

1.0 INTRODUCTION

M/s Swansgreen Infra Project Pvt. Ltd. has proposed to develop a Commercial cum Residential Building Project at Plot No. 1428, 1429, 1430, 1431, Khata No. 420, 429, 424, Tauzi No. 206, Thana No. 44, Mauza – Sabalpur, Didarganj, Fatuha, District Patna, Bihar. The total plot area of the project is **11,292.00** sq.m . The project comprises development of residential blocks (Block A, B, C and Affordable Housing Block D) along with a commercial component. A total of 464 residential units are proposed in Blocks A, B and C, including 130 affordable housing units in Block D. The project also includes a commercial built-up area of approximately 602.34 sq.m.

The development will be supported by necessary infrastructure such as internal roads (6.0 m wide), adequate parking facilities, water supply system, sewerage/septic system, storm water drainage with rainwater harvesting provisions, fire fighting system (including underground tank and hydrant system), and green/landscaped areas. The total built-up area of Block A, B, C, Affordable Housing Block D including Parking area of 14527.26 square meter is **78825.91 Square meter**.

1.1 APPLICABLE LEGAL FRAMEWORK

As per the provisions of the Environmental Impact Assessment (EIA) Notification, 2006 and its subsequent amendments, projects listed under the schedule of the notification require prior Environmental Clearance (EC) from the competent authority. Building and Construction projects having a built-up area more than 20,000 sq.m and up to 1,50,000 sq.m fall under Category B2, Item 8(a) of the EIA Notification, 2006. Since the total built-up area of the proposed project is approximately **78825.91 sq.m**, the project attracts the provisions of Item 8(a) of the EIA Notification, 2006 and therefore requires prior Environmental Clearance (EC) from the State Environment Impact Assessment Authority (SEIAA), Bihar before commencement of construction activities.

The proposed development will include residential buildings (Block A, B, C and Affordable Housing Block D) along with a commercial component, supported by infrastructure such as parking facilities, internal circulation roads, water supply system, sewerage system, storm water drainage, fire fighting system, and landscaped green areas, forming an integrated residential development.

In addition to the EIA Notification, the project shall comply with the provisions of various environmental legislations and regulations applicable to building and construction projects in India. These include:

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- **Environment (Protection) Act, 1986**
- **EIA Notification, 2006 and its amendments**
- **Solid Waste Management Rules, 2016**
- **Construction and Demolition Waste Management Rules, 2016**
- **Plastic Waste Management Rules, 2016**
- **Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016**
- **E-Waste (Management) Rules, 2016**
- **Air (Prevention and Control of Pollution) Act, 1981**
- **Water (Prevention and Control of Pollution) Act, 1974**
- **Applicable Local Building Bye-laws and Development Regulations**
- **Forest (Conservation) Act, 1980 and Indian Forest Act, 1927 (where applicable)**

1.2 CONNECTIVITY AND SURROUNDINGS OF PROJECT SITE

The project site lies in Fatuha, District Patna, Bihar. The Google map of the project site is shown in Figure 1. The geographical coordinates of the project site are approximately 25°33'56.63"N and 85°15'49.68"E. The site is relatively flat with an average elevation of about 54.96 m AMSL. The site is well connected to the nearby road network, with the nearest major road (Patna–Fatuha Road) located at a distance of approximately 0.1 km in the East direction. The nearest railway station (Patna Sahib Railway Station) is located at a distance of approximately 6.5 km in the West direction, and the nearest airport (Jay Prakash Narayan International Airport, Patna) is located at a distance of approximately 16 km in the South-West direction.

Details of the surroundings and connectivity of the site are provided in **Table 1**.

Table1: Geographical Coordinates of Project Site

S. No.	Latitude (N)	Longitude (E)
1	25°33'56.63"	85°15'49.68"
2	25°33'55.81"	85°15'49.76"
3	25°33'56.13"	85°15'50.10"
4	25°33'58.13"	85°15'51.71"
5	25°33'52.59"	85°15'53.03"
6	25°33'54.08"	85°15'55.33"

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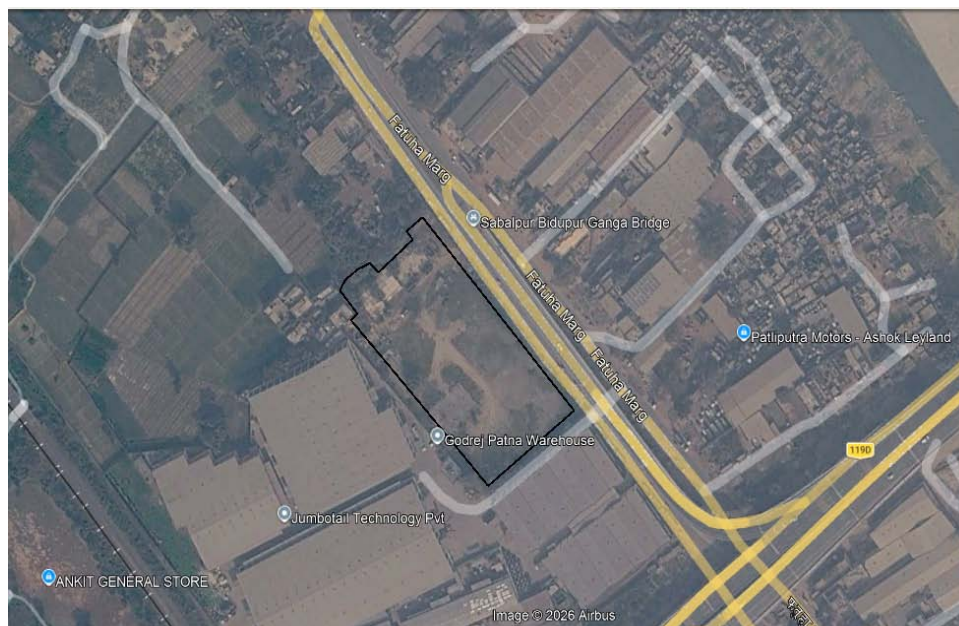


