Scheme is depicted in the following figure.

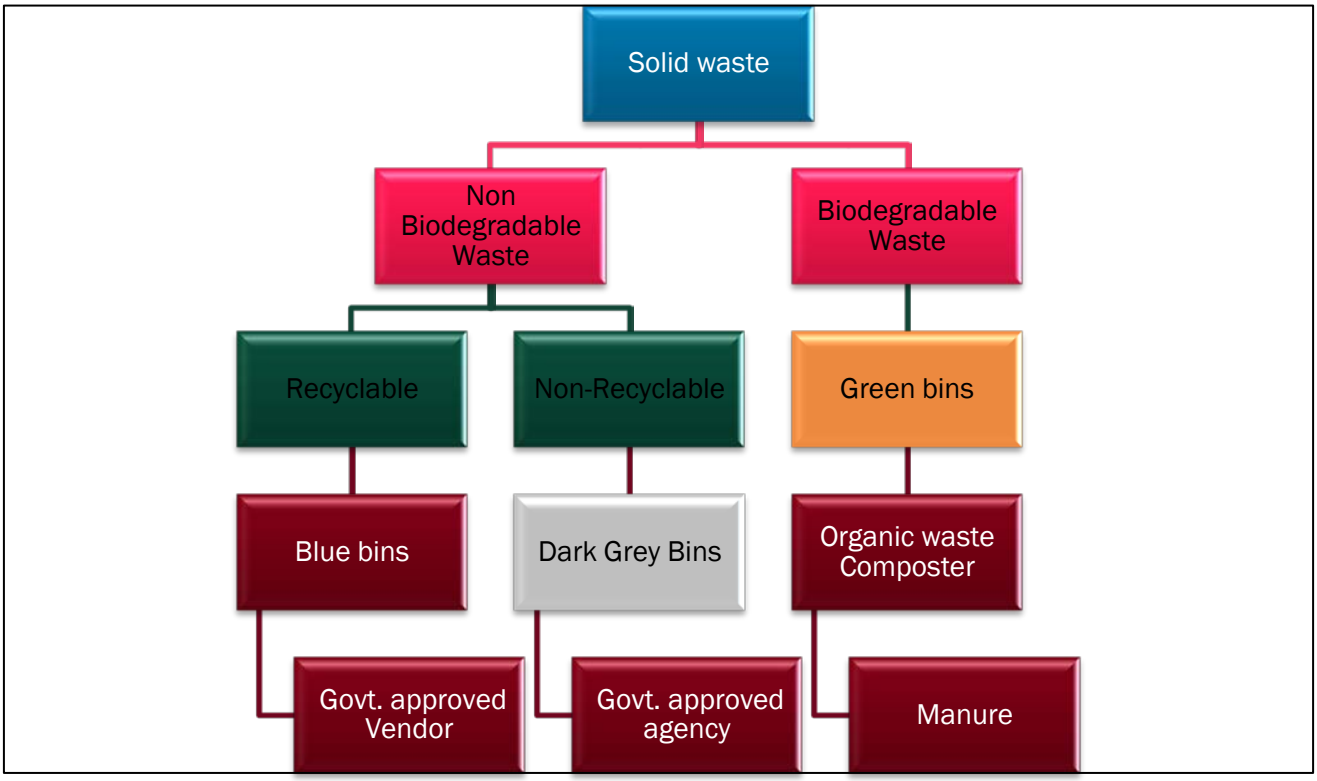

Figure 3: Solid Waste Management Scheme -Domestic Waste

Table 4-total solid waste generation

S. No.	Category	kg per capita per day	Waste generated	
			(kg/day)	**(MT/day)**
1.	Commercial Refuse			
	Staff	1865 @ 0.2kg/cap/day	373	0.37
	Visitors	46171 @ 0.06 kg/cap/day	2770	2.8
	TOTAL SOLID WASTE GENERATED		3,143 **kg/day**	3.14 **MT/day**

The garbage will be collected and stored in garbage collection room and segregated as Biodegradable waste, Non-Biodegradable waste and Recyclable waste using different color coded bins

- Bio degradable waste will be treated by OWC and used as a manure for gardening area
- Recyclable wastes are inert waste which will be disposed through authorized recyclers.
- The total excavated earth material will be used for refilling in the low lying area.

Technique for disposal of biodegradable waste

Organic Waste Converter

The Mechanical Composter involves a biomechanical process which decomposes bacteria and produces odorless pre-organic compost in 15 minutes. The machine occupies small area and provides a cleaner and better environment.

