FORM-1

FOR

ENVIRONMENTAL CLEARANCE

FOR THE PROPOSED EXPANSION OF THE

BUILDING PROJECT

‘CARITAS HOSPITAL’

AT

PEROOR VILLAGE
KOTTAYAM TALUK
KOTTAYAM DISTRICT
KERALA

BY

CARITAS HOSPITAL
THELLAKOM P.O
KOTTAYAM, KERALA- 686 630

APPENDIX I

(See paragraph – 6)

FORM 1

(I) Basic Information

S No.	Item	Details
1.	Name of the project/s	Proposed expansion of Caritas Hospital, Thellakom, Kottayam with the addition of a Hospital building, Geriatric Centre (Nursing Home) & Doctors quarter's block, Block for Nuclear Medicine and an Amenity Centre in Phase 1 and a Staff Quarters block and multi-level mechanical car parking system in Phase 2.
2.	S.No. in the schedule	8 (a)
3.	Proposed capacity/area/length/tonnage to be handled/ command area/lease area/number of wells to be drilled	Caritas Hospital has grown from a 50-bedded hospital to 660-bedstrength hospital in over 55 years. The hospital was being upgraded gradually based on the demand from the community. The EIA Notification 2006 was violated in the year 2008, when a new building of built-up area 14465.06 m^2 was constructed. The proposed expansion will increase the bed strength from 660 to 950 by the addition of 290 beds. The 290 beds proposed to be added include 270 beds in General Medicine and 20 beds in Nuclear Medicine Department. The proposed expansion includes the construction of (1) a G+5 storeyed building for nuclear medicine (BC Block) (2) a 2B+G+12 storeyed building for general medicine with geriatric centre (3 a building for staff quarters, (5) an amenity centre and (6) a multi-level mechanical car parking system. The area statement for the proposed expansion is as follows

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>Building Block Name</td><td>Maximum No. of floors</td><td>No. of beds</td><td>Maximum height of building [m]</td><td>Built-up area [m^2]</td></tr>
<tr><td>Proposed Extension to Hospital building for Nuclear Medicine</td><td>G+5</td><td>20</td><td>19</td><td>3221.82</td></tr>
<tr><td>Proposed Hospital building, Geriatric Centre (Nursing Home) & Doctors quarters</td><td>2B+G+12</td><td>270</td><td>47.55</td><td>32716.56</td></tr>
<tr><td>Proposed Staff Quarters</td><td>2B+G+5</td><td>--</td><td>19</td><td>23670.50</td></tr>
<tr><td>Commercial Building</td><td>G+3</td><td>--</td><td>13.8</td><td>2044.57</td></tr>
<tr><td>Multi-Level Parking</td><td>-</td><td>-</td><td>-</td><td>769.14</td></tr>
<tr><td colspan="4">Total Built-up Area of the proposed expansion</td><td>62422.59</td></tr>
</table>
</td></tr>
<tr><td>4.</td><td>New/Expansion/Modernization</td><td>Expansion</td></tr>
<tr><td>5.</td><td>Existing Capacity/Area etc.</td><td>
<table>
<tr><td>Total Plot area</td><td>89339 m^2</td></tr>
<tr><td>Existing no. of Beds</td><td>660</td></tr>
<tr><td>Existing Built up area</td><td>68905.69 m^2 …….(A)</td></tr>
<tr><td>Built up area constructed before 2006 EIA notification and hence exempted from requirement of EC</td><td>30473.92 m^2…….(B)</td></tr>
<tr><td>Built up area exempted</td><td>5367 m^2…….(C)</td></tr>
</table>
</td></tr>
</table>

		from EC, by MoEF & CC as per Gazetted Notification dated 22-12-2014, as these part of educational institutions	
		Built up area of the buildings proposed to be demolished	2321.8 m^2…….(D)
		Built up area of the proposed expansion	62422.59 m^2…….(E)
		Hence total built up area after the proposed expansion	129006.48 m^2……. (A-D+E)
		Total built up area requiring EC for the proposed expansion	**93165.56 m^2…(A-(B+C+D) +E)**
		Height of the building	Existing main Hospital building: 28.2 m above GL Proposed Hospital cum Apartment building: 47.55 m above GL
		Total Green area	30290.77 m^2
		FAR	1.44
		Coverage	30.25%
6.	Category of Project i.e.'A' or 'B'	Category B (B2)	
7.	Does it attract the general condition? If yes, please specify.	Not Applicable	
8.	Does it attract the specific condition? If yes, please specify	Not Applicable	
9.	Location	Thellakom in Peroor Village, Kottayam Taluk, Kottayam District, Kerala State	
	~~Plot~~/Survey/~~Khasra~~ No.	188/10, 200/1, 200/2, 200/3, 200/4, 201/8, 201/8-1, 201/9, 201/9-1, 201/10,201/15, 201/15-1, 201/24, 201/26, 201/26-1, 201/26-2, 202/3,202/4-2	
	Village	Peroor	
	Tehsil	Kottayam	
	District	Kottayam	
	State	Kerala	

10.	Nearest railway station/airport along with distance in kms	Ettumanoor railway Station : 4.3 km Cochin International Airport : 79 km
11.	Nearest Town, city, District Headquarters along with distance in kms.	Ettumanoor : 3.9 km District Headquarters, Kottayam : 9.1 km
12.	Village Panchayats, Zilla Parishad., Municipal Corporation, Local body (complete postal addresses with telephone nos. to be given	Peroor Village Office, Peroor P.O, Ettumanoor Kottayam District - 686637 Ph: 0481-2792136 Municipal office, Private Bus Stand Road Ettumanoor P.O Kottayam (Dist) -686631 Ph:0481-2537639
13.	Name of the applicant	Fr. Thomas Animoottil Director, Caritas Hospital, Kottayam
14.	Registered address	Fr. Thomas Animoottil Director Caritas Hospital Thellakom P.O Kottayam- 686 630
15.	Address for correspondence:	Fr. Thomas Animoottil Director Caritas Hospital Thellakom P.O Kottayam- 686 630
	Name	Fr. Thomas Animoottil
	Designation(Owner/Partner/CEO)	Director, Caritas Hospital
	Address	Caritas Hospital Thellakom P.O Kottayam- 686 630
	Pin Code	686 630
	E-mail	info@hostechpmc.com
	Telephone No.	+91 9744102202, +91 9446017200, 0481 2790025
	Fax No.	0481 2790418
16.	Details of Alternative Sites examined, if any. Location of these sites should be shown on a	Not applicable. The proposed project is the expansion of the existing hospital.

	Toposheet.	
17.	Interlinked Projects	No
18.	Whether separate application of interlinked project has been submitted?	Not Applicable
19.	If yes, date of submission	Not Applicable
20.	If no, reason	Not Applicable
21.	Whether the proposal involves approval/clearance under: if yes, details of the same and their status to be given	Not Applicable
	(a)The Forest (Conservation) Act,1980?	Nearest notified Forest area at an aerial distance of 34.6 km
	(b) The Wildlife (Protection) Act,1972?	Nearest Sanctuary (Kumarakom Bird Sanctuary) situated at an aerial distance of 13 km
	(c) The C.R.Z.Notification,1991?	The nearest CRZ area (Vembanad lake) is situated at an aerial distance of 14 km
22.	Whether there is any Government Order/Policy relevant/relating to the site?	No
23.	Forest land involved (hectares)	No
24.	Whether there is any litigation pending against the project and / or land in which the project is propose to be set up? (a) Name of the Court (b) Case No. (c) Orders/directions of the Court, if any and its relevance with the proposed project	No

(II) Activity

1. **Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)**

			Details thereof (with approximate quantities /rates, wherever possible) with source of

<table>
<tr><th>S.No.</th><th>Information/Checklist confirmation</th><th>Yes/No</th><th>information data</th></tr>
<tr><td>1.1</td><td>Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)</td><td>No</td><td>The site is already developed with Hospital, educational institutions, staff quarters, utility sheds, student hostels, convents and chapel. A few of the old buildings will be demolished. Four new buildings are proposed to be constructed, which include a hospital building, Geriatric Centre (Nursing Home), Doctors quarters, Nuclear medicine block and an Amenity Centre in Phase 1, Staff Quarters and multi-level mechanical car parking system in Phase 2.</td></tr>
<tr><td>1.2</td><td>Clearance of existing land, vegetation and buildings?</td><td>Yes</td><td>Clearance of garden trees will be compensated with the plantation of more native species in the green belt.</td></tr>
<tr><td>1.3</td><td>Creation of new land uses?</td><td>No</td><td>A few of the old buildings will be demolished for the construction of hospital building, Geriatric Centre (Nursing Home), Doctors quarters, Nuclear medicine block, Amenity Centre, Staff Quarters and multi-level mechanical car parking system with properly planned green belt and landscape.</td></tr>
<tr><td>1.4</td><td>Pre-construction investigations e.g. bore houses, soil testing?</td><td>Yes</td><td>Geotechnical Investigation has been carried out and the report is attached as Annexure</td></tr>
<tr><td>1.5</td><td>Construction works?</td><td>Yes</td><td>Construction of hospital building, Geriatric Centre (Nursing Home), Doctors quarters, Nuclear medicine block, Amenity Centre, Staff Quarters and multi-level mechanical car parking system.</td></tr>
<tr><td>1.6</td><td>Demolition works?</td><td>Yes</td><td>Old building structures such as Directors residence, a portion of Psychiatry unit, Vianney home (Oldage Homes), canteen, coffee shop, bank facility, Fire Pump House will be demolished. The total built up area of buildings to be demolished is as follows:
<table>
<tr><td>Building Block Name</td><td>Maximum No. of floors</td><td>Maximum height of building [m]</td><td>Built-up area [m^2]</td></tr>
<tr><td>Psychiatry unit (a portion)</td><td>-</td><td>-</td><td>185.30</td></tr>
<tr><td>Doctors quarters</td><td>G</td><td>3</td><td>167.94</td></tr>
<tr><td>Vianney Home</td><td>G+2</td><td>9</td><td>1427.42</td></tr>
<tr><td>Director</td><td>G</td><td>3</td><td>228.65</td></tr>
</table></td></tr>
</table>

			<table><tr><td>Residence</td><td></td><td></td><td></td></tr><tr><td>Bank Building</td><td>G</td><td>3</td><td>151.80</td></tr><tr><td>Canteen</td><td>G</td><td>3</td><td>88.26</td></tr><tr><td>Coffee shop AB-15</td><td>G</td><td>3</td><td>30.19</td></tr><tr><td>Plant House AB-16 (Fire Pump House)</td><td>G</td><td>3</td><td>42.24</td></tr><tr><td colspan="3">Total Built-up Area to be demolished</td><td>2321.8</td></tr></table>
1.7	Temporary sites used for construction works or housing of construction workers?	No	No housing for construction workers is planned as the labourers deployed will be accommodated offsite by the contractor.
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations	Yes	The quantity of earth cutting involved = 56,000 m^3 The quantity of earth filling involved = 20,000 m^3 The earth obtained from cutting shall be partially utilized for road laying and landscaping. Excess soil will be transferred to approved user agencies.
1.9	Underground works including mining or tunneling?	No	Not applicable
1.10	Reclamation works?	No	Not involved
1.11	Dredging?	No	Not involved
1.12	Offshore structures?	No	Not involved
1.13	Production and manufacturing processes?	No	Not involved
1.14	Facilities for storage of goods or materials?	Yes	Temporary storage facilities will be created to store the raw materials for construction.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	**Liquid Waste** • ETP for treatment of wastewater. In the ETP, wastewater is treated anaerobically using UASB Reactor followed by MBBR treatment • Treated wastewater will be recycled and used for flushing, gardening and HVAC, excess shall be discharged to the percolation pond followed by soak pit.