Figure1: Location Map

Table1: Surroundings and Connectivity of the Project Site

Particular	Details
Near-by Residential Areas	• Didarganj residential area • Nearby local settlements along Patna–Fatuha road
Nearest City/Town	• Patna (~8–10 km)
District Headquarters	• Patna (~8–10 km)
Nearest Schools & Colleges	• Local schools in Didarganj area • Colleges in Patna city (~8–12 km)
Nearest Hospitals	• Nalanda Medical College & Hospital (NMCH) (~6–8 km) • Local clinics in Didarganj
Nearest Water Bodies	• River Ganga (~0.5–1.0 km)
Nearest Highway & Road	• Patna–Fatuha Road (SH/NH connectivity) adjacent to site • Near Patna Ganga Bridge
Nearest Railway Station	• Patna Sahib Railway Station (~6–7 km) / Fatuha Junction (~8–10 km)
Nearest Airport	• Jay Prakash Narayan International Airport, Patna (~15–18 km)

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1.3 PROJECT COST

Total cost of the project shall approximately be INR 85 Crores.

1.4 LAND REQUIREMENT AND AREA SUMMARY

The Total Plot area as per Deed is 11,442.41 sq.m and total plot area of the project as per site is approximately 11,292.00 sq.m. The project involves development of residential buildings (**Block A, B and C**), an **Affordable Housing Block (Block D)**, and a **commercial component** along with associated infrastructure. The **total built-up area of the project is 78825.91 sq.m.**

The area summary of the project is given in **Table 2**.

Table 2: Area Statement

S. No.	Description	Area / Details
1.	Total Plot Area	11,292.00 sq.m
2.	Proposed Ground Coverage (@33.50%)	3,832.21 sq.m
3.	Total Built-up Area (Block A+B+C+D & Parking)	78825.91 sq.m
4.	FAR Built-up area excluding Affordable Housing	55771.25 sq.m
5.	FAR (Excluding Affordable Housing)	4.93
6.	Built-up area including Affordable Housing	64298.65 sq.m
7.	Provided Parking Area	14,527.26 sq.m
8.	Green Area @ 15.60 %	1,762.17 sq.m
9.	Road / Internal Circulation	6.0 m wide internal roads provided
10.	Total Dwelling Units	464 Units
11.	Height of Building	120 m
12.	Maximum number of Floor	G+34

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Table 2 (a) : Block - wise built-up area statements in Sqm.

B/u Area	Block - A	Block - B	Block - C	Block – D (Affordable House)
Ground Floor Area	1712.10			133.56
1 st Floor Area	1151.10			322.84
2 nd Floor Area	302.25			322.84
3 rd Floor Area	1487.28			322.84
4 th Floor Area	671.12	563.10	447.36	322.84
5 th Floor Area	671.12	563.10	447.36	322.84
6 th Floor Area	671.12	563.10	447.36	322.84
7 th Floor Area	671.12	563.10	447.36	322.84
8 th Floor Area	671.12	563.10	447.36	322.84
9 th Floor Area	671.12	563.10	447.36	322.84
10 th Floor Area	671.12	563.10	447.36	322.84
11 th Floor Area	671.12	563.10	447.36	322.84
12 th Floor Area	671.12	563.10	447.36	322.84
13 th Floor Area	671.12	563.10	447.36	322.84
14 th Floor Area	671.12	563.10	447.36	322.84
15 th Floor Area	671.12	563.10	447.36	322.84
16 th Floor Area	671.12	563.10	447.36	322.84
17 th Floor Area	671.12	563.10	447.36	322.84
18 th Floor Area	671.12	563.10	447.36	322.84
19 th Floor Area	671.12	563.10	447.36	322.84
20 th Floor Area	671.12	563.10	447.36	322.84
21 th Floor Area	671.12	563.10	447.36	322.84
22 th Floor Area	671.12	563.10	447.36	322.84
23 th Floor Area	671.12	563.10	447.36	322.84
24 th Floor Area	671.12	563.10	447.36	322.84
25 th Floor Area	671.12	563.10	447.36	322.84
26 th Floor Area	671.12	563.10	447.36	322.84
27 th Floor Area	671.12	563.10	447.36	
28 th Floor Area	671.12	563.10	447.36	
29 th Floor Area	671.12	563.10	447.36	
30 th Floor Area	671.12	563.10	447.36	
31 th Floor Area	671.12	563.10	447.36	
32 th Floor Area	671.12	563.10	447.36	
33 th Floor Area	671.12	563.10	447.36	
34 th Floor Area	671.12			
Total B/U AREA	20804.72	16893.00	13420.80	8527.40

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Table 2 (b) : Total built-up area Details

S. No.	Block	Built-up Area (sq.m)	No. of Units
1.	Ground Floor Area of Block- A, Block- B & Block- C	1712.10	
2.	1 st Floor Area of Block- A, Block- B & Block- C	1151.10	
3.	2 nd Floor Area of Block- A, Block- B & Block- C	302.25	
4.	3 rd Floor Area of Block- A, Block- B & Block- C	1487.28	
5.	Block A	20,804.72	124
6.	Block B	16,893.00	120
7.	Block C	13,420.80	90
8.	Block D	8,527.40	130
9.	Total Parking Area (Ground Floor + 1 st Floor + 2 nd Floor Parking Area)	14,527.26 (5240.18+3895.21+5391.87)	
	Total Built-up Area	78825.91 sq.m.	464 Units

Table 2 (c) : Details of Dwelling Unit

Serial No.	Description	Number
1	4 BHK + Servant	62
2	3 BHK + Servant	122
3	3 BHK	150
4	1 BHK (EWS)	130
Total	--	464

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1.5 ESTIMATED POPULATION

Population estimated at the site is 3073 which includes residential & visitors population.