Working Principle

Mechanical Composter converts the organic waste into odorless, pre-compost manure in 15-20 minutes. The organic waste, free from foreign particles is fed into MC. The shredder reduces the organic waste into the optimum particle size for composting. Then it is mixed with moisture absorbing materials and Useful microorganisms. This mixture is then blended for a homogeneous mixture and is converted into pre compost manure in 20 minutes. The pre compost manure is then fed into aerated compost blocks or 12 - 15 days. The compost blocks or piles are specially designed for the pre-compost manure to have proper aeration and suitable environment to mature. The final manure will be rich in nutrients and used for the development of green belt.

Salient Features of Organic Waste Converter (OWC)

- Quick, easy to operate, less space requirement and odor free manure compared to other waste conversion process
- Immediate and hygienic disposal of food waste

- Waste minimization strategy followed by 3R Technique (Reduce, Reuse, Recycle)
- Savings on Purchase of Manure for landscape
- Savings on Waste Disposal Expenses
- Elimination on the usage of chemical fertilizers
- Carbon credit revenue in the future

Optimum Conditions for Composting

During Composting process, optimum conditions shall be maintained to achieve better compost value. The parameters mentioned below shall be maintained accordingly during operation.

Table 5-Optimum condition for composting

S.No.	Parameters	Values
1.	C/N ratio	30 : 1
2.	Particle Size	1/8 to 2 inches
3.	Oxygen	15 % - 20 %
4.	Temperature	55 - 65.5 □ C
5.	Moisture	40 % - 60 %
6.	pH	6.5 - 7.5

Table 6-Characterstic of Final Compost

S.No.	Parameters	Concentration (% except pH)
1.	Total Nitrogen	1.3
2.	Total Phosphorus	0.2-0.5
3.	Total Potassium	0.5
4.	Organic phosphorus	0.054
5.	pH	8.6
6.	Moisture	45-50
7.	Organic Matter	30-70

Figure 4-Organic Waste Convertor

Benefits of organic waste converter:

- Large quantity of solid waste is converted to fertilizer in a very short period
- This fertilizer can be sold as compost to farmers, or used for gardening
- Machine requires less space and the efficiency is high
- Manpower and maintenance is very less
- This is one of the latest techniques of managing solid waste.

8. ENERGY CONSERVATION

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

Power Details

The power shall be supplied by Bihar power holding company ltd. The total demand load for the project will be 5736 kVA. It is proposed to install 3 Electrical Subs- Stations .

D. G. Sets Details

In case of power failure, there will be 3 Nos. of D.G. sets that will of 4500 kVA capacity. The location of DG rooms shall be either at the ground.

Effective measures have been incorporated to minimize the energy consumption in following manners:

- Solar street lights. Solar blinkers. Roof top SPV (Solar Photo voltaic) systems with or without grid interaction.
- All external lighting shall be BEE star rated. All internal lighting shall be BEE star rated and solar lit,
- All common spaces including street lights (where there is no use of light for reading purposes), shall be of "LED".
- Solar street light controllers will be used for automatic dusk to dawn operation of street lights.
- Traffic light, blinkers, direction signage, based on LEDs shall be powered by solar.
- A minimum of 20% hot water requirement shall be met by solar water heating systems. Integration of automated system to operate electrical equipment as per load requirement to save energy

9.2 What type and capacity of power backup do you plan to provide?

Refer 9.1

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

- Energy efficient double glazing windows shall be used for the project since they offer superior thermal performance (Reduced solar heat gain) and help in significantly reducing unwanted external noise of traffic. Details are given in GRIHA technical volume as proposed site is approaching for 3 star rating green building

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

- Passive solar design refers to use of the sun's energy for the heating and cooling of living spaces. Pergolas, projections, façade elements, metal louvers will be provided for sun shading to reduce the heat influx into the building and thus reduce the air conditioning loads

9.5 Does the layout of street & building 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.

- Layout of buildings has been done as per the sun path analysis so that the design cuts off direct radiations of critical hours which are specific to the orientation. Solar energy will be harnessed to meet various energy requirements of the project such as:
- Solar street lights.
- Solar blinkers.

9.6 Is the shading effectively used to reduce cooling/heating lands? 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?

- Plantation along periphery and at suitable location is planned to provide shade to roads and building envelope. East and west façade has been suitably modified to reduce heat gain. Passive solar architectural measures have been adopted and provided shading devices for windows which would effectively reduce heating up of building envelope.

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

- **Yes.** The walls and rooms will be insulated such that air conditioning load is reduced. Well designed building structures will allow natural light to enter. Measures prescribed in Energy Conservation Building Code 2007 will be adopted to reduce the heat influx by walls, roofs and openings. Only prescribed quality of glasses will be used.

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

Heat emissions from the proposed construction may be from the following sources:

- Heat absorbed from the paved and concrete structures
- Heat generated from equipment/appliances
- Heat increase due to population increase in the housing project.

However, the heat generated will not be significant and will be dissipated in the greens and open areas provided within the project area.

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 value or the R values of the individual components.