			• The sludge from ETP will be dried, composted and used as manure **Solid Waste** • The solid waste generated shall be segregated at source to organics and recyclables • All the organic solid waste generated will be treated onsite in a biogas plant • Incinerator of capacity of 150 kg/h with Venturi scrubber and a stack height of 30 m above ground level is provided for the non-recyclable waste • All the recyclable solid waste shall be stored and sold to recyclers **Biomedical Waste** • The biomedical waste is being segregated at source by providing appropriate colour coded bins/ containers as per the colour coding provided in the Bio-Medical Waste Management Rules 2016. The Bio-medical waste from the hospital buildings would be outsourced through a Kerala State Pollution Control Board Authorized agency Indian Medical Association Goes Eco Friendly (IMAGE). **Radioactive Waste** • During the operation phase, for treatment with nuclear medicine, radioactive isotopes will be used. Radioactive source storage, their use, radioactive waste storage and disposal of radioactive waste will be according to the Atomic Energy Regulatory Board guidelines
1.16	Facilities for long term housing of operational workers?	No	All the operational workers will be from the district itself and no housing accommodation will be provided to them.
1.17	New road, rail or sea traffic during construction or operation?	No	Not required
1.18	New road, rail, air waterborne or other transport infrastructure including new or altered	No	No new transport infrastructure is required. The existing road has the capacity to cater for the additional traffic

	routes and stations, ports, airports etc?		
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	There will not be any closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements
1.20	New or diverted transmission lines or pipelines?	No	Not Applicable
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	There will not be any impoundment, damming, culverting, realignment or other changes to the hydrology of water courses or aquifers
1.22	Stream crossings?	No	There are no stream crossings
1.23	Abstraction or transfers of water form ground or surface waters?	Yes	Water is extracted from the two existing bore wells at the site. Water from two open wells in Caritas Hospital's property around 2 km away is carried to the site in pipelines laid down by Caritas. This water is stored in tank of capacity 615 kLD.
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	Yes	There is no water body in the immediate vicinity that may be affected by runoff. There will be an increase in run off after the development which will be intercepted and used to recharge groundwater. Hence runoff is likely to be reduced in the post construction scenario.
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	There will be transport of personnel and construction materials during the construction phase. Precautions will be taken to reduce the impact of the vehicular movement by scheduling the vehicular trips for transporting construction material to non-peak hours
1.26	Long-term dismantling or decommissioning or restoration works?	No	Not applicable
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	Not applicable

1.28	Influx of people to an area in either temporarily or permanently?	Yes	The proposed expansion includes the construction of a hospital building, Geriatric Centre (Nursing Home), Doctors quarters, Nuclear medicine block, Amenity Centre and Staff Quarters. It is estimated that there will be an additional influx of maximum 1574 persons including patients, staff and visitors.
1.29	Introduction of alien species?	No	There will not be any introduction of alien species. Only indigenous plants will be raised
1.30	Loss of native species or genetic diversity?	No	At present site has different type of native and non-native garden plants. Only a few exotic plants/ trees along with weeds and colonizers should be cleared. There will not be any significant loss of native species or genetic diversity.
1.31	Any other actions?	No	Not applicable

2. **Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):**

<table>
<tr><th>S.No.</th><th>Information/checklist confirmation</th><th>Yes/No</th><th>Details thereof (with approximate quantities /rates, wherever possible) with source of information data</th></tr>
<tr><td>2.1</td><td>Land especially undeveloped or agricultural land (ha)</td><td>No</td><td>The site is already developed with hospital, educational institutions, residential units/quarters, sheds, hostels, convents and church. Few old structures will be demolished and new buildings will be constructed.</td></tr>
<tr><td>2.2</td><td>Water (expected source & competing users) unit: kLD</td><td>Yes</td><td>
<table>
<tr><th>Description</th><th>Quantity of water required (kLD)</th><th>Source of water supply</th></tr>
<tr><td colspan="3">Construction Phase</td></tr>
<tr><td>For workers (domestic)</td><td>0.45</td><td>Drinking water cans</td></tr>
<tr><td>For workers (flushing)</td><td>2.3</td><td>Open well</td></tr>
</table>
</td></tr>
</table>

			For Construction activity	15	Open well
			Existing hospital (Non-Monsoon Season)		
			Domestic	328	2 Open wells, 2 Bore wells & KWA supply.
			Flushing	169	2 Open wells, 2 Bore wells & KWA supply.
			Gardening	120	2 Open wells & 2 Bore wells
			HVAC	20	2 Open wells & 2 Bore wells
			Total [A]	*637*	
			Operation phase (Non-Monsoon Season for the proposed expansion)		
			Domestic	141	Harvested rain water after filtration and UV disinfection, 2 open wells, and KWA supply
			Flushing	71	Treated effluent from ETP
			Gardening	58	Treated effluent from ETP
			HVAC	30	Treated effluent from ETP
			Total [B]	*250*	
			Grand Total [A+B], after expansion	**887**	
			Existing Hospital (Monsoon Season)		
			Domestic	328	2 Open wells, 2 Bore wells & KWA supply.
			Flushing	169	2 Open wells & 2 Bore wells
			HVAC	20	2 Open wells & 2 Bore wells

			Total [A] 517
			Operation phase (Monsoon Season for the proposed expansion)
			Domestic 141 Harvested rain water after filtration and UV disinfection, 2 open wells and KWA supply.
			Flushing 71 Treated waste water from ETP
			HVAC 30 Treated waste water from ETP
			Total [B] 242
			Grand Total [A+B] after expansion 759
2.3	Minerals (MT)	No	No minerals are required, except for aggregated which are derived from minor minerals.
2.4	Construction material – stone, aggregates, sand / soil (expected source – MT)	Yes	The quantity of construction materials required is as follows Cement : 3,00,000 bags Steel : 2250 MT Coarse aggregates : 30,000MT Fine aggregates : 6,00,000MT
2.5	Forests and timber (source – MT)	No	Not required
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)	Yes	Total power requirement: 3250 kW Existing:1700 kW, Proposed: 1550 kW DG Sets : 1 x 500 kVA, 1 x 550 kVA, 3 x 1000 kVA (Total capacity: 3240 kW)
2.7	Any other natural resources (use appropriate standard units)	Yes	2 kV Solar panels of 500 numbers are proposed to be installed. It is proposed to save 800 Units/day by the use of solar energy.

3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	No	The only hazardous materials used during construction will be fuels and engine oils in makeup quantities. Proper management of these materials will leave no significant impact on the environment.
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	The site will be maintained free of stagnant water to avoid breeding of vectors. Hence vector borne diseases are not likely to occur.
3.3	Affect the welfare of people e.g. by changing living conditions?	Yes	Will positively affect the quality of life of local people by providing health care and allied facilities and direct employment in the project.
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,	No	Not applicable. There is no storage of any material within the site which will affect the vulnerable groups of people.
3.5	Any other causes	No	None

4. Production of solid wastes during construction or operation or decommissioning (MT/month)

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes	No	Not Applicable

<table>
<tr>
<td>4.2</td>
<td>Municipal waste (domestic and or commercial wastes)</td>
<td>Yes</td>
<td>
<table>
<tr><td rowspan="2">Average No of construction workers per day</td><td colspan="3">Solid Waste generation (kg/day)
During construction phase</td></tr>
<tr><td>Non-Biodegradable</td><td>Biodegradable</td><td>Total</td></tr>
<tr><td>150</td><td>9</td><td>21</td><td>30</td></tr>
</table>
<table>
<tr><td colspan="4">Solid Waste generation (kg/day)
From Existing and proposed buildings</td></tr>
<tr><td></td><td>Non-Biodegradable</td><td>Biodegradable</td><td>Total</td></tr>
<tr><td>Existing buildings</td><td>553</td><td>1201</td><td>1754</td></tr>
<tr><td>Proposed buildings</td><td>264</td><td>496</td><td>760</td></tr>
<tr><td>Total</td><td>817</td><td>1697</td><td>2514</td></tr>
</table>
<table>
<tr><td colspan="2">Biomedical Waste generation (kg/day)
From Existing and proposed buildings</td></tr>
<tr><td>Building</td><td>Biomedical waste quantity</td></tr>
<tr><td>Existing buildings</td><td>119</td></tr>
<tr><td>Proposed buildings</td><td>52</td></tr>
<tr><td>Total</td><td>171</td></tr>
</table>
</td>
</tr>
<tr>
<td>4.3</td>
<td>Hazardous wastes (as per Hazardous Waste Management Rules)</td>
<td>Yes</td>
<td>In the hospital, for treatment with nuclear medicine, radioactive isotopes will be used. Radioactive source storage, their use, radioactive waste storage and disposal of radioactive waste will be according to the Atomic Energy Regulatory Board guidelines.
Waste oil generated from DG sets shall be stored at separate location duly marked and will be sold to the CPCB authorized recyclers.</td>
</tr>
<tr>
<td>4.4</td>
<td>Other industrial process wastes</td>
<td>No</td>
<td>Not applicable</td>
</tr>
</table>

4.5	Surplus product	No	Not applicable
4.6	Sewage sludge or other sludge from effluent treatment	Yes	Sewage sludge from ETP will be digested in the biogas plant
4.7	Construction or demolition wastes	Yes	Construction waste of inorganic origin will be used to lay foundation of roads and walkways.
4.8	Redundant machinery or equipment	No	Any machinery or equipment used for construction will be removed from site by the contractor as per the terms of contract.
4.9	Contaminated soils or other materials	No	Not applicable
4.10	Agricultural wastes	No	Not applicable
4.11	Other solid wastes	No	Not applicable

5. Release of pollutants or any hazardous, toxic or noxious substances to air (Kg/hr)

<table>
<tr><th>S.No.</th><th>Information/Checklist confirmation</th><th>Yes/No</th><th>Details thereof (with approximate quantities/rates, wherever possible) with source of information data</th></tr>
<tr><td>5.1</td><td>Emissions from combustion of fossil fuels from stationary or mobile sources</td><td>Yes</td><td>D.G setsshall be installed as back up with the following capacities. The DG sets will meet standards prescribed by CPCB.
<table>
<tr><td>Capacity of DG set in kVA</td><td>No of DG sets provided</td></tr>
<tr><td>500</td><td>1</td></tr>
<tr><td>550</td><td>1</td></tr>
<tr><td>1000</td><td>3</td></tr>
</table></td></tr>
<tr><td>5.2</td><td>Emissions from production processes</td><td>No</td><td>No production process is involved</td></tr>
<tr><td>5.3</td><td>Emissions from materials handling including storage or transport</td><td>Yes</td><td>Fugitive dust emission due to handling and loading unloading activities is envisaged during construction phase. So as to reduce this offsite produced ready mix concrete will be used. To minimize traffic related dust, areas of vehicular movement in and around the project site will be sprayed with water.</td></tr>
<tr><td>5.4</td><td>Emissions from construction activities including plant and</td><td>Yes</td><td>The project may cause rise in dust levels during construction phase. Precautions would be taken to reduce dust generation during</td></tr>
</table>

	equipment		construction phase by the following management practices. • Use of Ready Mix Concrete(RMC) will eliminate the handling of cement, sand and concrete thus dust emission will be minimized • Water will be sprinkled at regular intervals to reduce dust in areas of vehicular movement.
5.5	Dust or odours from handling of materials including construction materials, sewage and waste	Yes	Dust generation will be controlled by • Use of RMC will eliminate the handling of cement, sand and concrete • Water sprinkling will be done at regular intervals • The ETP will operate in aerobic mode and no odours are expected • Proper ventilation will be provided for ETP to eliminate stagnant air • Food waste will be charged into biogas plant within 24 hours and ETP sludge will be digested in the biogas plant
5.6	Emissions from incineration of waste	Yes	Incinerator of capacity of 150 kg/h with Venturi scrubber and a stack height of 30 m above ground level is provided for incinerating the non-recyclable waste. It meets the standards prescribed by KSPCB.
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	As a good environmental management practice, wastes will not be burnt in the open air.
5.8	Emissions from any other sources	No	Not applicable

6. Generation of Noise and Vibration, and Emissions of Light and Heat:

S.No.	**Information/Checklist confirmation**	**Yes/No**	**Details thereof (with approximate quantities/rates, wherever possible) with source of information data with source of information data**