Table3: Estimated Population

S. No.	Category	No. of DU / Area	Standard (Persons/DU)	Population
A Residential				
1	4 BHK + Servant	62	7	434
2	3 BHK + Servant	122	6	732
3	3 BHK	150	6	900
4	1 BHK (EWS)	130	4	520
Total	--			2586
5	Visitor 10 % of Total Population			258
6	Staff 5 % of Total Population			129
7	Residential			2973
B Commercial				
8	Commercial	602.34 sq.m	1 person / 6 sq.m	100
9	Staff	10 % of Total Population	—	10
10	Visitor	90 % of Total Population	-	90
Total Population	A+B			3073

1.6 WATER REQUIREMENT

The water requirement during the construction phase is estimated to be approximately **20–50 KLD**, which will be sourced through private water tankers. During the operation phase, the total water requirement is estimated to be **412 KLD**. Out of this, **287 KLD** will be met through fresh water sources (municipal supply supplemented by groundwater, subject to permission from the concerned authority), and **125 KLD** will be met through recycled treated wastewater.

Detailed water consumption and reuse calculations are presented in **Table 4 and Table 5**, and the water balance diagram is provided in **Figure 2 & 3**.

1.7 SEWAGE GENERATION

Sewage generation from the site is expected to be 354 KLD which will be treated in STP of capacity of 400 KLD will be proposed. Treated water from the STP will be used for flushing, gardening and other purpose. STP will be provided with MBBR Technology.

Table4: Calculations for Total Daily Water Demand

Category	Population / Area (sqm) / Capacity	Standard (LPCD)	Water Requirement (KLD)	Fresh Water Requirement (KLD)	Recycled Water Requirement (KLD)
Domestic					
Residents	2973 Persons	135	401	280	121
Staff	139 Persons	45	6	4	2
Visitors	348 Persons	15	5	3	2
Total Domestic Water Demand	—	—	412	287	125
Landscape	1762.17 sq.m	6 l/sqm	11	—	11
Fire Fighting	—	—	1.00	—	1.00
DG Cooling	—	—	5.00	—	5.00
Road Washing & Misc			5.00	—	5.00
Total	—	—	434	287	147

DG set operation period for 8hr

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Table 5: Wastewater Calculations

Category	Total Quantity (KLD)
Domestic Water Requirement (Fresh)	287
Flushing Water Requirement (Recycled)	125
Sewage Generation (80% of fresh + 100% flushing)	354
Capacity of STP (Proposed)	400
Recovered Water from STP (90%)	318
1. Flushing	125
2. Landscaping	11
3. Fire Fighting	1
4. DG Cooling	5
5. Road Washing & Misc	5
6. Discharge to Sewer	171