- Since the project building envelope for external walls will be made of CFC blocks and structures of concrete and steel.

S.NO.	Building envelope Component	ECBC Prescriptive Compliance	Proposed
1.	Top Roof	U = 0.261 W/sqm K (max) ; Initial Solar Reflectance = 0.7 (min) ; Initial Emittance = 0.75 (min	Heat Reflective tile/china mosaic + 35 mm screed + geo textile & plastic sheet + 50 mm XPS Board standard density of 32-35 kg/m3 + Waterproofing+ 150 mm RCC (with steel) + putty finish U = 0.255 W/sqm K (max) ;
2.	External Wall	U = 0.44 W/sqm K	External light coloured paint+15 mm

		(max)	Gypsum plaster + 20mm high density XPS +plastic sheet+ 115 mm A.A.C wall + 15 mm Gypsum plaster. U = 0.42 W/sqm K (max)
3.	Fenestration	U = 3.3 W/sqm K (max) ; SHGC = 0.25 (max) ; VLT = 0.27 (min)	Double glazed UPVC window with 6mm thick clear glass inside and 6mm thick reflective glass outside with 12mm air cavity. Rectangular box type shading with horizontal and vertical members. U = 2.8 W/sqm K (max), SHGC = 0.24, VLT= 0.31

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

- Firefighting measures shall be adopted as per the guidelines of NBC. External yard hydrants installed around all buildings in the complex and galvanized steel fire hose boxes/cabinet (weather proof). All external yard hydrants shall be at one meter height from finished ground level as per NBC at a distance of 45 m along the road. External fire hydrants shall be located such that no portion of any building is more than 45 m from a hydrant and the external hydrants are not vulnerable to mechanical or vehicular damage.
- Fire hydrant system will be provided within the buildings, fire escape staircases and refuge areas will be provided and the building structures will be planned as per NBC. In addition, 10 kg fire extinguishers will be provided for class A, B, and C fires. CO_2 extinguishers will also be provided.

Precaution & Mitigation Methods to Prevent Disasters:

(Fire Hazard)

- Fire safety would be taken into account and would follow all the safety norms and regulations as per the NBC and other related Indian Standards.
- All electrical cables would be underground and sophisticated modern electrical distribution system to reduce risk of fire.
- Special fire fighting equipments like Automatic Fire Detection and alarm system, automatic Sprinkler System etc. would be installed as per the NBC standards.
- Risk assessment with on site disaster management plan will be specified to fire, smoke and other emergency conditions.
- Fire Fighting Plan and Evacuation Plan are attached.

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

- The Building envelope details will be followed as per ECBC to reduce heat intake from outside. Walls, roofs and glass U values will be less than the ASHRAE Standard 90.1 2007 to save energy compared to baseline building energy consumption..

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

Air tight construction is proposed with provision of sealants & flashing wherever required. However leakage will be restricted within the limits specified in ECBC 2007.

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.

Solar energy will be variedly used as:

- Solar street lights and solar blinkers.
- CFLs will be used in buildings to minimize the energy consumption.
- Green area is provided along with tree plantation which will result in natural air cooling and will reduce the load on conventional energy sources.

9. ENVIRONMENT MANAGEMENT PLAN

The Environment Management Plan (EMP) would consist of all mitigation measures for each component of the environment due to the activities increased during the construction, operation and the entire life cycle to minimize adverse environmental impacts resulting from 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 case of emergency such as accidents at the sites including fire, Electrical etc. The detailed EMP for the project is given below.

Purpose of EMP

The Environment Management Plan (EMP) is a site specific plan developed to ensure that the project is implemented in an environmental sustainable manner where all contractors and subcontractors, including consultants, understand the potential environmental risks arising from the project and take appropriate actions to properly manage that risk. EMP also ensures that the project implementation is carried out in accordance with the design by taking appropriate mitigation actions to reduce adverse environmental impacts during its life cycle. The plan outlines existing and potential problems that may adversely impact the environment and recommends corrective measures where required. Also, the plan outlines roles and responsibility of the key personnel and contractors who will be in-charge of the responsibilities to manage the project site.

- EMP prepares in accordance with rules and requirements of the MoEF and CPCB/ SPCB
- To ensure that the component of facility are operated in accordance with the design
- A process that confirms proper operation through supervision and monitoring
- A system that addresses public complaints during construction and operation of the facilities and
- A plan that ensures remedial measures is implemented immediately.

The key benefits of the EMP are that it offers means of managing its environmental performance thereby allowing it to contribute to improved environmental quality. The other benefits include cost control and improved relations with the stakeholders.

Major Elements of EMP

- Commitment & Policy: The management will strive to provide and implement the Environmental Management Plan that incorporates all issues related to air, water, land and noise.
- Planning: This includes identification of environmental impacts, legal requirements and setting environmental objectives.
- Implementation: This comprises of resources available to the developers, accountability of contractors, training of operational staff associated with environmental control facilities and documentation of measures to be taken.
- Measurement & Evaluation: This includes monitoring, counteractive actions and record keeping.