6.1	From operation of equipment e.g. engines, ventilation plant, crushers	Yes	For control of noise following measures shall be adopted: • Only permanent installations conforming to CPCB standards will be present. • Noise generating equipment will have regulative measures and performance evaluation. • Vibration generating heavy machines will be installed on vibration damping foundation. • High noise generating construction activities would be out only during day time. • Workers working near high noise construction machinery would be supplied with ear plugs and their exposure duration will be as per recommended intervals and duration • No blasting is needed • Construction work will be done only during the day time to avoid annoyance to workers
6.2	From industrial or similar processes	No	Not applicable
6.3	From construction or demolition	Yes	Noise Pollution Control : Noise pollution will occur due to operation of machinery and movement of vehicles. The following good management practices would be implemented. High noise generating construction activities would be carried out only during day time • Installation, use and maintenance of mufflers and silencers on equipment • Workers working near high noise construction machinery would be supplied with ear muffs/ear plugs
6.4	From blasting or piling	No	Not applicable

6.5	From construction or operational traffic	Yes	**During Construction phase:** Vehicular trips will be scheduled for non-peak traffic hours and avoiding the time slots for conveyance of the school children **Operation Phase :** Entrance to the site is designed and manned to avoid traffic hold up at entrance. Circulation and parking will be one-way only so that traffic flow will be smooth. Adequate parking space is provided to avoid on-road parking. Green belt and garden trees will be planted to mitigate noise, traffic related pollution and heat island effect.
6.6	From lighting or cooling systems	No	Building space will be illuminated according to task based standards. External lighting will be controlled so as not to cause illumination beyond the project site. Vehicular and pedestrian circulation areas will be provided with pathway illuminating fittings so that stray light emission to the surroundings can be avoided
6.7	From any other sources	No	Not applicable

7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials	Yes	In the hospital, for treatment with nuclear medicine, radioactive isotopes will be used. Radioactive source storage, their use, radioactive waste storage and disposal of radioactive waste will be according to the Atomic Energy Regulatory Board guidelines. Waste oil generated from DG sets shall be stored at separate location duly marked and will be sold to the CPCB authorized recyclers.

7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	Waste water and effluent will be collected and treated as per norms prescribed by Kerala State Pollution Control Board. The treated water will be reused for flushing and gardening within the premises. Excess quantity of treated sewage would be direct to the stabilization pond.
7.3	By deposition of pollutants emitted to air into the land or into water	No	Dust will be generated during construction phase from earthworks and movement of vehicles. Appropriate fugitive dust control measures, including water sprinkling of exposed areas and dust covers for trucks, will be provided to minimize any impacts. DG stack height shall be as per CPCB guidelines.
7.4	From any other sources	No	Not applicable
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	Not applicable

8. Risk of accidents during construction or operation of the Project, which could affect human health or the environment

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances	No	Not applicable
8.2	From any other causes	No	Not applicable
8.3	Could the project be affected by natural disasters causing environmental damage (e.g.floods, earthquakes, landslides, cloudburst etc)?	No	The site has a stable laterite formation and is not prone to landslide or subsidence. The site is not prone to flood. Storm water runoff will be controlled by intercepting the run off for roof top harvesting and for ground water recharging. This will help to reduce contribution of the development to offsite

			flooding. **Earthquake :** The structure of the building is designed as per IS codes for zone III.

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting**.** facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.:		The site is not served by Sewage System. Independent ETP will be installed for treating the sewage.
	• Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.)	Yes	During the project operation stage for the purpose of day-to-day maintenance, workers will be employed. Moreover, more employment will be created as a result of positive induced development in the immediate vicinity of project site.
	• housing development	No	Not applicable
	• extractive industries	No	Not applicable
	• supply industries	No	Not applicable
	• other	No	Not applicable
9.2	Lead to after-use of the site, which could havean impact on the environment	No	Not applicable
9.3	Set a precedent for later developments	Yes	Thellakom is a small town in Ettumanoor Municipality. Hospital is located near to M.C. road which is a major arterial state highway in the state. The project plays a major role to improve the health care of

			the local population. The location of project is easily accessible from Idukki district and other major towns in Kottayam. The project will also create / add job opportunities for professionals as well as support staff like Security, Maintenance, and Household Workers etc.
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	Not applicable

(III) Environmental Sensitivity

S.No.	**Areas**	**Name/ Identity**	**Aerial distance (within 15 km.) Proposed project location boundary**
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Ramsar site – Vembanad Lake	At an aerial distance of 14 km West
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Kumarakom Bird Sanctuary	Aerial distance of 13 km West.
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Vembanad Lake	At an aerial distance of 14 km West
4	Inland, coastal, marine or underground water	Vembanad Lake (estuary) Meenachil River	Aerial distance of 14 km West Aerial distance of 2.3 km Southeast

5	State, National boundaries	No	None
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	M.C road	Distance of 0.1 km West
7	Defence installations	No	Not Applicable
8	Densely populated or built-up area	Ettumanoor	Aerial distance of 2.9 km
9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	**Schools**	
		1. St. Mary's School	2.5 km N
		2. K.E.English Medium School	2.72 km W
		3. Mar Makil Public School	5.3 km NW
		4. St. Alphonsa Public school	4.86 km SW
		5. St. Mary's Central School	7.17 km SW
		6. Radcliffe School, Kottayam	7..62 km SW
		7. Infant Jesus Public School	8.94 km NE
		8. Gayathri Central School	12.03 km NE
		9. St. Michael's Higher Secondary School	14.10 km NW
		10. Govt. Model higher secondary school	7.23 km SW
		11. St. Ephrem's Higher secondary school	3.16 km W
		12. Baker Memorial Girls HSS	6.40 km SW
		13. CMS College HSS	6.2 km SW
		14. St. Anne's Girls HSS	6.69 km SW
		15. Holy family HSS	6.41 km S
		16. Mount Carmel HSS	6.44 km S
		Colleges	
		1. Ettumanoorappan College	3.8 km N

		2. Mangalam college of Engineering	4.46 km NE
		3. Bishop Kurialacherry college	1.52 km W
		4. Kuriakose Elias college	3.43 km W
		5. M.G.University	2.3 km NW
		6. CMS college	6.36 km S
		7. Baker College for Women	6.51 km S
		8. NSS Co-operative Training college	7.08 km S
		9. University college of Nursing	4.14 km W
		10. Govt. ITI, Ettumanoor	3.46 km W
		11. I.T.I., Thiruvarppu	9.75 km SW
		12. Government Medical College	3.67 km W
		Hospitals	
		1. Matha Hospital	0.2 km N
		2. Mitera Hospital	0.28 km NW
		3. Vimala Hospital	2.03 km N
		4. KIMS Hospital	4.31 km SW
		5. Bharat Hospital	7.20 km S
		6. SH Medical Centre	6.18 km S
		7. District Hospital, Kottayam	6.69 km S
		8. Kottayam Medical College	3.38 km SW
		Church	
		1. St. Mary's Forane Church	2.56 km N
		2. St. Gregorio's Catholic church	3.87 km NW
		3. St. Sebastian's Church, Cheruvandoor	1.80 km NE
		4. Marthasmooi Jacobite Syrian Church	1.33 km E
		5. St. Sebastian's Church	1.92 km SE

		6. Punnathura Old church	11.03 km NE
		7. Little Flower Church	10.77 km E
		8. St. Thomas Orthodox Church	7.95 km E
		9. St. George Orthodox Church	10.13 km SE
		10. St. Mary's Church	6.20 km N
		11. St. Mary's Jacobite Syrian Cathedral	4.43 km S
		12. Sacred Heart Church	6.96km SW
		13. Mar Baselios-Mar Gregorios Orthodox Church	7.82 km SW
		14. St. Thomas Marthoma Church	6.81 km SW
		15. St. Ignatious Simhasana Church	7.31 km SW
		16. St. George Jacobite Syrian Orthodox Church	4.70 km S
		Temples	
		1. Ettumanoor Sree Mahadeva Temple	3.27 km N
		2. Sree Ganapathi Temple, Kudamaloor	5.07 km SW
		3. Vasudevapuram Kolettu temple	4.80 km W
		4. Puthukulangara Temple	3.81 km S
		5. Thirunakkara temple	7.05 km S
		6. Amayannoor temple	6.44 km E
		7. Areeparambu Sree Mahadevar temple	7.78 km SE
		Mosque	
		1. Athirampuzha Juma Masjid	2.89 km NW
		2. Mattam Juma Masjid	2.74 km NW
		3. Ettumanoor Town Juma Masjid	2.81 km N

		4. Juma Masjid, Kaithamala	1.52 km N
		5. Adichira Mosque	1.48 km S
		6. MCH Masjid	2.64 km SW
		7. Masjid Noor, Ayarkunnam	6.10 km E
		8. Thazhatangady Juma Masjid	7.15 km SW
		9. Mosque, Illikkal	8.74 km SW
10	Areas containing important, high quality or scarce resources *(ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)*	Kumarakom	At an aerial distance 13.43 km
11	Areas already subjected to pollution or environmental damage. *(those where existing legal environmental standards are exceeded)*	No	None within 15 km
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (*earthquakes, subsidence, landslides, erosion, floodingor extreme or adverse climatic conditions*)	Kuttanad is prone to Flood during Monsoon	Situated at an aerial distance of 6 km west

"I hereby given undertaking that the data and information given in the application and enclosures are true to the best of my knowledge and belief and I am aware that if any part of the data and information submitted is found to be false or misleading at any stage, the project will be rejected and clearance give, if any to the project will be revoked at our risk and cost.

Date: 02/11/2017
Place: Thellakom

Fr. Thomas Animoottil
Director, Caritas Hospital
Opp. M.C Road
Thellakom P.O
Kottayam- 686 630

FORM-1A

FOR

ENVIRONMENTAL CLEARANCE

FOR THE PROPOSED EXPANSION OF THE

BUILDING PROJECT

‘CARITAS HOSPITAL’

AT

PEROOR VILLAGE
KOTTAYAM TALUK
KOTTAYAM DISTRICT
KERALA

BY

CARITAS HOSPITAL
THELLAKOM P.O
KOTTAYAM, KERALA - 686 630

FORM-1 A (only for construction projects listed under item 8 of the Schedule)

CHECK LIST 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 programme)

1 LAND ENVIRONMENT

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

1.1 Will the existing landuse get significantly altered from the project that is not consistent with the surroundings? (Proposed landuse must conform to the approved Master Plan / Development Plan of the area. Change of landuse if any and the statutory approval from the competent authority be 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.

The project site has an existing hospital building established in the year 1962 which is being upgraded in phases. It has grown from a 50 bed hospital to a 660 bed hospital over 55 years. The EIA Notification 2006 was violated in the year 2008, when a new building of built-up area 14465.06 m^2 was constructed. The proposed expansion includes a hospital building, Geriatric Centre (Nursing Home) and Doctors quarters, Nuclear medicine block and an Amenity Centre in Phase 1, Staff Quarters and multi-level mechanical car parking system in Phase 2.