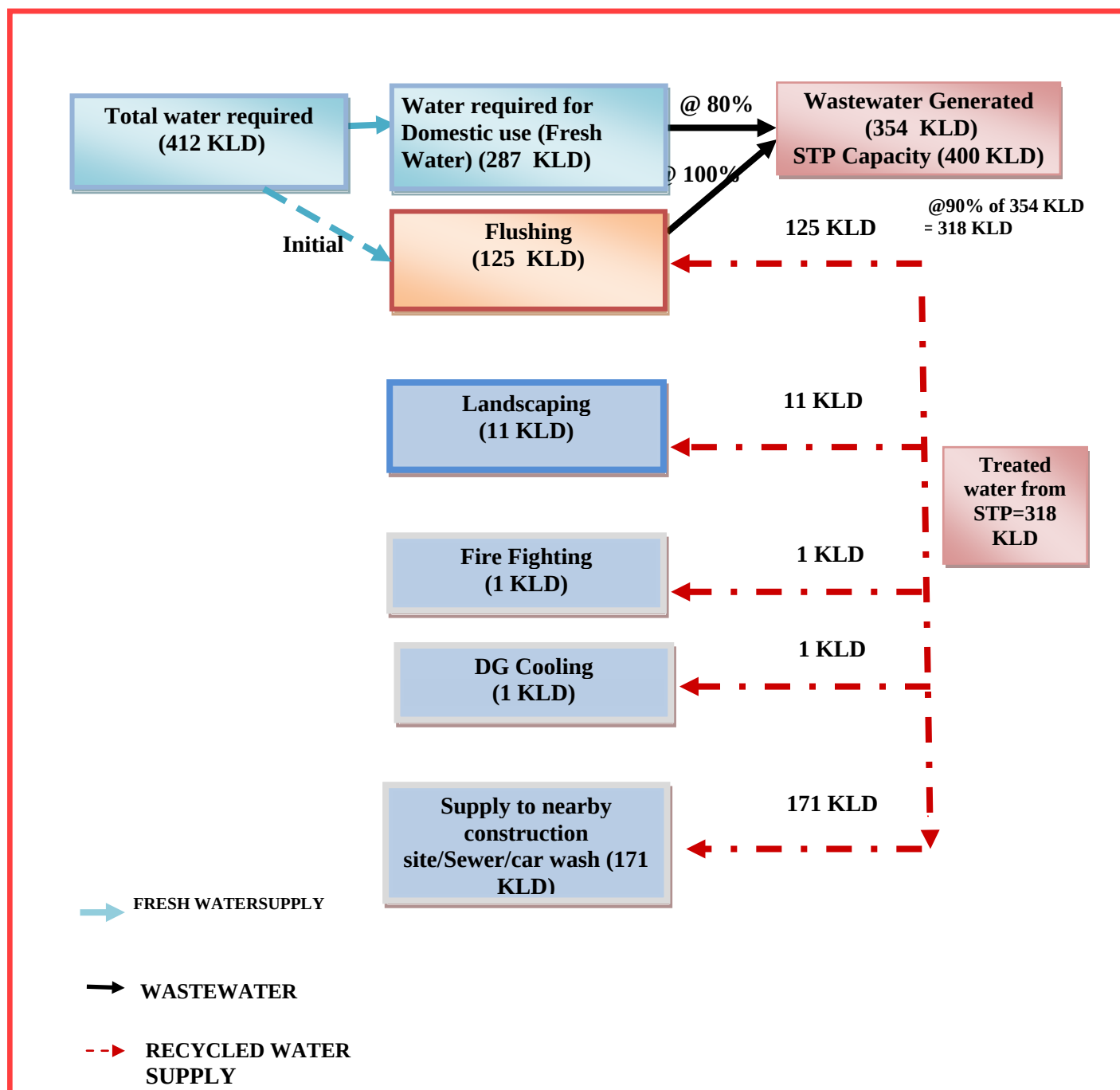


Figure 2: Water balance diagram During Non-Monsoon

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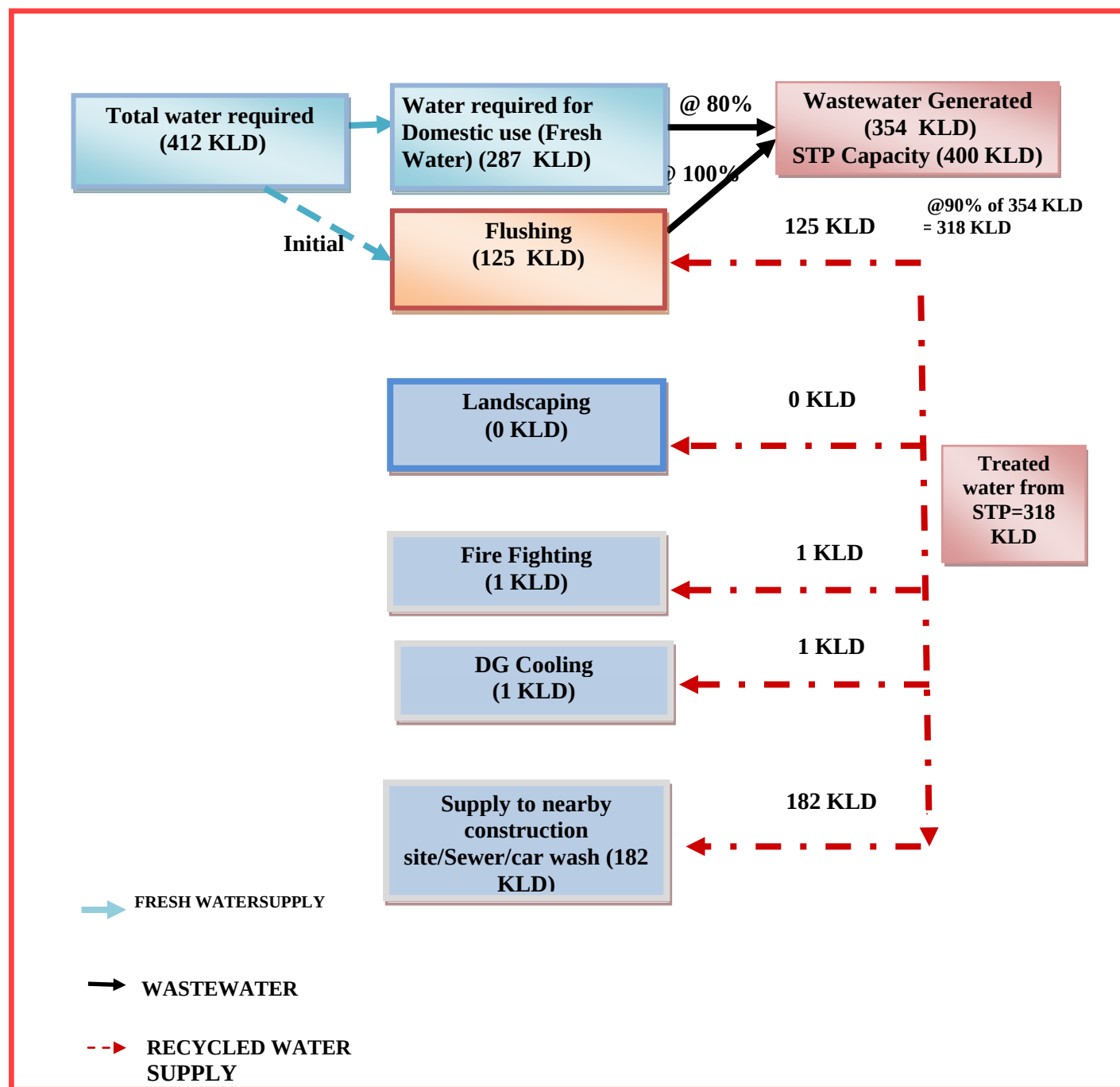


Figure 3: Water balance diagram During Monsoon

1.8 SEWAGE MANAGEMENT

STP of 400 KLD with MBBR technology is provided at the site. Detail of the treatment technology and sewerage system are given below:

Sewerage System

An external sewage network shall collect the sewage from all units, and flow by gravity to the proposed sewage treatment plant.

Following are the benefits of providing the Sewage Treatment Plant in the present circumstances:

- Reduced net daily water requirements, source for Horticultural purposes by utilization of the treated waste water.
- Reduced dependence on the public utilities for water supply and sewerage systems.
- Sludge generated from the Sewage Treatment Plant shall be rich in organic content and an excellent fertilizer for horticultural purposes.

a. Wastewater Details

(a)	Daily load	:	354 KLD
(b)	Duration of flow to STP	:	24 hours
(c)	Temperature	:	Maximum 32°C
(d)	PH	:	6.5 to 8.5
(e)	Color	:	Mild
(f)	T.S.S.(mg/l)	:	200-450mg/l
(g)	BOD(mg/l)	:	300-400mg/l
(h)	COD (mg/l)	:	600-800mg/l
(i)	Oil & Grease	:	30-50mg/l

b. Final discharge characteristics

(a)	PH	:	6.0 to 8.5
(b)	Oil & Grease	:	<5mg/l
(c)	B.O.D.	:	<20mg/l
(d)	C.O.D.	:	<100mg/l
(e)	Total Suspended Solids	:	<10mg/l

c. Treatment Technology

The technology is based on attached growth aerobic treatment followed by clarification by a tube settler. Lime will be dosed in for suppression of foaming tendencies. The clarified water will be filtered in a pressure sand filter after dosing of coagulant (alum) for removal of unsettled suspended impurities. This water will be passed through an activated carbon filter for removal of organics. The filtered water from ACF is then chlorinated & stored in the flushing tank.