An Environmental Management Plan (EMP) will be required to mitigate the predicted adverse environmental impacts during construction and operation phase of the project and these are discussed in later subsections.

EMP for Air Environment

Construction Phase

To mitigate the impacts of PM during the construction phase of the project, the following measures are recommended for implementation:

- A dust control plan
- Procedural changes to construction activities

Dust Control Plan

The most cost-effective dust suppressant is water because water is easily available on construction site. Water can be applied using water trucks, handled sprayers and automatic sprinkler systems. Furthermore, incoming loads could be covered to avoid loss of material in transport, especially if material is transported off-site.

Procedural Changes to Construction Activities

Idle time reduction: Construction equipment is commonly left idle while the operators are on break or waiting for the completion of another task. Emission from idle equipment tends to be high, since catalytic converters cools down, thus reducing the efficiency of hydrocarbon and carbon monoxide oxidation. Existing idle control technologies comprises of power saving mode, which automatically off the engine at preset time and reduces emissions, without intervention from the operators.

Improved Maintenance: Significant emission reductions can be achieved through regular equipment maintenance. Contractors will be asked to provide maintenance records for their fleet as part of the contract bid, and at regular intervals throughout the life of the contract. Incentive provisions will be established to encourage contractors to comply with regular maintenance requirements.

Reduction of On-Site Construction Time: Rapid on-site construction would reduce the duration of traffic interference and therefore, will reduce emissions from traffic delay.

Operation Phase

To mitigate the impacts of pollutants from DG set and vehicular traffic during the operational phase of the project, following measures are recommended for implementation:

1. DG set emission control measures

2. Vehicular emission controls and alternatives
3. Greenbelt development

1. **Diesel Generator Set Emission Control Measures**

Adequate stack height will be maintained to disperse the air pollutants generated from the operation of DG set to dilute the pollutants concentration within the immediate vicinity. Hence no additional emission control measures have been suggested.

2. **Vehicle Emission Controls and Alternatives**

- During construction, vehicles will be properly maintained to reduce emission. Vehicles having "PUC" certificate will be allowed
- Footpaths and Pedestrian ways: Adequate footpaths and pedestrian ways would be provided at the site to encourage non-polluting methods of transportation.

3. **Greenbelt Development**

Increased vegetation in the form of greenbelt is one of the preferred methods to mitigate air and noise pollution. Plants serve as a sink for pollutants, act as a barrier to break the wind speed as well as allow the dust and other particulates to settle on the leaves. It also helps to reduce the noise level at large extent. The following table indicates various species of the greenbelt that can be used to act as a barrier.

EMP For Noise Environment

Construction Phase

To mitigate the impacts of noise from construction equipment during the construction phase on the site, **the following measures are recommended for implementation.**

1. **Time of Operation:** Noisy construction equipment would not be allowed to use at night time.
2. **Job Rotation and Hearing Protection:** Workers employed in high noise areas will be employed on shift basis. Hearing protection such as earplugs/muffs will be provided to those working very close to the noise generating machinery.

Operation Phase

To mitigate the impacts of noise from diesel generator set during operational phase, **the following measures are recommended:**

1. **Adoption of Noise emission control technologies**
2. **Greenbelt development**

1. **Noise Emission Control Technologies**

- The DG set room will be provided with acoustic enclosure to have minimum 25 dB (A) insertion loss or for meeting the ambient noise standard whichever is on higher side as per E (P) Act, GSR 371 (E) and its amendments.
- It would be ensured that the manufacturer provides acoustic enclosure as an integral part along with the diesel generators set. Further, enclosure of the services area with 4

m high wall will reduce noise levels and ensure that noise is at a permissible limit for resident of the site and surrounding receptors.

2. **Greenbelt Development**

Total green area measures **15, 95, 871.8** m^2 (78.8 % of Plot Area) is being proposed. A diverse variety of indigenous evergreen and ornamental trees would be planted. The plant species will be selected on the basis of Urban Standard Plantation norms and CPCB guidelines.

EMP For Water Environment

Construction Phase

To prevent degradation and to maintain the quality of the water source, adequate control measures have been proposed. To check the surface run-off as well as uncontrolled flow of water into any water body check dams with silt basins are proposed. **The following management measures are suggested to protect the water source being polluted during the construction phase:**

1. Avoid excavation during monsoon season. Care would be taken to avoid soil erosion
2. Common toilets will be constructed on site during construction phase and the wastewater would be channelized to the septic tanks in order to prevent enter into the water bodies
3. Any area with loose debris within the site shall be planted. To prevent surface and ground water contamination by oil and grease, leak-proof containers would be used for storage and transportation of oil and grease. The floors of oil and grease handling area would be kept effectively impervious. Any wash off from the oil and grease handling area or workshop shall be drained through imperious drains
4. Collection and settling of storm water, prohibition of equipment wash downs and prevention of soil loss and toxic release from the construction site are necessary measure to be taken to minimize water pollution
5. All stacking and loading area will be provided with proper garland drains, equipped with baffles, to prevent run off from the site, to enter into any water body.