Figure 1: Google Image of site location

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

Table 1: Building details

<table>
<tr><td>Project Details</td><td>Proposed expansion of Caritas Hospital with the addition of a Hospital building, Geriatric Centre (Nursing Home), Doctors quarter's block, Nuclear medicine block and an Amenity Centre in Phase 1, Staff Quarters block and multi-level mechanical car parking system in Phase 2.</td></tr>
<tr><td>Existing details in the Campus</td><td>
<table>
<tr><td>Total Plot area</td><td>89339 m^2</td></tr>
<tr><td>Existing no. of Beds</td><td>660</td></tr>
<tr><td>Existing Built up area</td><td>68905.69 m^2 …….(A)</td></tr>
<tr><td>Built up area constructed before 2006 EIA notification and hence exempted from requirement of EC</td><td>30473.92 m^2…….(B)</td></tr>
<tr><td>Built up area exempted from EC, by MoEF & CC as per Gazetted Notification dated 22-12-2014, as these are educational institutions</td><td>5367 m^2…….(C)</td></tr>
<tr><td>Built up area of the buildings proposed to be demolished</td><td>2321.8 m^2…….(D)</td></tr>
<tr><td>Built up area of the proposed expansion</td><td>62422.59 m^2…….(E)</td></tr>
<tr><td>Hence total built up area after the proposed expansion</td><td>129006.48 m^2….(A-D+E)</td></tr>
<tr><td>Total built up area requiring EC for the proposed expansion</td><td>93165.56 m^2…(A-(B+C+D) +E)</td></tr>
<tr><td>Height of the building</td><td>Existing main Hospital building: 28.2 m above GL</td></tr>
<tr><td>Total Green area</td><td>30290.77 m^2</td></tr>
<tr><td>FAR</td><td>1.44</td></tr>
<tr><td>Coverage</td><td>30.25 %</td></tr>
</table>
Detailed area wise statement given as Annexure 1. Site and Service plan is also given as annexure.
</td></tr>
<tr><td>Proposed Expansion details</td><td>Proposed built-up area : 62422.59 m^2
This includes the construction of a 290 bedded hospital building, Geriatric Centre (Nursing Home), 30 3BHK residential units for doctors, Nuclear medicine block and an Amenity Centre in Phase 1,</td></tr>
</table>

<table>
<tr><td colspan="2"></td><td>Staff Quarters and multi-level mechanical car parking system in Phase 2. The area statement for the proposed expansion is as follows:
<table>
<tr><th>Building Block Name</th><th>Maximum No. of floors</th><th>No. of beds</th><th>Maximum height of building [m]</th><th>Built-up area [m^2]</th></tr>
<tr><td>Proposed Extension to Hospital building for Nuclear Medicine</td><td>G+5</td><td>20</td><td>19</td><td>3221.82</td></tr>
<tr><td>Proposed Hospital building, Geriatric Centre (Nursing Home) & Doctors quarters</td><td>2B+G+12</td><td>270</td><td>47.55</td><td>32716.56</td></tr>
<tr><td>Proposed Staff quarters</td><td>2B+G+5</td><td>--</td><td>19</td><td>23670.50</td></tr>
<tr><td>Commercial Building</td><td>G+3</td><td>--</td><td>13.8</td><td>2044.57</td></tr>
<tr><td>Multi-Level Mechanical Car Parking system</td><td>-</td><td>-</td><td>-</td><td>769.14</td></tr>
<tr><td colspan="4">Total Built-up Area of the proposed expansion</td><td>62422.59</td></tr>
</table></td></tr>
<tr><td rowspan="2">Occupancy Estimated</td><td>Existing</td><td>A total of 3253 persons which includes patients, staffs, residents, students and visitors</td></tr>
<tr><td>Proposed</td><td>A total of 1574 persons which includes patients, residents, staff and visitors.</td></tr>
</table>

Table 2: Parking Statement

	Category	Mandatory parking area requirement	Parking area provision
Existing Buildings	4 Wheelers	752	-
Proposed Hospital building, Geriatric Centre (Nursing Home) & Doctors quarters		300	
Proposed Staff quarters building		188	
Proposed Commercial building		27	
Total		**1267(Nos.)**	**1316(Nos.)**
Existing Building	2 Wheelers	3135 m^2	
Proposed Hospital building, Geriatric Centre (Nursing Home) & Doctors quarters		1125 m^2	
Proposed Staff quarters building		820 m^2	

Proposed Commercial building		102 m^2	
Total		**5182 m^2**	**5833 m^2**

Table 3: Occupancy load in the Campus

Sl.No.	Purpose		Occupancy
1.	Existing Facility	Beds	660
2.		Staff	1069
3.		Visitors	444
4.		Other Residents/students	1080
	Total [A]		***3253***
5.	Proposed Facility	Beds	290
6.		Staff	239
7.		Visitors	575
8.		Residents	470
	Total [B]		***1574***
	Grand Total [A+B]		**4827**

Reference: Criteria for Occupancy Load: National Building Code (NBC) -2005 – Part 4, Page 27, Occupant Load

Table 4: Water consumption (Existing & Operation phase for domestic and flushing)

Sl. No.		Purpose	Occupancy	Total water requirement (m^3/day)		
				Domestic	Flushing	*Total*
1.	Existing buildings	Beds	660	207	89	*296*
2.		Staffs	1069	21	27	*48*
3.		Visitors	444	3	4	*7*
4.		Residents/students	1080	97	49	*146*
	Total [A]		***3253***	***328***	***169***	***497***
5.	Proposed buildings	Beds	290	91	39	130
6.		Staffs	239	5	6	11
7.		Visitors	575	3	5	8
8.		Residents	470	42	21	63
	Total [B]		***1574***	***141***	***71***	***212***
	Grand Total [A+B]		**4827**	**469**	**240**	**709**

Reference: Criteria for water requirement: National Building Code (NBC) -2005 – Part 9, Page19, Water Requirement. The amount of water demand is calculated based on the occupancy of the building and the per capita consumption as given in MoEF & CC-Manual on norms and standards for EC of large construction projects

i.e. Total quantity of water used (LPCD) = Occupancy x Quantity (LPCD)

Then Total quantity of water used for Domestic and Flushing in m^3 is calculated.

Table 5: Total water requirement for the project and source

S.No	Description	Quantity of water required (m^3/day)	Source of water supply

1.	**Construction Phase**		
a.	For workers (domestic)	0.45	Drinking water cans
b.	For workers (Flushing)	2.3	Open Wells
c.	For construction activity	15(Average depending up on construction activity	Open Wells
2.	**Existing facility (Non Monsoon Season)**		
a.	Domestic	328	2 Open wells, 2 Bore wells and KWA supply.
b.	Flushing	169	2 Open wells, 2 Bore wells and KWA supply.
c.	Gardening	120	2 Open wells and 2 Bore wells
d.	HVAC	20	2 Open wells and 2 Bore wells
	Total [A]	***637***	
3.	**Operation phase (Non Monsoon Season)**		
a.	Domestic	141	Harvested rain water after filtration and UV disinfection, 2 open wells, and KWA supply
b.	Flushing	71	Treated wastewater from ETP
c.	Gardening	8	Treated wastewater from ETP
d.	HVAC	30	Treated wastewater from ETP
	Total [B]	***250***	
	Grand Total [A+B]	**887**	
4.	**Existing facility (Monsoon Season)**		
a.	Domestic	328	2 Open wells, 2 Bore wells and KWA supply.
b.	Flushing	169	2 Open wells and 2 Bore wells
c.	HVAC	20	2 Open wells and 2 Bore wells
	Total [A]	***517***	
5.	**Operation phase (Monsoon Season)**		
a.	Domestic	141	Harvested rain water after filtration and UV disinfection, 2 open wells and KWA supply.
b.	Flushing	71	Treated waste water from ETP
c.	HVAC	30	Treated waste water from ETP
	Total [B]	***242***	
	Grand Total	**759**	

	[A+B]		

Water requirement for gardening purpose is considered as 4 liters per square meter of gardening area on ground and 3 liters per square meter of gardening on podium.
Total quantity of water used (LPCD) =Gardening Area (Sq. Mt.) x Quantity (Lit /Sq. Mt.)

Table 6: Waste water generation

Sl. No.	Description	Quantity of waste water generated (m^3/day)	Treatment/Disposal
1.	Construction Phase	2.7	Compact STP (Portable)
2.	Existing Facility	432	Treatment in ETP and discharged to the stabilization pond.
3.	Operation Phase	185	Treatment in ETP and reuse of treated waste water

Reference: Criteria for waste water: Manual on norms and standards for EC of large construction projects - MoEF.

Table 7: Municipal Solid Waste generation during Construction phase

Avg. no. of construction workers per day	Criteria for Solid waste generation			Solid waste generation (kg/day)		
	Total kg/person	Biodeg-radable	Non-biodegradable	Total	Biodeg-radable	Non-biodegradable
150	0.2	70%	30%	30	21	9

Table 8: Municipal Solid Waste generation from Existing & Operation phase

Sl. No.	Building		Occupancy	Solid waste generation (kg/day)		Total
				Biodegradable	Non-biodegradable	
1.	Existing buildings	Beds	660	472	202	674
2.		Staff	1069	187	80	267
3.		Visitors	444	13	44	57
4.		Residents/students	1080	529	227	756
	Total [A]			**1201**	**553**	**1754**
5.	Proposed	Beds	290	207	89	296
6.		Staffs	239	42	18	60

7.	buildings	Visitors	575	17	58	75
8.		Residents	470	230	99	329
	Total [B]			**496**	**264**	**760**
	Grand Total [A+B]			**1697**	**817**	**2514**

For Beds, Residents, Staff & Visitors :70 % wet garbage and 30 % dry garbage out of total 1.2, 0.7, 0.25 and 0.10Kg/person /day respectively.

Table 9: Hospital Solid Waste generation from Existing & Operation phase

Sl. No.	Building	Bio-Medical waste generation (kg/day)
1.	Existing Hospital building	119
2.	Proposed Hospital building	52
	Total	171

For Hospital solid waste: 15 % biomedical waste out of total 1.20 Kg/person /day.

The total quantity of solid waste expected is 2514 kg/day. Out of which 817 kg/day will be non-biodegradable and 1697 kg/day will be biodegradable. The project proponent has provision for segregation and collection of biodegradable & non-biodegradable waste within the premises. Biodegradable waste will be treated in Biogas plant with a capacity of 220m^3. The non-biodegradable waste will be handed over to recyclers. There is an incinerator of capacity 150 kg/h with Venturi scrubber for disposing the incinerable waste. The Bio-medical waste would be outsourced through a Kerala State Pollution Control Board authorised agency Indian Medical Association Goes Eco Friendly (IMAGE).

Any e-waste generated during the operation phase of the project will be handed over to authorized e-waste collection centres.

Table 10: Power requirement during construction phase and operation phase

S No	**Purpose**		**Power requirement**	**Source of Power**
1.	Construction Phase		120 kW	DG sets
2.	Operational Phase	Existing Facility	1700 kW	KSEB Transformer, 3 DG sets (in the case of power failure)
3.		Proposed Facility	1550 kW	KSEB Transformer, 2 DG sets (in the case of power failure)

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

Project site will be expanded with the addition of a hospital building, Geriatric Centre (Nursing Home) block, Nuclear medicine block, amenity centre, staff quarters and multi-level mechanical car parking system hence, there may be some minor impacts on water, air environment, power requirement etc. but it shall be mitigated by providing proper pollution control facilities like ETP. Also for water conservation, rain water harvesting shall be done. Power consumption shall be reduced by using energy saving practices. Impact on air quality shall be reduced by the green cover. This project will enhance the health care and allied services to the public and it will generate employment during construction and operation phase and there by shall have positive impact on socio economy.

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

Soil type: The area is little rocky with laterite soil. With proper protection of cut faces, the soil is not likely to slide or subside. Geotechnical report is attached as annexure.

Slope analysis: The elevation of the site gradually varies from 93 m to 122 m. The slope of site is about 17.89%.

During excavation for foundation and construction, the slope will be leveled to create larger terraces. This will cause erosion during rain events. So as to avoid erosion, excavation and leveling will be done during the dry season. Any excavated material will be covered with geo-membrane during rainy season.

All the engineered structures will be as per the seismic zoning map of India, region falls under zone III. The structural design will be certified as per IS code 456-2000, 875-1987 and IS-1893-2002 for seismic zone-III of Kerala.

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

No. The site is sloped. The project will implement a storm water management plan by which post development run off will be less than no-action scenario.

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

The quantity of earth cutting involved = 56,000 m^3

The quantity of earth filling involved = 20,000 m^3

The building structure is so design that the excavated soil to form the basement parking will be used for leveling the down-slope of the basement. Additional earth will be used for landscaping. Hence excavated soil will not be taken out of the site.

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

Water required for sanitation will be abstracted from the open wells. Drinking water will be provided in canisters supplied by bottled drinking water vendors. Sanitation wastewater will be

treated compact STP (portable) and effluent will be discharged through a subsurface flow engineered wetland.