The attached growth Moving bed bio reactor (MBBR) process combines the biological processes of attached & suspended growth. It combines submerged fixed film with extended aeration for treatment of the waste water.

The waste water after screening is collected in an equalization tank. The equalization tank is required for preventing surges in flow & facilitating equalization of characteristics over the entire quantity of effluent in a given time. A provision for pre-aeration is made in the equalization tank in order to ensure mixing & to prevent the sewage from going septic.

The equalized sewage is then pumped into the MBBR reactor for biological processing. The water enters the bottom of the reactor & flows up through the fixed film media which grossly enhances the hydraulic retention time & provides a large surface area for growth of biological micro – organisms. The MBBR reactor is aerated by fine pore sub – surface diffusers which provide the oxygen for organic removal. The synthetic media floats on the water & the air agitation ensures good water to micro-organism contact.

The MBBR treatment is an attached growth type biological treatment process where in, the majority of biological activity takes place on the surface of the PVC media. Continuous aeration ensures aerobic activity on the surface of the media. Micro – organisms attach themselves on the media & grow into dense films of a viscous jelly like nature. Waste water passes over this film with dissolved organics passing into the bio-film due to concentration gradients within the film. Suspended particles & colloid may get retained on this sticky surface where they are decomposed into soluble products. Oxygen from the aeration process in the waste water provides oxygen for the aerobic reactions at the bio-film surface. Waste products from the metabolic processes diffuse outward & get carried away by the wastewater or air currents through the voids of the media.

The aerated effluent passes into a tube deck settler for clarification. The theory of gravity tube settler system is that the carrier fluid maintains laminar flow in the settling media at specified maximum viscosity. These two parameters of a carrier fluid, flowing through a hydraulic configuration, will determine the velocity gradients of the flow, the height of boundary layer at the inclined surface and the residence time within the media.

The carrier fluid must be viscous Newtonian, exhibiting a Reynolds number of less than 1000 and preferably, a number under 400. The laminar flow, through the inclined tubes, will produce velocity gradients sufficiently large to form an adequate boundary layer, where the velocity of fluid approaches zero. Boundary layers are necessary in functioning tube settlers, to allow suspended solids to separate from the viscous carrier fluid. Under gravitational forces, they will settle to the hydraulic surface of the tube and subsequently from the clarifier media.

Since the tubes are inclined at 60 degrees, solids settled on the tubes are continually discharged down. This downward rolling action increases particle contact and hence further agglomeration, which increases the sludge settle ability. Studies show that the sea agglomerated sludge particles can have a settling rate in excess of ten times the settling rate

of the individual floc particles in the influent. These heavy agglomerated masses quickly slide down the 60 degree inclined tube and settle at the bottom of the tank.

At the bottom of the Tube deck, where the sludge leaves the Tube surface, the larger agglomerated captures smaller particles in the upcoming stream. This solid contact phenomenon greatly enhances the capture efficiency.

Stages of Treatment: The treatment process consists of the following stages:

- Equalization
- Bio-Degradation
- Clarification &Settling
- Filtration

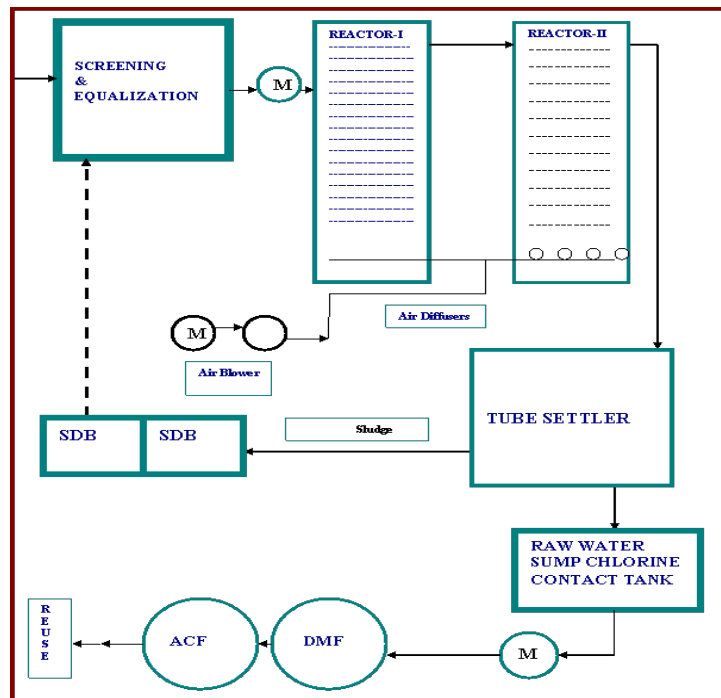


Figure 4: Schematic Diagram of STP

1.9 STORM WATER MANAGEMENT

A storm water drainage system is proposed at the site for efficient channelization of storm water and prevention of local flooding. Covered storm water drains will be provided throughout the site. The surface run-off generated from the site will be collected and recharged into the ground through 5 nos. of rainwater harvesting (RWH) pits. Recharge of rainwater not only prevents water logging during rainfall but also helps in augmenting the groundwater level in the area.

The groundwater level in the project area varies from approximately 2.2 to 12.2 m below ground level (bgl) during pre-monsoon and 1.81 to 6.60 m bgl during post-monsoon. The proposed recharge structures will have a bore diameter of about 150 mm and depth of 10–15 m or up to the weathered rock formation zone.

The run-off generation from the site prior to development is estimated to be lower; however, due to an increase in paved and roofed surfaces, the post-development run-off increases. The total run-off from the site after development is estimated to be approximately **380 m³/hr during peak rainfall and 7613 m³ annually**, as presented in Table 6.

Calculations for rainwater harvesting pits are provided in Table 7. The excess run-off, after recharge, will be safely discharged into the external storm water drainage system.