Operation Phase

In the operation phase of the project, water conservation and development measures will be taken, including all possible potential for rain water harvesting. **Following measures will be adopted:**

1. Water source development.
2. Minimizing water consumption.
3. Promoting reuse of water after treatment and development of closed loop systems for different water streams.

1. **Water Source Development**

Water source development shall be practiced by installation of scientifically designed Rain Water Harvesting system. Rainwater harvesting promotes self-sufficiency and fosters an appreciation for water as a resource.

2. **Minimizing Water Consumption**

Consumption of fresh water will be minimized by combination of water saving devices and other domestic water conservation measures. Further, to ensure ongoing water conservation, an awareness program will be introduced for the residents. The following section discusses the specific measures, **which shall be implemented:**

1) **Domestic and Commercial Usage**

- Use of water efficient plumbing fixtures (ultra low flow toilets, low flow sinks, water efficient dishwashers and washing machines). Water efficient plumbing fixtures uses less water with no marked reduction in quality and service
- Leak detection and repair techniques.
- Sweep with a broom and pan where possible, rather than hose down for external areas. Meter water usage: Implies measurement and verification methods.
- Monitoring of water uses is a precursor for management.

2) **Horticulture**

- Drip irrigation system shall be used for the lawns and other green area. Drip irrigation can save 15-40% of the water, compared with other watering techniques.
- Plants with similar water requirements shall be grouped on common zones to match precipitation heads and emitters.
- Use of low-angle sprinklers for lawn areas.
- Select controllers with adjustable watering schedules and moisture sensors to account for seasonal variations and calibrate them during commissioning.
- Place 3 to 5 inches of mulch on planting beds to minimize evaporation.

3. **Promoting Reuse of Water after Treatment and Development of Closed Loop Systems**

To promote reuse of wastewater and development of closed loop system for wastewater segregation, two wastewater schemes are suggested, namely:

1) Storm Water Harvest
2) Wastewater recycling

Storm water harvest as discussed in earlier, will be utilized for artificial recharge of ground water sources; and wastewater will be reused on site after treatment.

Treated wastewater will be used for landscaping, flushing, DG set cooling and recreational purpose. Following section discuss the scheme of wastewater treatment.

1) **Storm Water Management**

Most of the storm water produced on site will be harvested for ground water recharge. Thus proper management of this resource is a must to ensure that it is free from contamination.
Contamination of Storm Water is possible from the following sources:

- Diesel and oil spills in the diesel power generator and fuel storage area
- Waste spills in the solid / hazardous waste storage area
- Oil spills and leaks in vehicle parking lots
- Silts from soil erosion in gardens
- Spillage of sludge from sludge drying area of sewage treatment plant cum ETP

A detailed storm water management plan will be developed which will consider the possible impacts from above sources. The plan will incorporate best management practices which will include following:

- Regular inspection and cleaning of storm drains
- Clarifiers or oil/separators will be installed in all the parking areas. Oil / grease separators installed around parking areas and garages will be sized according to peak flow guidelines. Both clarifiers and oil/water separators will be periodically pumped in order to keep discharges within limits
- Covered waste storage areas
- Avoid application of pesticides and herbicides before wet season
- Secondary containment and dykes in fuel/oil storage facilities
- Conducting routine inspection to ensure cleanliness
- Provision of slit traps in storm water drains
- Good housekeeping in the above areas

2) **Wastewater Treatment Scheme**

Proponent will treat the wastewater of the Project in well designed sewage treatment plant of capacity 1750 KLD based on MBBR technology.

EMP for Land Environment

Construction Phase

The waste generated from construction and demolition activity includes construction debris, biomass from land clearing activities, waste from the temporary make shift tents for the labors and hazardous waste. Following section discuss the management of each type of waste. Besides waste generation, management of the topsoil is an important area for which management measures are required.

1) **Construction and demolition Debris**

Construction debris is bulky and heavy and re-utilization and recycling is an important strategy for management of such waste. As concrete and masonry constitute the majority of waste generated, recycling of this waste by conversion to aggregate can offer benefits of reduced

landfill space and reduced extraction of raw material for new construction activity. This is particularly applicable to the project site as the construction is to be completed in a phased manner.

Mixed debris with high gypsum, plaster, shall not be used as fill, as they are highly susceptible to contamination.