Table 11: Water demand during the construction phase

Sl. No.	Water demand	Quantity	Source
1.	Construction workers (Domestic)	0.45 m^3/day	Drinking water cans
2.	Construction workers (Flushing)	2.3 m^3/day	Open Well
3.	Construction activity	15 m^3/day (Average depending on the construction activity)	Open Well

Table 12: Waste water generation, treatment and disposal during the construction phase

Sl. No.	Description	Quantity of Waste water generated (m^3/day)	Treatment/ Disposal
1.	Construction Phase	2.7	Compact STP (Portable)

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

No, the site is open plot and there is an existing natural drain to carry the excess run off from the site. Hence there is no alteration to low lying areas or wetlands.

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

There will be construction waste and garbage generated during construction phase. On the average there would be about 150 persons working at the site on 8-hour shift, and they will be accommodated off-site. It is assumed that workers present at the site on 8-hour shift contribute only one-third of garbage as compared to domestic garbage. This amounts to 150x 0.2 = 30kg per day, of which 70%, i.e. 21 kg will be food waste. Garbage will be segregated in to biodegradable (food waste) and non-biodegradable. Biodegradable material will be treated in a Biogas Plant.

Table 13: Municipal Solid Waste generation during construction phase

Avg. no. of construction workers per day	Criteria for Solid waste generation			Solid waste generation (kg/day)		
	Biodeg-radable	Non-biodegradable	Total kg/person	Biodegradable	Non-biodegradable	Total
150	70%	30%	0.2	21	9	30

2 WATER ENVIRONMENT

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

The details of the water requirement for the proposed project with the breakup of requirements for various uses are given in Table 14.

Table 14: Total water requirement for the project and source

S.No	Description	Quantity of water required (m^3/day)	Source of water supply
1.	**Construction Phase**		
a.	For workers (domestic)	0.45	Drinking water cans
b.	For workers (Flushing)	2.3	Open Wells
c.	For construction activity	15(Average depending up on construction activity	Open Wells
2.	**Existing facility (Non Monsoon Season)**		
a.	Domestic	328	2 Open wells, 2 Bore wells and KWA supply.
b.	Flushing	169	2 Open wells, 2 Bore wells and KWA supply.
c.	Gardening	120	2 Open wells and 2 Bore wells
d.	HVAC	20	2 Open wells and 2 Bore wells
	Total [A]	***637***	
3.	**Operation phase (Non Monsoon Season)**		
a.	Domestic	141	Harvested rain water after filtration and UV disinfection, 2 open wells, and KWA supply
b.	Flushing	71	Treated wastewater from ETP
c.	Gardening	8	Treated wastewater from ETP
d.	HVAC	30	Treated wastewater from ETP
	Total [B]	***250***	
	Grand Total [A+B]	**887**	
4.	**Existing facility (Monsoon Season)**		
a.	Domestic	328	2 Open wells, 2 Bore wells and KWA supply.
b.	Flushing	169	2 Open wells and 2 Bore wells

c.	HVAC	20	2 Open wells and 2 Bore wells
	Total [A]	***517***	
5.	**Operation phase (Monsoon Season)**		
a.	Domestic	141	Harvested rain water after filtration and UV disinfection, 2 open wells and KWA supply.
b.	Flushing	71	Treated waste water from ETP
c.	HVAC	30	Treated waste water from ETP
	Total [B]	***242***	
	Grand Total [A+B]	**759**	

*Water requirement for gardening purpose is considered as 4 liter per square meter of gardening area on ground and 3 liters per square meter of gardening on podium.

Total quantity of water used (LPCD) =Gardening Area (Sq. Mt.) x Quantity (Lit /Sq. Mt.)

Water demand will be met through water from the two open wells, two bore wells, KWA water supply and rain water harvesting.

The water balance charts of existing and after expansion for non-monsoon and monsoon seasons are shown in
Figure 2, **Figure 3** and **Figure 4** respectively.

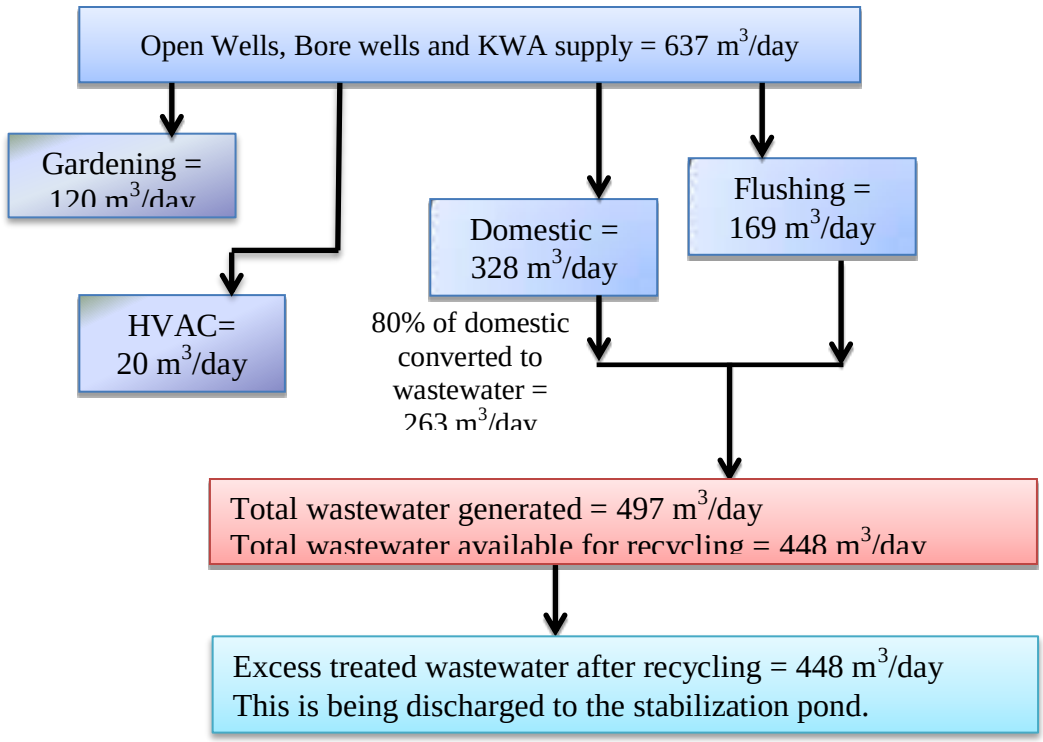

Figure 2: Existing Water Balance Chart for Non-Monsoon Season

*We have considered 10% less availability of waste water for recycling considering losses of waste water in evaporation and sludge formation.

Total water requirement = 637 m^3/day
Total waste water available for recycling = 448 m^3/day
After recycling treated waste water is discharged to the stabilization pond.
Hence Net freshwater requirement= 637 m^3/day [From Open wells, bore wells and KWA]

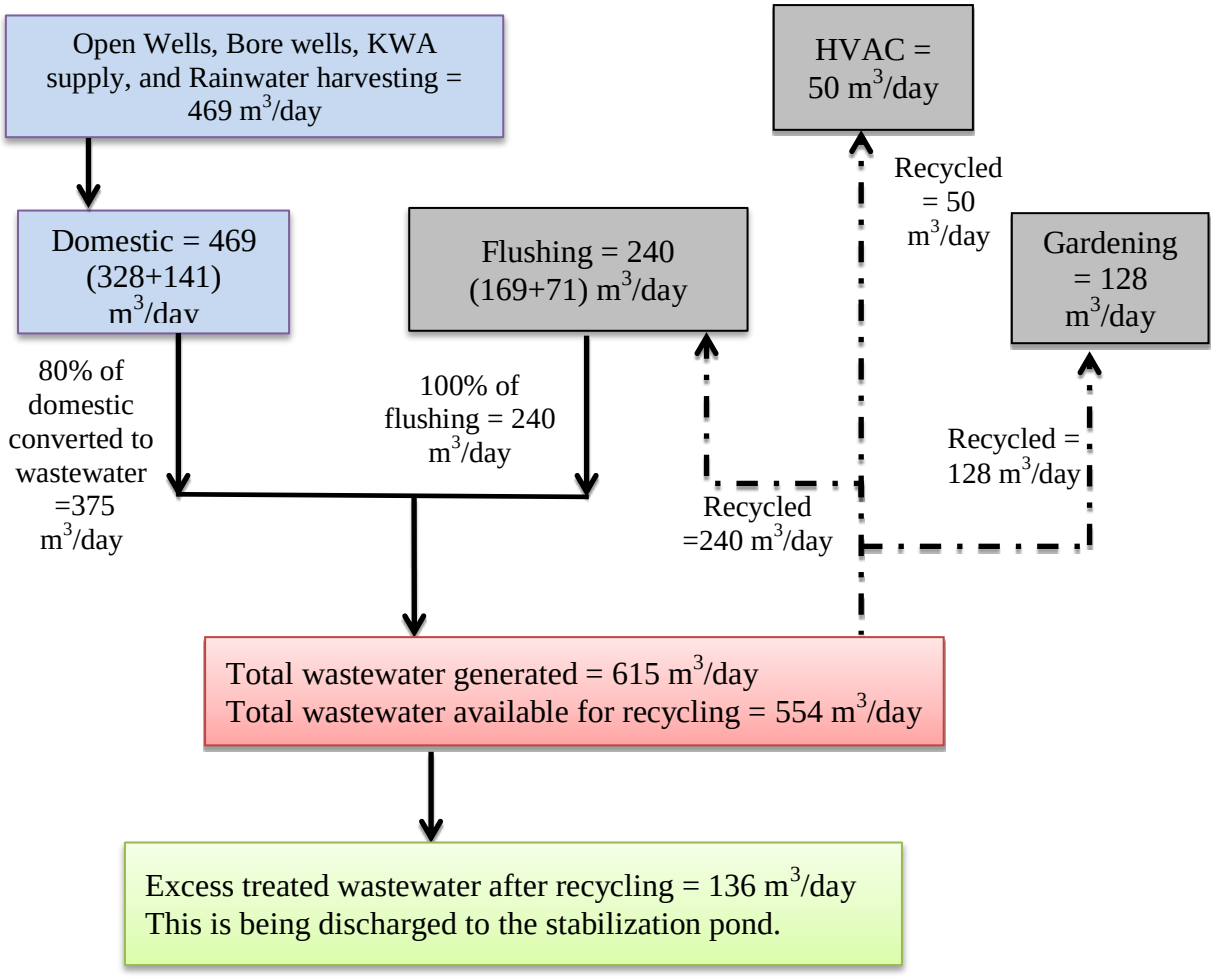

Figure 3: Water Balance Chart for Non-Monsoon Season after Expansion

*We have considered 10 % less availability of waste water for recycling considering losses of waste water in evaporation and sludge formation.