Table 6: Available Run-off from Site

S. No.	Catchment	Area(sq m)	Run-off Coefficient	Average Annual Rainfall (m)	Runoff Annually (m3)	Peak Hourly Rainfall (m)	Runoff (m3/hr)
1.	Rooftop	3832.21	0.9	1.0	3449	0.05	172.44
2.	Green	1762.17	0.1	1.0	176.21	0.05	9
3.	Paved Areas	5697.62	0.7	1.0	3988	0.05	199
Total Run-off					7613 m³/year		380 m³/hr

Table7: Calculation for RWH Pits

Total Run-off (m3/hr)	380
Retention Time	15 min
AvailableRun-offin15min	95 m ³
Length and breadth and depth of the RWH pit m ³	3 m × 2 m × 3 m (18 m³)
Nos. of Pits Required	5.27 or 5

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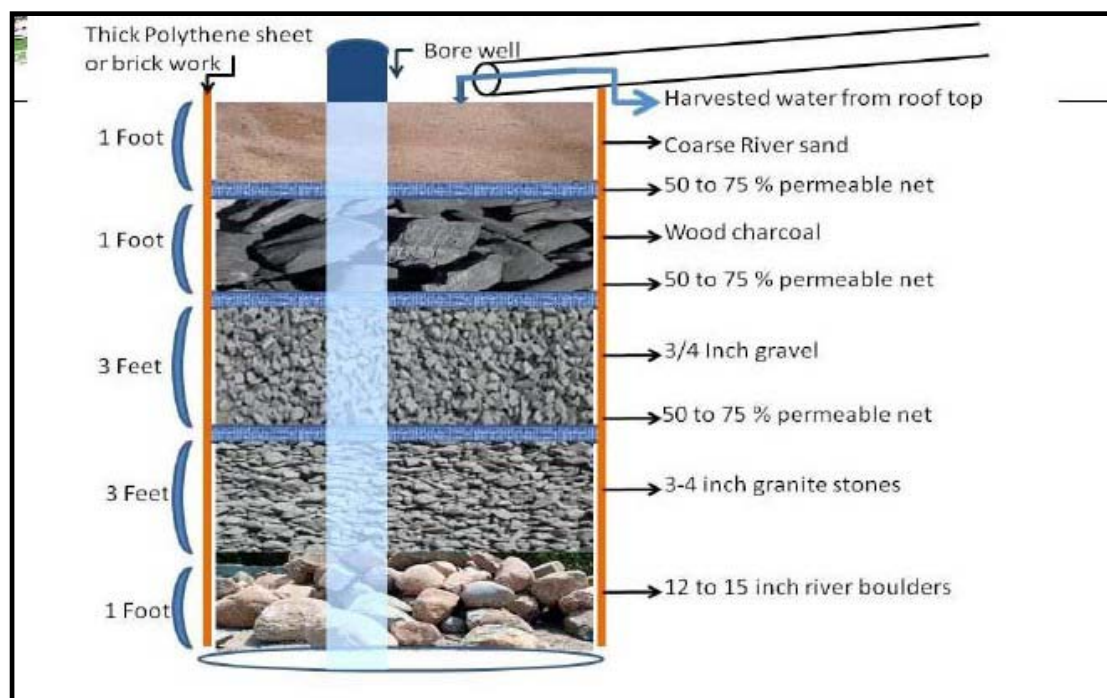


Figure5: Schematic Diagram of RWH Pit

1.10 VEHICLE PARKING FACILITIES

Adequate parking space has been provided within the project premises to accommodate the expected vehicles during the operation phase, in accordance with the requirements of local building bye-laws. The total parking area required is approximately 14,221.67 sq.m, whereas a parking area of about 14,527.26 sq.m has been provided. Parking details are presented in Table 8

Table8: Parking Details

S. No.	Parking Type	No. of Vehicles / ECS	Area (sq.m.)
1	Car Parking	484	14,527.26
	Total Parking	484	14,527.26 sq.m

1.11 POWER REQUIREMENT

Maximum power demand for the project during construction and operation phase is estimated to be 125 kVA and 2500 kVA respectively. Source of power will be State Electricity Board. DG set of total capacity 1250 kVA will be provided as power back-up during power failure.

1.12 SOLID WASTE GENERATION AND MANAGEMENT

Construction Phase

Solid waste will be generated both during construction as well as during operation phase. Solid waste generated during construction phase are majorly excavated materials, cement bags, bricks, concrete, MS rods, tiles, wood etc. Construction waste was segregated into re-usable, recyclable and reject fraction. Re-usable waste was stored at site, recyclable material was sold to authorized vendor and rejected material and disposed off at the designated areas of RMC. Solid waste management plan followed is given in **Table 9**.

Table9: Solid waste management during construction phase

S. No.	Solid waste	Solid waste management
1.	Waste materials like MS Rods, bricks, concrete, broken tiles, wood pieces, cement bags etc.	Construction waste will be segregated into recyclable/reusable and discarded material. Recyclable material will be sold to authorize dealers. Re-usable material will be stored under covered conditions at site and reject will be disposed off at the designated locations by MC. Waste will be s transported in covered vehicles only.
2.	Excavated Soil	Top soil will be stripped off and stored in covered condition. Top soil will be used for landscaping within the project site. Remaining excavated soil will be used within the site for filling and leveling and construction of roads. Excess muck will be disposed off through authorized vendors.
3.	Domestic Waste	Domestic waste generated by lab or at the site will be disposed off through local agencies in the area on daily basis.