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 will be reused on site. Recyclable wastes such as plastics, glass fiber insulation, roofing etc shall be sold to recyclers.

Construction sites are sources of many toxic substances such as paints, solvents wood preservatives, pesticides, adhesives and sealants. Hazardous waste generated during construction phase shall be stored in sealed containers and disposed off as per The Hazardous Wastes (Management & Handling) Rules, 1989.

Some management practices to be developed are:

- Herbicides and pesticide will not be over applied (small-scale applications) and not applied prior to rain.
- Paint brushes and equipment for water and oil based paints shall be cleaned within a contained area and will not be allowed to contaminate site soils, water courses or drainage systems
- Provision of adequate hazardous waste storage facilities. Hazardous waste collection containers will be located as per safety norms and designated hazardous waste storage areas will be away from storm drains or watercourses
- Segregation of potentially hazardous waste from non-hazardous construction site debris
- Well labeled all hazardous waste containers with the waste being stored and the date of generation
- Instruct employees and subcontractors in identification of hazardous and solid waste
- Wastes generated from temporary make shift labor tents will mainly comprise of household domestic waste, which will be managed by the contractor of the site. The sullage generated will be channelized to the septic tank.
- Top Soil Management: To minimize disruption of soil and for conservation of top soil, the contractor shall keep the top soil cover separately and stockpile it. After the construction activity is over, top soil will be utilized for landscaping activity.

Other measures, which would be followed to prevent soil erosion and contamination include:

- Maximize use of organic fertilizer for landscaping and green belt development
- To prevent soil contamination by oil/grease, leaf proof containers would be used for storage and transportation of oil/grease and wash off from the oil/grease handling area shall be drained through impervious drains and treated appropriately before disposal
- Removal of as little vegetation as possible during the development and re-vegetation of bare areas after the project.
- Working in a small area at a point of time (phase wise construction)
- Construction of erosion prevention troughs/berms.

Operational Phase

The philosophy of solid waste management at the proposed complex will be to encouraging the four R's of waste i.e. **R**eduction, **R**euse, **R**ecycling and **R**ecovery (materials & energy). Regular public awareness meetings will be conducted to involve the residents in the proper segregation and storage techniques. The Environmental Management Plan for the solid waste focuses on three major components during the life cycle of the waste management system i.e., collection and transportation, treatment or disposal and closure and post-closure care of treatment/disposal facility.

1) **Collection and Transportation**

- During the collection stage, the solid waste of the project will be segregated into biodegradable waste and non-biodegradable. Biodegradable waste and non biodegradable waste will be collected in separate bins. Biodegradable waste will be treated in the project premises by organic waste converter. The recyclable wastes will be sent off to recyclables. Proper guidelines for segregation, collection and storage will be prepared as per MSW Rules, 2000 and amended Rules, 2008.
- To minimize littering and odor, waste will be stored in well-designed containers/ bins that will be located at strategic locations to minimize disturbance in traffic flow
- Care would be taken such that the collection vehicles are well maintained and generate minimum noise and emissions. During transportation of the waste, it will be covered to avoid littering.

2) **Disposal**

With regards to the disposal/treatment of waste, the management will take the services of the authorized agency for waste management and disposal of the same on the project site during its operational phase.

EMP for Ecological Environment

Construction activity changes the natural environment. The project requires the implementation of following choices exclusively or in combination.

Construction Stage

- Restriction of construction activities to defined project areas, which are ecologically sensitive.
- Avoid the tree cutting to the maximum extent and even if tree cutting required compensatory plantation should be done.
- Restrictions on location of temporary labor tents and offices for project staff near the project area to avoid human induced secondary additional impacts on the flora and fauna species. Cutting, uprooting, coppicing of trees or small trees if present in and around the project site for cooking, burning or heating purposes by the labors will be prohibited and suitable alternatives for this purpose will be made

- Along with the construction work, the peripheral green belt would be developed with suggested native plant species, as they will grow to a full-fledged covered at the time of completion.

Operation Stage

Improvement of the current ecology of the project site will entail the following measures:

1) Plantation and Landscaping
2) Green Belt Development
3) Park and Avenue Plantation

The section below summarizes the techniques to be applied to achieve the above objectives:

1) Plantation and landscaping

Selection of the plant species would be done on the basis of their adaptability to the existing geographical conditions and the vegetation composition of the forest type of the region earlier found or currently observed.

2) Green Belt Development Plan

The plantation matrix adopted for the green belt development includes pit of 0.3 m × 0.3 m size with a spacing of 2 m x 2 m. In addition, earth filling and manure may also be required for the proper nutritional balance and nourishment of the sapling. It is also recommended that the plantation has to be taken up randomly and the landscaping aspects could be taken into consideration.

Multi-layered plantation comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt. In addition creepers will be planted along the boundary wall to enhance its insulation capacity.