Total water requirement = 887 m^3/day
Treated wastewater available for recycling = 554 m^3/day
After recycling treated waste water for flushing (240m^3/day), HVAC (50 m^3/day) and gardening (128 m^3/day)
Hence Net freshwater requirement= 469 m^3/day [From Open wells, Pond, KWA water and rain water harvesting.]
Reduction in water Demand = 47.12 %

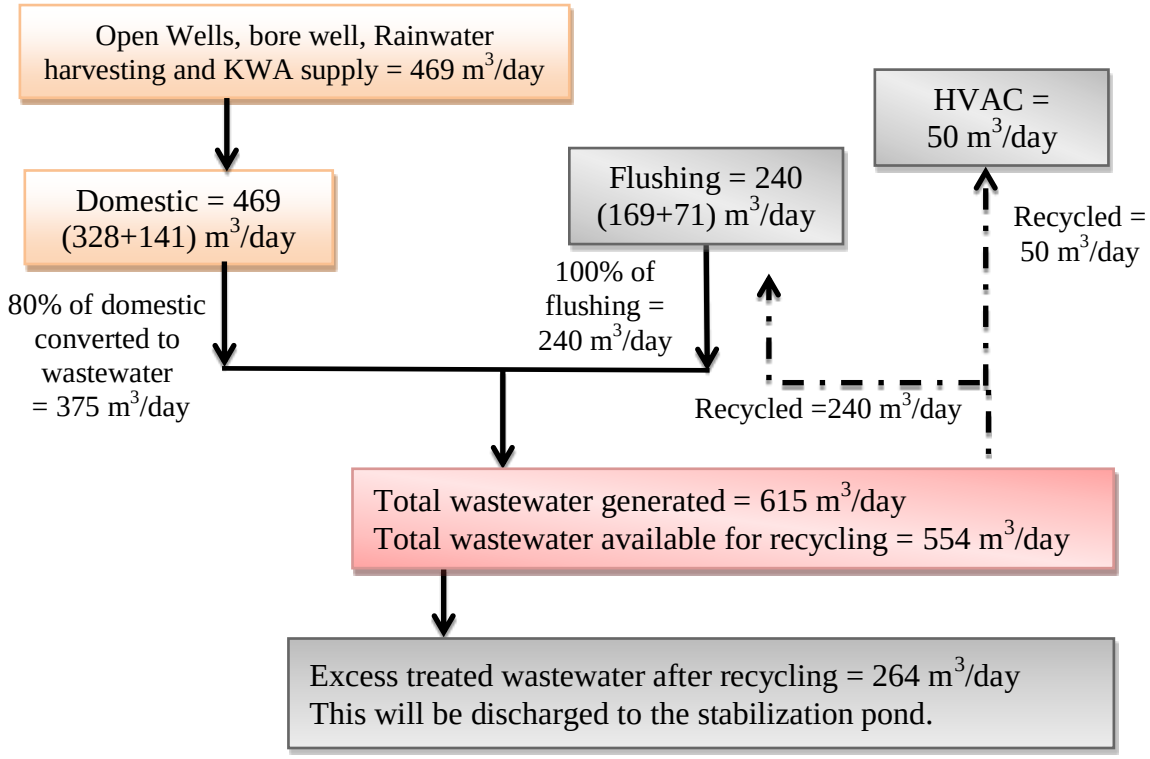

Figure 4: Water Balance Chart for Monsoon Season

We have considered 10 % less availability of waste water for recycling considering losses of waste water in evaporation and sludge formation.

Total water requirement = 759 m^3/day

Treated wastewater available for recycling = 554 m^3/day

After recycling treated waste water for flushing (240 m^3/day), HVAC (50 m^3/day)

Hence Net freshwater requirement= 469 m^3/day [From Open wells, bore wells, rain water harvesting and KWA]

Reduction in water Demand = 38.23 %

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

Existing Fresh water requirement: 637 m^3/day (during non-monsoon season) which will be reduced to 469 m^3/day after the proposed expansion, as currently, freshwater is being used for gardening and HVAC, which will be replaced by treated effluent after the proposed expansion.

Sources of water: Harvested rain water after filtration and UV disinfection, two open wells,two bore wells and KWA supply.

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)

The raw water available meets physical and chemical standards prescribed for by BIS 10500 for drinking water.

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

All secondary requirements like flushing (240 m^3/day), gardening (128 m^3/day) and HVAC (50 m^3/day) would be fulfilled by treated waste water from ETP. Excess treated waste water during non-monsoon (136 m^3/day) and monsoon seasons (264 m^3/day) shall be discharged to the stabilization pond followed by soak pit.

Table 15: Water requirement met by recycled water

Sl. No.	Description	Quantity of water required(m^3/day)	Source of water
1.	Flushing	240	Treated waste water from ETP
2.	Gardening	128	Treated waste water from ETP
3.	HVAC	50	Treated waste water from ETP

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

Potable water will be drawn from KWA supply intended for local population. This will not create any conflict of interest, as the project site has onsite sources of potable water in the form of pond, rainwater harvesting and open well.

2.6 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)

During operation phase, the waste water generation from the building will be 615 m^3/day and will be treated in full-fledged Effluent Treatment Plant by EGSB digestor followed by MBBR treatment. The capacity of ETP will be 10 MLD. Treated waste water will be reused for flushing, gardening and HVAC. Excess treated waste water during non-monsoon and non-monsoon season shall be discharged to the stabilization pond followed by soak pit.

Table 16: Quantity of waste water generated

Sl. No.	Description	Quantity of waste water generated (m^3/day)	Treatment/Disposal
1.	Construction Phase	2.7	Compact STP (Portable)

2.	Existing Facility	432	617	Treatment in ETP and reuse of treated wastewater (available for recycling (554 m^3/day), for flushing (240 m^3/day) for HVAC (50 m^3/day) and gardening (128 m^3/day). Excess treated waste water i.e., 136 m^3/day during non-monsoon season and 264 m^3/day during monsoon season will be discharged to the stabilization pond followed by soak pit.
3.	Operation Phase	185		

Reference: Criteria for waste water: Manual on norms and standards for EC of large construction projects - MoEF.

Table 17: Raw & Treated Waste water Quality

Sl. No.	Details of characteristic parameters	Values		Units
		Raw waste water	Treated waste water	
1.	pH	7.0 -8.0	6.5 – 7.5	-
2.	Total Suspended solids	200 - 450	≤10	mg/l
3.	Chemical Oxygen Demand	400 - 600	≤30	mg/l
4.	Biological Oxygen Demand (3days at 27^0 C)	250 - 400	≤10	mg/l
5.	Oil & Grease	50	≤5	mg/l

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

Rainwater harvesting system will be constructed for the project. Kottayam has an average annual rain fall of 3200 mm. This will be available distributed in nearly 80 rain days scattered over monsoon spells and a few summer showers. This will be stored in underground tank of capacity 226.8 m^3/day and used in the fill and draw mode during rainy days. Un-stored rain water will be used to charge ground water through recharge pits.

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

Management plan for storm water is as follows:

- Rain water will be harvested from roof top and stored in underground tanks
- Un-stored rain water will be used for recharging ground water through recharging pits.
- To avoid on site flooding storm water drain shall be cleaned at regular intervals.
- The final finished level maintains adequate slope for laying of drains. Hence there is no potential for flooding.

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)

Yes, two bore wells were used to meet the partial water requirement and to compensate the extraction of ground water recharging pits were provided. In addition, six open wells were already exist at the site, which were also used to recharge the groundwater during monsoons.
In the proposed expansion, Rainwater harvesting system with more recharging pits will be installed for the recharge of ground water.

2.10 What precautions/measures are taken to prevent the run-off from construction activities polluting land & aquifers? (Give details of quantities and the measures taken to avoid the adverse impacts)

The runoff from the site during construction phase will be intercepted by temporary detention ponds constructed with geomembrane liner for protecting surface of soil. Detained water will be discharged through aprons made from geomembrane. This will avoid any adverse impacts from runoff on receiving water body.

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)

Storm water runoff will be minimized by intercepting the same in rain water harvesting tanks and recharge pits. The details of the storm water management plan as well as the storm water management layout are given in Annexure.

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

- During construction phase, temporary toilets with connection to compact STP (portable) will be provided. Hence there will not be unsanitary conditions around the project site.
- On site accommodation will not be provided to the construction workers as they are from the nearby localities and they will have their permanent accommodation offsite. Labourers employed by contractor will be accommodated offsite as per contract terms.
- Regular segregation and disposal of solid waste generated by these workers shall be as per Municipal Solid Waste Management Rules and Construction and Demolition Waste Management Rules, 2016.
- First aid and medical facilities will be provided to all the employees and labourers working on the site.
- Proper housekeeping will be maintained throughout the premises.
- Pest and vector control measures will be done on site.

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

Table 18: Quantity of waste water generated

Sl. No.	Description	Quantity of waste water generated (m^3/day)		Treatment/Disposal
1.	Construction Phase	2.7		Compact STP (Portable)
2.	Existing Facility	432	617	Treatment in ETP and reuse of treated waste water (available for recycling (554 m^3/day), for flushing (240 m^3/day) for HVAC (50 m^3/day) and gardening (128 m^3/day).
3.	Operation Phase	185		

In the ETP, wastewater is treated anaerobically in Up-flow Anaerobic Sludge Blanket (UASB) Reactor followed by Moving Bed Biofilm Reactor (MBBR) treatment. The sludge from ETP will be dried, composted and used as manure. The existing waste water treatment plant has a capacity of 10 MLD. Disinfected effluent meeting irrigation standards will be used for irrigating the landscape and for flushing. The excess treated waste water will be discharge to the stabilization pond followed by soak pit. The process flow diagram of ETP as follows:-

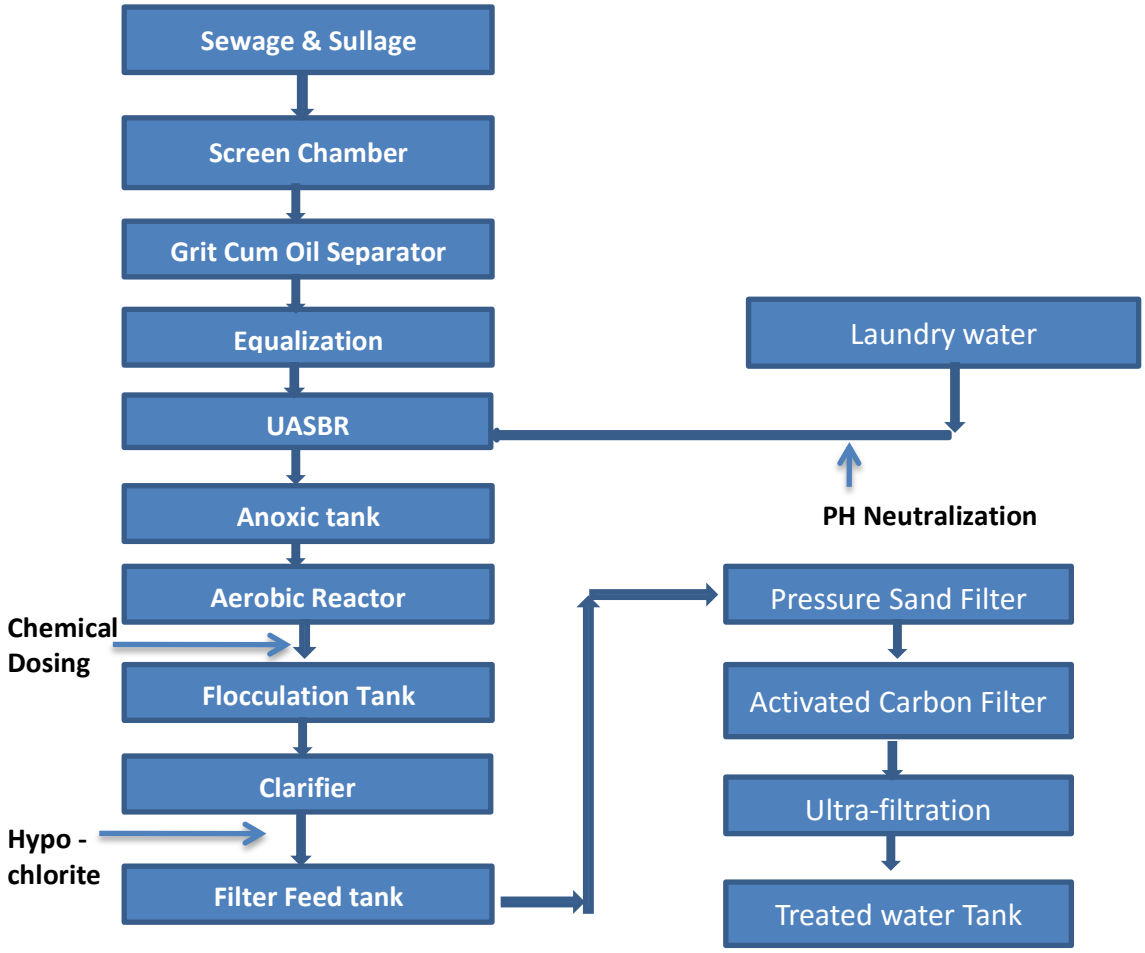

Figure 5: ETP process diagram

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

Color coding for dual plumbing system shall be done as per standard practices. Recycling of treated waste water is used for flushing (114 m^3/day), HVAC (50 m^3/day and gardening (5 m^3/day). The scheme is shown in the figure below.