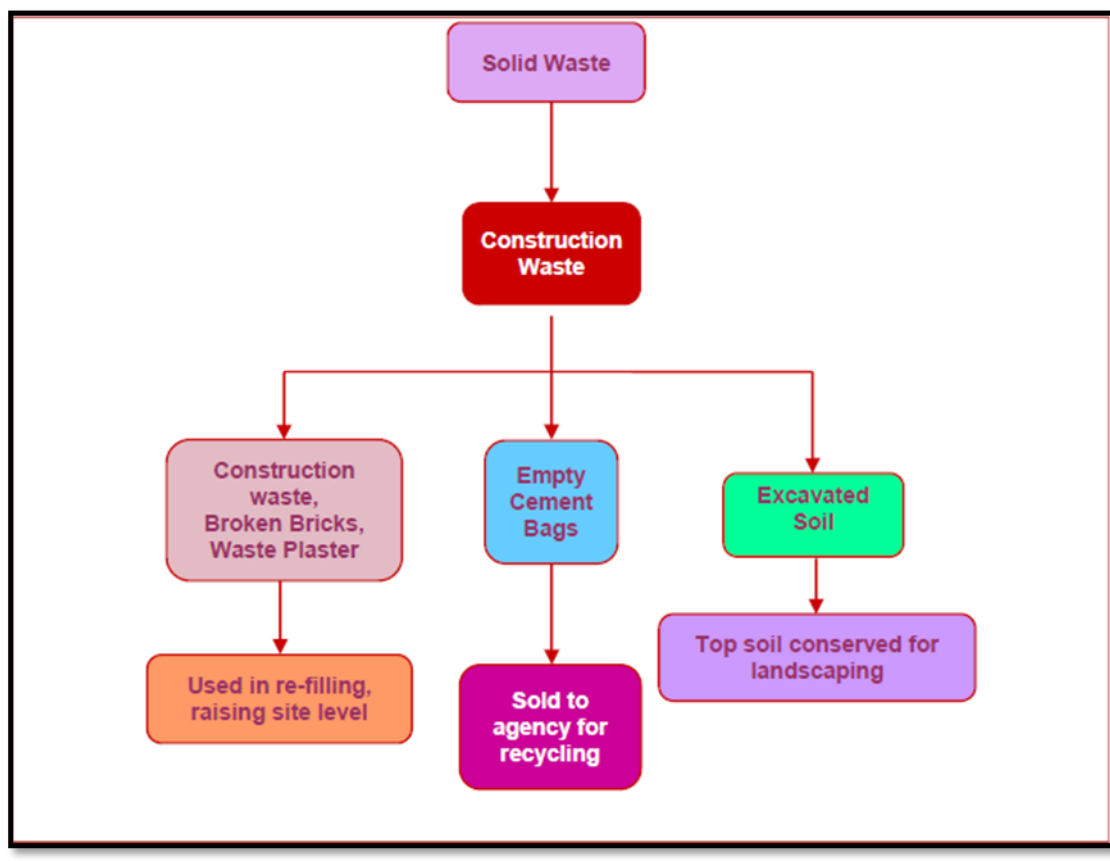


Figure 6: Solid Waste Management Scheme (Construction Phase)

Operation phase

During the operation phase, the waste generated will primarily comprise municipal solid waste. It is estimated that approximately **1609 kg/day** of solid waste will be generated from the project site. The estimation is based on standard generation rates of **0.50 kg per capita per day for residents, 0.25 kg per capita per day for staff, 0.15 kg per capita per day for visitors**, and approximately **0.2 kg per 100 sq.m per day for landscape waste**. Additionally, **STP sludge generation is estimated at about 35 kg/day**, considering a sewage generation of 354 KLD.

Estimations for solid waste generation during operation phase are given in **Table 10**. Waste management plan is given below.

Table10: Calculation of Solid Waste Generation

S. No.	Description	Population / Area	kg/cap/day	Total Solid Waste (kg/day)	Recyclable (40%) (kg/day)	Non-Recyclable (60%) (kg/day)
1	Staff	139	0.25	35	14	21
2	Visitors	348	0.15	52	21	31
3	Residents / Occupants	2973	0.50	1487	595	892
4	Landscape Waste	1762.17 sq.m	~0.2 kg/acre/day	0.2	0.2	-
5	STP Sludge (354 KLD STP)	—	—	35	35	-
	Total Waste Generated	—	—	1609.2 or 1609 kg/day	665.2 or 665 kg/day	944 kg/day

(Source: For Waste Collection, Chapter 3, Table 3.6; Page no. 49, of Central Public Health & Environment Engineering Organization, Ministry of Urban Development, (Government of India, May 2000))