Selection of Plant Species for Green Belt Development

The selection of plant species for the development depends on various factors such as climate, elevation and soil. The plants would exhibit the following desirable characteristics in order to be selected for plantation

- The species should be fast growing and providing optimum penetrability
- The species should be wind-firm and deep rooted
- The species should form a dense canopy
- As far as possible, the species should be indigenous and locally available
- Species tolerance to air pollutants like SO_2 and NO_2 should be preferred
- The species should be permeable to help create air turbulence and mixing within the belt
- There should be no large gaps for the air to spill through
- Trees with high foliage density, leaves with larger leaf area and hairy on both the surfaces
- Ability to withstand conditions like inundation and drought
- Soil improving plants (Nitrogen fixing rapidly decomposable leaf litter)
- Attractive appearance with good flowering and fruit bearing
- Bird and insect attracting tree species
- Sustainable green cover with minimal maintenance.

3) Parks and Avenue Plantation

3).1. Parks and gardens maintained for recreational and ornamental purposes will not only improve the quality of existing ecology at the project site but also will improve the aesthetic value.

3).2. Avenue Plantation

- Trees with colonial canopy with attractive flowering
- Trees with branching at 7 feet and above
- Trees with medium spreading branches to avoid obstruction to the traffic
- Fruit trees to be avoided because children may obstruct traffic and general movement of public

EMP For Socio-Economic Environment

The social management plan has been designed to take proactive steps and adopt best practices, which are sensitive to the socio-cultural setting of the region. The Social Management Plan for proposed Project focuses on the following components:

Income Generation Opportunity during Construction and Operation Phase

The project would provide employment opportunity during construction and operation phase. There would also be a wide economic impact in terms of generating opportunities for secondary occupation within and around the complex.

The main principles considered for employment and income generation opportunities are out lined below:

- Employment strategy will provide for preferential employment of local people
- Conditions of employment would address issues like minimum wages and medical care for the workers.
- Contractors would be required to abide to employment priority towards locals and abide by the labor laws regarding standards on employee terms and conditions.

Improved Working Environment for Employees

The project would provide safe and improved working conditions for the workers employed at the facility during construction and operation phase. With the proposed ambience and facilities provided, the complex will provide a new experience in living and recreations. **Following measures would be taken to improve the working environment of the area:**

- Less use of chemicals and biological agents with hazard potential
- Developing a proper interface between the work and the human resource through a system of skill improvement
- Provision of facilities for nature care and recreation e.g. indoor games facilities
- Measures to reduce the incidence of work related injuries, fatalities and diseases
- Maintenance and beautifications of the complex and the surrounding roads

EMP For Energy Conservation

Energy conservation program will be implemented through measures taken both on energy demand and supply.

Energy conservation will be one of the main focus during the complex planning and operation stages. The conservation efforts would consist of the following:

1) **Architectural design**
   - Maximum utilization of solar light will be done.
   - Maximize the use of natural lighting through design.
   - The orientation of the buildings will be done in such a way that maximum daylight is available.
   - The green areas will be spaced, so that a significant reduction in the temperature can take place.
2) **Energy Saving Practices**
   - Energy efficient lamps will be provided within the complex.
   - Constant monitoring of energy consumption and defining targets for energy conservation.
   - Adjusting the settings and illumination levels to ensure minimum energy used for desired comfort levels.
3) **Behavioral Change on Consumption**
   - Promoting resident awareness on energy conservation
   - Training staff on methods of energy conservation and to be vigilant to such opportunities.

Environmental Management System and Monitoring Plan

For the effective and consistent functioning of the proposed complex, an Environmental Management system (EMS) would be established at the site. The EMS would include the following:

1) An Environmental management cell.
2) Environmental Monitoring.
3) Personnel Training.
4) Regular Environmental audits and Correction measures.
5) Documentation – standards operation procedures Environmental Management Plan and other records.

1) An Environmental management cell.

Apart from having an Environmental Management Plan, it is also proposed to have a permanent organizational set up charged with the task of ensuring its effective implementation

of mitigation measures and to conduct environmental monitoring. The major duties and responsibilities of Environmental Management Cell shall be as given below:

- To implement the environmental management plan.
- To assure regulatory compliance with all relevant rules and regulations.
- To ensure regular operation and maintenance of pollution control devices.
- To minimize environmental impact of operations as by strict adherence to the EMP.
- To initiate environmental monitoring as per approved schedule.
- Review and interpretation of monitored results and corrective measures in case monitored results are above the specified limit.
- Maintain documentation of good environmental practices and applicable environmental laws for a ready reference.
- Maintain environmental related records.
- Coordination with regulatory agencies, external consultants, monitoring laboratories.
- Maintenance of log of public complaints and the action taken.