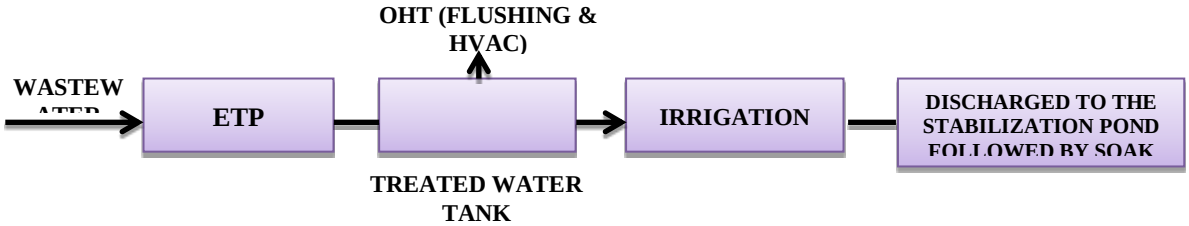

Figure 6: Scheme of Treated water usage

3 VEGETATION

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

The site has an existing hospital and allied facilities. In the remaining portion there may be some clearance of weeds, musa, garden trees and colonizers. Green belt and gardening will improve the plant diversity. Hence there is no threat to the biodiversity due to the project.

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

The project does not involve extensive clearing or modification of vegetation. The list of existing flora in the site is given in the table below. There are no endangered species in the site.

Table 19: Existing flora in the project site

Scientific Name	Common Name/ Vernacular Name	Description	Native/ Exotic
Abrusprecatorius	Rosary Pea	Medicinal	Native
Acacia mangium	Mangium	Softwood	Exotic
Aerva lantana	Cherula	Medicinal	Native
Allamanda cathartica	Kolambi	Ornamental	Exotic
Albizia saman	Rain Tree	Ornamental Avenue Tree	Exotic
Alstonia scholaris	Ezhilampaala	Medicinal	Native
Araucaria heterophylla	Norfolk Island Pine	Ornamental	Exotic
Areca catachu	Kavungu	Economic crop, Medicinal	Native
Artocarpus heterophyllus	Jackfruit	Edible	Native
Artocarpus altilis	Bread Fruit	Edible	Exotic
Artocarpus hirsutus	Wild Jack	Edible	Native
Asparagus racemosus	Sathawari	Climbers	Native
Asparagus setaceus	Common Asparagus Fern	Climbers	Exotic
Azadirachta indica	Neem	Medicinal, softwood	Native
Bauhinia acuminata	Vella Mandharam	Ornamental	Native
Bauhinia purpurea	Butterfly tree	Ornamental Shade tree	Native
Biophytum sensitivum	Mukutty	Medicinal	Native
Carica papaya	Papaya	Fruit edible, Medicinal	Exotic
Caesalpinia sappan	Sappan wood	Ornamental, Medicinal	Native
Chromolaena odorata	Communist pacha	Medicinal	Native
Clerodendrum infortunatum	Peringalam	Medicinal	Native
Cocos nucifera	Coconut tree	Culinary, Toddy, Oil, Milk, water, timber	Native
Colocasia esculenta	Chemb	Edible	Native

Curculigo orchioides	Nilapana	Flowering	Native
Delonix regia	Flamboyant/Vaka	Ornamental shade tree, Medicinal	Exotic
Dendrophthoe falcata	Ethilkanni	Climber	Native
Emilia sonchifolia	Muyalcheviyan	Medicinal	Native
Hevea brasiliensis	Rubber Tree	Latex, Timber, Firewood	Exotic
Hibiscus rosa-sinensis	Chembarathi	Ornamental, Flowering	Native
Hibiscus schizopetalus	Japanese Lantern	Ornamental, Flowering	Exotic
Impatiens balsamina	Balsam	Ornamental, Flowering	Native
Ipomoea cairica	Morning Glory	Ornamental, Climber	Exotic
Lantana montevidensis	Konginni	Ornamental, Flowering	Exotic
Laportea interrupta	Choriyanam	Medicinal	Native
Lawsonia inermis	Mylanchi	Medicinal	Native
Leucas zeylanica	Thumba	Medicinal	Native
Macarana petalta	Vatta	Folk Medicine, Softwood	Native
Mangifera indica	Mango Tree	Fruit edible	Native
Mikania micrantha	Mill a minute	Weed, Climber	Exotic
Moringa oleifera	Drumstick	Edible	Native
Musa acuminata	Banana	Fruit edible	Native
Myristica fragrans	Nutmeg	Economic, Medicinal crop	Native
Ocimum gratissimum	Rama Tulasi	Medicinal	Native
Ocimum tenuiflorum	Krishna Tulasi	Medicinal	Native
Polyalthia longifolia	Indian Mast Tree	Avenue tree, Firewood	Native
Peltophorum pterocarpum	Copper Pod	Avenue tree	Native
Psidium guajava	Common Guava/Pera	Fruit edible, Softwood	Exotic
Saropaus androgynus	Vellicheera	Edible, medicinal	Exotic
Syzygium aqueum	champa	Edible	Exotic
Tamarindus indica	Tamarind	Medicinal	Exotic
Tectona grandis	Teak	Hardwood	Native
Terminalia catappa	Indian almond	Edible, Softwood	Native

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

The existing green area is 30290.77 m^2. An area of 2500 m^2 (podium) is allocated for green belt in the proposed expansion. In addition, the sides of the internal roads will be provided with garden plants. The index of tree plantation is given in the table below:-

Table 20: Index of Avenue Plantation

Scientific Name	Vernacular Name	Type
Trees		
Cassia fistula	Konna	Flowering tree
Citrus lemon	Cherunaregam	Domestic use
Moringa pterygosperma	Muringa	Domestic use & flowering
Psidium guajava	Pera	Fruit tree
Garcinia cambogia	Kodampuli	Domestic use
Azardiracta indica	Aryaveppu	Medicinal use
Mangifera indica	Mavu	Fruit tree
Mimusops elengi	Elangi tree	Medicinal tree & flowering
Plumeria obtusa	White Champa	Fruit tree
Shrubs, Herbs & Climbers		
Ervatamia coronaria	Pinwheel flower	Flowering shrub
Allamanda cathartica	Golden trumpet	Flowering climber
Tecomaria capensis	Cape Honey suckle	Flowering shrub
Jatropha	Nettlespurge	Flowering shrub
Pentas lanceolata	Pentas (Star flower)	Flowering shrub
Tradescantia spathacea	Boatlily	Herb
Epiphyllum oxypetalum	Dutchman's pipe cactus	Flowering shrub
Hameliapatns	Firebush	Flowering shrub
Ananas comosus	Pineapple	Fruit herb
Vetiveria zizanioides	Ramacham (cuscus grass)	Medicinal Shrub
Ocimum tenuiiflorum	Thulasi (Holy basil)	Medicinal Shrub

4 FAUNA

4.1 Is there likely to be any displacement of fauna- both terrestrial and aquatic or creation of barriers for their movement? Provide the details.

No, there will not be any displacement of fauna –both terrestrial and aquatic or creation of barriers for their movement

4.2 Any direct or indirect impacts on the avifauna of the area? Provide details.

No direct or indirect impacts on the avifauna due to the project. There is no nesting or migratory path of avifauna.

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

Not Applicable

5 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 constructions)

The proposed project is an expansion of the existing hospital campus project and it will not increase atmospheric concentration of gases, the project has provision of Incinerator with Venturi scrubber and D.G. Sets for standby arrangement of electricity and will run only during power failure. The stack attached to the Incinerator and proposed D.G. Sets will follow all the rules and regulations of State Pollution Control Board and Central Pollution Control Board. The ambient air quality of the site carried out through an accredited laboratory.

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.

During construction phase, Particulate Matter (dust) is the main pollutant, which may be generated during construction activities. Other emission sources are intermittent and include emissions of SO_2, NO_x and CO from materials transport of heavy vehicles on site etc. Proper upkeep and maintenance of vehicles, sprinkling of water on roads and construction site are some of the measures that would reduce the impact during construction phase.

Sources of Air pollution During Operational phase:

- The gaseous emissions from vehicles.
- Emissions from DG set while in operation only during power failure

Mitigation Measures:

- The traffic congestion will be avoided by proper parking arrangement and maintaining smooth traffic flow
- Regular PUC checkup for vehicles
- DG sets will be used as per CPCB norms
- Proper maintenance of DG sets shall be done and Low sulphur fuel shall be used

5.3 Will the proposal create shortage of parking space for vehicles? Furnish details of the present level of transport infrastructure and measures proposed for improvement including the traffic management at the entry & exit to the project site.

The proposed project would provide well organized parking arrangement.

Table 21: Parking statement

	Category	Mandatory parking area requirement	Parking area provision
Existing Buildings	4 Wheelers	752	-
Proposed Hospital building, Geriatric Centre (Nursing Home) & Doctors quarters		300	
Proposed Staff quarters building		188	
Proposed Commercial building		27	
Total		**1267(Nos.)**	**1316 (Nos.)**
Existing Building	2 Wheelers	3135 m^2	
Proposed Hospital building, Geriatric Centre (Nursing Home) & Doctors quarters		1125 m^2	
Proposed Staff quarters building		820 m^2	

Proposed Commercial building		102 m^2	
Total		**5182 m^2**	**5833 m^2**

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

The project proponent will provide adequate driveways and walkways. The project site is directly accessible from a 10 m wide Old MC road and 5 m panchayat road.

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.

The proposed project is an expansion of the existing hospital project and there would be some increase in noise and vibration due to the vehicular movement. The project proponents have proposed to provide well organized parking arrangement and maintaining smooth traffic flow which would help in reducing traffic congestion and noise levels. Trees would act as noise barrier and will reduce the noise level.

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

D.G. Sets will be operated only in case of power failures during operational phase. The Pollutants like SPM, SO_2 that may arise from emissions from D.G. sets will be discharged through vent of proper height. D.G. sets are with inbuilt acoustic enclosures to reduce the noise of D.G. sets while in operation. Plantation of trees would act as noise barrier and will reduce the noise level.

6 AESTHETICS

6.1 Will the proposed constructions in any way result in the obstruction of a view, scenic amenity or landscapes? Are these considerations taken into account by the proponents?

The project site is in the midst of occupied land with buildings and roads. The proposed construction will not cause any obstruction of a view, scenic amenity or landscapes.

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

The project site is within the municipality limit area. The surrounding area is residential/ institutional developments. There are four side access roads to the project site. There will not be any adverse impacts due to the development of the proposed project.

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 site is not covered by any master plan for development. As such there is no restriction on the design, except those imposed by building rules and regulations. The building

rules and regulations are compiled and clearance will be obtained from State Town Planning Department.

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

No. There is no report of existence of any anthropological or archaeological site nearby the project area.

7 SOCIO-ECONOMIC ASPECTS

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

The project is meant to improve the healthcare facility. The project will provide job opportunities for local people during construction and operational phases. Hence the project will improve the economic status of local workers, technicians and professionals.

Table 22: Occupancy Load

Sl. No.	Purpose		Occupancy
1.	Existing Facility	Beds	660
2.		Staff	1069
3.		Visitors	444
4.		Other Residents/students	1080
	Total [A]		***3253***
5.	Proposed Facility	Beds	290
6.		Staff	239
7.		Visitors	575
8.		Residents	470
	Total [B]		***1574***
	Grand Total [A+B]		**4827**

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

The project site is located in the within an aerial distance of 2.9 km radius of Ettumanoor. Mahatma Gandhi University is situated at an aerial distance of 2 km. Several Educational institutions such as Managalam college of Engineering, Ettumanoorappan College, Government ITI, etc. and hospitals such as Kottayam Medical College, Kottayam District Hospital, KIMS Hospital, etc are located within 10 km radius. Ettumanoor Police station, family court, places of worship and recreation facilities is also available within 10 km radius.

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 would not cause any effects on local communities, disturbance to sacred sites or other cultural values.

8 BUILDING MATERIALS

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

Pozalona Portland cement shall be used which already contains 15% Fly ash. Construction materials from nearest source are chosen to minimize energy consumption for transportation. The proposed project will make all attempts to use to avoid building materials with high embodied energy. Further, the river sand will be replaced by manufactured sand from stone crushers.