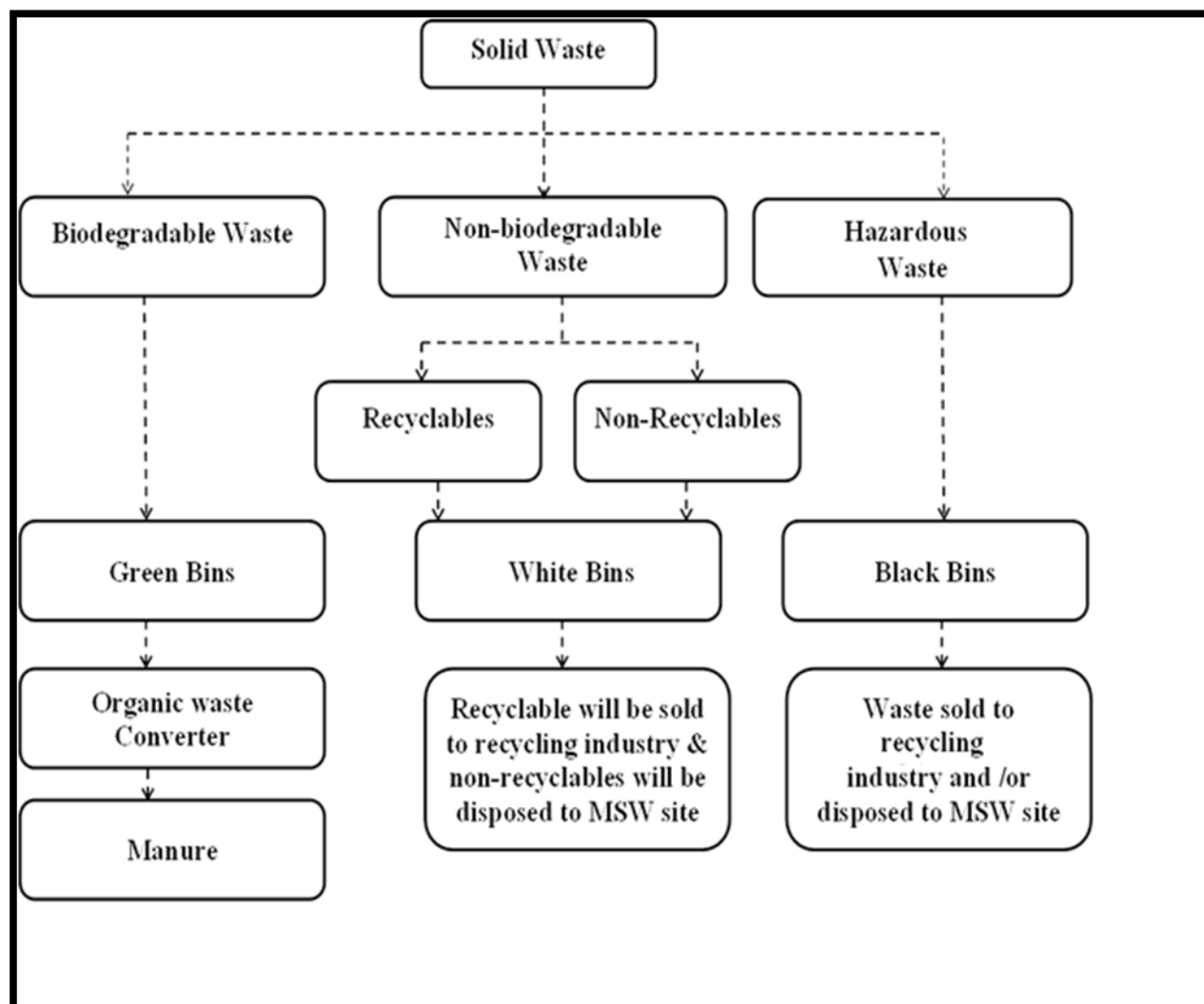


Figure 7: Solid Waste Management during Operation Phase

❖ **Collection and Segregation of waste**

- a. Door to door collection system will be provided for collection of domestic waste
 - b. Local vendors will be hired for waste collection, management and disposal
- ❖ Separate colored bins for dry recyclables and rejected waste will be provided to residents as well as in common and open areas

❖ **Disposal**

- a. Rejected fraction of the waste will be collected and disposed by local agencies on daily basis at the locations designated by Ranchi Municipal Corporation. Recyclable waste and E-waste will be sold to authorized vendors
- b. Used oil from DG sets will be sold to authorized vendors

1.13 GREEN AREA

Total Green Area: It is proposed to develop approximately **1,762.17 sq.m** of area under green within the project site, which is **more than the minimum required green area (10% of the net plot area)**. Evergreen native species along with ornamental tree species will be planted within the site to enhance the aesthetic and environmental quality of the development. The proposed plantation will be carried out along the site periphery, internal roads, and open spaces. **Table 11** indicates the various suggested species to be used for greenbelt development.

Table11: List of Plant to be proposed to planted

S. No.	Scientific Name	Common Name
1	<i>Terminalia arjuna</i>	Arjun
2	<i>Dalbergia sissoo</i>	Shishu
3	<i>Swietenia macrophylla</i>	Mahogany
4	<i>Neolamarckia cadamba</i>	Kadam
5	<i>Roystonea regia</i>	Royal Palm
6	<i>Delonix regia</i>	Krishnachura (Gulmohar)
7	<i>Peltophorum pterocarpum</i>	Radhachura (Copperpod)
8	<i>Cassia fistula</i>	Amaltas
9	<i>Butea monosperma</i>	Palash
10	<i>Magnolia champaca</i>	Champa
11	<i>Azadirachta indica</i>	Neem
12	<i>Alstonia scholaris</i>	Chatim (Devil Tree)
13	<i>Mimusops elengi</i>	Bakul
14	<i>Saraca asoca</i>	Ashoka
15	<i>Shorea robusta</i>	Sal
16	<i>Tectona grandis</i>	Teak
17	<i>Madhuca longifolia</i>	Mahua
18	<i>Mangifera indica</i>	Mango
19	<i>Tamarindus indica</i>	Imli

1.14 CONSTRUCTION MATERIAL

Detail of different type of construction material used in the site is given in **Table 12** with their U values is given in **Table 13**. List of machinery which will be used for construction is given below.

Table 12: Construction materials List

S.No.	Description
1.	Cement
2.	Sand
3.	Metal 20mm
4.	AAC Blocks
5.	AAC Block Jointer
6.	MS/RTS Rods
7.	Ceramic Tiles
8.	Country wood scantling upto 4m length
9.	UPVC Windows
10.	Solid Core Flush Doors
11.	PVC Door Shutters

Table 13: U values Construction materials

S. No.	Type of Construction	Specification	U-Value (W/m ² °C)
1	Walls	Brick, plastered both sides	3.24
		Brick, solid unplastered	2.67
		Brick, plastered both sides (improved)	2.24
		Concrete (ordinary dense), 152 mm	3.58
		Concrete (ordinary dense), 203 mm	3.18
		CLC Fly Ash Block	1.19
		Hollow concrete block (220 mm), single skin, outside rendered & inside plastered	1.70
2	Roofs (Flat)	RCC slab (100 mm) + screed (63–12 mm) + 3 layers bituminous felt	3.35
3	Floors	Concrete on ground / hardcore fill	1.13
		+ Grano / Terrazzo / Tile finish	1.13
		+ Wood block finish	0.85
4	Glazing (South Exposure – Sheltered)	Single glazing	3.97
		Double glazing (6 mm air gap)	2.67

1.15 LIST OF MACHINERY USED DURING CONSTRUCTION

- Dumper
- Concrete mixer with hopper
- Excavator
- Cranes
- Hoist
- Labor Lifts
- Concrete pressure pumps