Hierarchical Structure of Environmental Management Cell

Normal activities of the EMP cell would be supervised by a dedicated person who will report to the site manager/coordinator of the site. The hierarchical structure of suggested Environmental Management Cell is given in following Figure

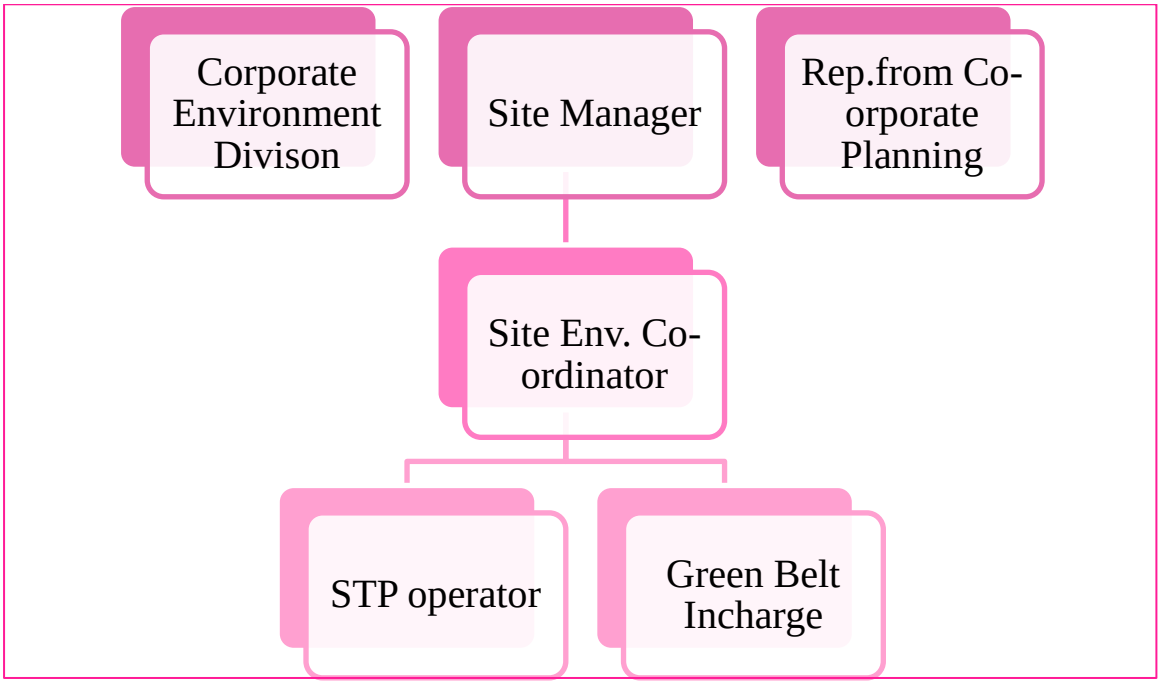

Figure 5: Environment Management Cell

2) Environmental Monitoring

The purpose of environmental monitoring is to evaluate the effectiveness of implementation of Environmental Management Plan (EMP) by periodic monitoring. The important environmental parameters within the impact area are selected so that any adverse affects are

detected and time action can be taken. The project proponent will monitor ambient air Quality, Ground Water Quality and Quantity, and Soil Quality in accordance with an approved monitoring schedule.

Table 7: Suggested Monitoring Programme

S. No.	Type	Locations	Parameters	Period and Frequency
1.	Ambient Air Quality	Project Site	Criteria Pollutants: SO_2, NO_2, $PM_{2.5}$, PM_{10}, CO	Once in a six months.
2.	Groundwater (Portability testing)	Project site	Drinking water parameters as per IS 10500.	Once in a six months.
3.	Ambient Noise	Project site	dB (A) levels	Once in a six months.
4.	Fresh water quality	Municipal Supply	As per IS 10500 potable water standards	Once in a six months.
5.	Soil quality	Project site	Organic matter, C.H., N, Alkalinity, Acidity, heavy metals and trace metal, Alkalinity, Acidity.	Once in a six months.
6.	Waste Characterization	Residential	Physical and Chemical composition	Daily Basis.
7.	Treated water	Outlet of STP	BOD, MPN, coliform count, etc.	Daily Basis.

3) Awareness and Training

Training and human resource development is an important link to achieve sustainable operation of the facility and environment management. For successful functioning of the project, relevant EMP would be communicated to: **Residents and Contractors**

Residents must be made aware of the importance of waste segregation and disposal, water and energy conservation. The awareness can be provided by periodic Integrated Society meetings. They would be informed of their duties.

4) Environment Audit and Corrective Action Plan

To assess whether the implemented EMP is adequate, periodic environmental audits will be conducted by the project proponent's Environmental division. These audits will be followed by Correction Action Plan (CAP) to correct various issues identified during the audits.