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

The material required for construction activities shall be procured from company's authorized / approved vendors only. The vendor's performance is monitored periodically. In case of urgency or non-availability of materials from authorized/approved vendors, it will be procured from the open market to maintain the pace of the work. The mode of transport for above materials will be by trucks and / or by trailers.

- All vehicles which bring construction material to the site would possess under Pollution Control Certificates (PUC).
- The construction material will be carried in properly covered vehicles.
- Security staff presents at site will supervise loading and unloading of material at site.
- Construction material will be stored at identified site/ temporary godowns at site.
- The material handling location will be surrounded by a sheet wall up to 4 m.

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

The construction waste will be used for laying the internal roads

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

- Segregation of three types of garbage i.e. biodegradable, non-biodegradable and domestic hazardous shall be done.
- Non-biodegradable garbage: Shall be segregated into recyclable and non-recyclable waste.
- Recyclable waste: Shall be handed over to recyclers.
- Biodegradable garbage shall be treated in Biogas plant and slurry will be fed to the ETP.
- The domestic hazardous waste shall be handed over to authorized waste collectors.

9 ENERGY CONSERVATION

9.1 Give details of the power requirements, source of 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?

Table 23: Power requirement during the operation phase

S No	Purpose	Power requirement	Source of Power
1.	Existing Facility	1700 kW	KSEB Transformer
		500 kVA x 1, 550 kVA x 1, 1000 kVA x 1	3 DG sets (in the case of power failure)
2.	Proposed Expansion	1550 kW	KSEB Transformer, Solar Energy
		1000 kVA x 2	2 DG sets (in the case of power failure)

The energy consumption is proposed to be reduced by the use of solar energy lighting devices in the driveways and the garden. 2 KV Panels of 500 numbers were proposed for new expansion. It is proposed to save 800 units/day by the use of solar energy.

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

DG set will be provided for power back up. DG set of 500 kVA, 550 kVA and 1000 kVA is used for the project.

Table 24: Power requirement during the operation phase

S No	Purpose	Power requirement	Source of Power
1.	Existing Facility	500 kVA x 1, 550 kVA x 1, 1000 kVA x 1	3 DG sets (in the case of power failure)
2.	Proposed Expansion	1000 kVA x 2	2 DG sets (in the case of power failure)

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?

The project site is located in a place with predominantly tropical climate. Glass used should preferably avoid long and wavelengths (IR and UV). Soft glass which absorbs UV with special features to reflect IR radiation will be used for blazing. Typically locally available Saint Gobain™ neutral glass Evolite® or its equivalent will be used. Typical specifications are light transmission 50%, solar factor 0.5, shading coefficient 0.58 and U-value 5 (0.88 W/m^2 K). Glass is not used as a wall material.

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

The following passive solar features are incorporated in the building design:

- Orientation: Building is oriented to take advantage of north facing during summer, partly compromising with alignment with access road.
- Open spaces equivalent to atrium are provided in interconnected rows of building.
- This provides partial shading from solar exposure from east and west for dwelling units coming on the interior side.
- Distributes breeze in summer to majority of units.
- In general the design and orientation of the building helps to avoid solar heat build-up and induces cooling to living spaces.

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

The building orientation and alignment are laid out in such a way that solar heating of the walls is minimized (at no time solar heating is needed since minimum night temperature is 23^0C.) The project proponent shall made provision for solar panel system (hot water purpose) in building blocks and solar energy devices will be used for street lighting, emergency lighting in the proposed expansion. However, it is planned to install PV array on roof top on the south facing side. This will partly shade the roof.

9.6 Is shading effectively used to reduce cooling/heating loads? What principles have been used to maximize the shading of Walls on the East and the West and the Roof? How much energy saving has been effected?

The building is located at a place predominantly with tropical features, especially hot and humid climate. Cooling is the preferred feature. Vertical walls on the east and west will be painted with white or light shade paints with low heat absorption.

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

In the proposed expansion project central air conditioning is not provided. For common facilities like street lighting, common space illumination and water treatment facilities, electrical devices with green energy star certification will be used.

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

Un-shaded roof portion will be provided with expanded poly styrene sheet insulation to reduce adverse thermal effect. Paved areas will be covered under the canopy of shade trees in the landscape. Open spaces will be covered with garden shrubs so that heat absorption by paving materials and open soil can be minimized. Irrigation of landscape with treated effluent will keep the surroundings cool. This will mitigate heat island effect to a large extent.

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

The following materials are used in the construction of walls and roof. Their thermal properties are also given.

Table 25: Thermal characteristics of building envelope

Material	**Thermal mass C kJ/Km^2**	**Thermal inertia(Jm^2 K^{-1}S$^{-0.5}$)**
Cement plastering	1.480	1033.02
Brick wall	1.601	1139.69
EPS insulation	0.032	33.55
Cellular concrete	0.739	372.78
Dense concrete	2.120	1920.98

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

The project proponents are implementing a fire safety plan based on National Building Code. The emergency/ disaster management plan is enclosed as Annexure

9.11 If you are using glass as wall material provides details and specifications including emissivity and thermal characteristics.

The glass used will be low with low emissivity and the other specifications of the glass will comply with the norms as per ECBC.

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

All the Hospital air conditioned areas are provided with 2 ACPH (Air Change per Hour) fresh air, hence all the areas are pressurized and the air will always move from clean conditioned areas to the outside non clean areas. By this way the indoor infection prone air is diluted and all indoor air is replaced two times every hour.

Two levels of filtration is provided (10 Micron + 5 Micron) in all clean and critical areas. (like sterile / ice / mRI / CT / Cath / Post OP / Pre OP / etc) , this cleans the air by filtration.

For Operation Theatre (OT) terminal HEPA filter is provided over and above the above 2 filtration and the 5 ACPH fresh air. (Approximately 20% of total air is fresh air always), so the OT air is replaced approximately five times an hour.

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

Solar energy proposed to be utilized for hot water supply as well as for common area and outdoor lighting. Solar PV panels of 2 kVA capacity of 500 numbers with an efficiency of 20 percent will be installed in each tower to meet power demand for lighting up the common spaces and outdoors. It is proposed to save 800 units/day by the use of solar energy.

10 Environment Management Plan

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

Table 26: EMP for construction phase

Sl. No.	Environmental Component	Activity	Impact	Precautionary measures
1	Ambient Air quality and Noise level	❖ Site Clearance ❖ Excavation ❖ Construction of Structures ❖ Heavy vehicle traffic ❖ Use of DG Set ❖ Open burning of Waste	• Increased level of dust & other air pollutants • Increased Noise level	**For controlling air pollution :** ▪ Water Sprinkling ▪ Cover on trucks ▪ Use of RMC instead of preparing concrete at site ▪ Vehicles with valid PUC ▪ DG sets: CPCB approved low sulphur fuel. **For controlling noise pollution :** ▪ Barricades along the periphery of the site. ▪ Ear Plugs for Labourers ▪ D.G. sets CPCB approved ▪ No work in night shifts. ▪ Using electrically operated construction

				equipment.
2	Water	❖ Use of fresh water for Construction activity /labours ❖ Waste water generation ❖ Disposal of site run off into SWD ❖ Water logging	• Sedimentation, Pollution of nearby water courses. • Unhygienic condition for surrounding residents.	▪ Provision of temporary toilets for labour. ▪ Precaution to avoid water logging during construction ▪ Rainwater recharge pits will capture the runoff.
3	Soil	❖ Preconstruction and excavation of debris ❖ Storage of construction material /chemicals ❖ Transportation of hazardous material such as Residual paints/Solvents/bituminous material etc. ❖ Operation /maintenance ❖ Generation of garbage by labour	▪ Loss of good fertile soil ▪ Soil erosion ▪ Soil Contamination due to mixing of construction material/ accidental spillage of chemicals/oil	▪ Recycle of Debris in the project site. ▪ Proper and Separate storage of construction material ▪ Storage of all petroleum products on impervious layers viz. concrete. ▪ Transportation, storage and handling, disposal of HW as per their

				guidelines and handing it over to authorized agencies. ▪ Use of electrically operated machinery. ▪ Segregation of waste at Source
4	Ecology	❖ Site clearance, Construction of Structures	▪ Disturbing natural flora and fauna ▪ Loss of vegetation from chemical spills from vehicles	▪ Plantation of local tree species on the Periphery of site ▪ Regulation of vehicular trips and speed and proper maintenance of machinery
5	Safety and Hygienic measures	❖ Construction work Labor	• Positive impact: Employment generation • Safety and hygiene at site may be affected during construction	▪ Adequate drinking water and toilet facilities. ▪ Regular analysis of drinking water. ▪ Personal protective and safety equipment will be provided. ▪ First aid facility. ▪ Regular health check up ▪ Regular pest control at site. ▪ Educational and awareness programme for safety

				measures.

Table 27: EMP for operation phase

Sl. No.	Environmental Component	Activity	Impact	Precautionary measures
1	Ambient Air quality and Noise level	❖ Increased vehicular trips. ❖ Use of DG sets	• Traffic congestion • Air pollution • Increase in noise level	▪ Adequate parking provision, well organized traffic management plan for smooth flow of vehicles ▪ Regular PUC check-up for vehicles ▪ DG sets: As per CPCB norms, proper maintenance, and use of Low Sulphur fuel. ▪ Acoustic enclosures for DG sets ▪ Plantation of tress will reduce air pollution and also act as noise buffer.
2	Water	❖ Increased Demand of natural water ❖ Generation of waste water ❖ Increased paved structure	• Stress on existing water supply • Pollution of water bodies • Increased run off from site	▪ Use of water saving practices ▪ Adoption of dual plumbing system ▪ Rain water harvesting ▪ Plantation of less water consuming species. ▪ ETP is planned and treated water will be used for secondary requirements like flushing and

				gardening.
3	Land	❖ Solid waste generation ❖ Biomedical waste generation ❖ Transportation of hazardous material ❖ Increased paved Structure	• Improper disposal of waste • Accidental spillage of hazardous chemicals leads to soil contamination • Increased run off from site.	▪ Waste minimization recovery and reuse. ▪ Segregation at source for all solid waste streams. ▪ Recycling of non-biodegradable waste. ▪ Domestic hazardous waste will be handed over to authorized waste collectors. ▪ Treatment of biodegradable waste onsite by Biogas plant and use of its slurry as manure. ▪ Biomedical waste handed over to Indian Medical Association Goes Eco Friendly [IMAGE]. ▪ Transportation, storage and handling, disposal of Hazardous Waste as per their guidelines and handing it over to authorized agencies. ▪ Strom water drainage of adequate capacity.
4	Ecology	▪ Introduction of new plant species	▪ Disturbing natural flora and fauna ▪ Increased exposure to anthropogenic	▪ Plantation of local tree species for developing

				the green belt
5	Safety and Hygienic measures	Influx of People	• Stress on all utilities, risk and danger due to natural and manmade disaster • Positive impact: Employment generation	▪ Emergency preparedness plan and disaster management plan will be prepared and explained.

Table 28: Cost of Environment Management Plan

SLNo.	Management Measure	Cost (in Rs.)
Construction Phase		
1.	Dust Suppression	50,000
2.	Storm water detention and settling	5,00,000
3.	Excavated Soil Protection	50,000
4.	Noise and dust barrier around site	1,00,000
5.	Liquid waste management	2,00,000
6.	Solid waste management	1,00,000
	Total	**10,00,000**
Operation Phase		
1.	Rain water harvesting	20,00,000
2.	Green belt and Landscape	1,00,000
3.	Solid Waste Management	20,00,000
4.	Liquid Waste Management	50,00,000
	Total	**91,00,000**
Grand Total for Environment Management Plan		**1,01,00,000**

Table 29: Suggested Monitoring Plan for Caritas Hospital during the Construction Phase

Sl. No.	Type	No. of Locations	Parameters	Period and Frequency	Cost (in Rs.)
1.	Ambient Air Quality	3	Criteria Pollutants: SO_2, NO_2, PM, CO.	Once in 6 months.	30,000
2.	Ambient Noise	3	dB (A) levels.	Once in 6 months.	15,000
3.	Fresh water quality	2	As per IS 10500 potable water standards.	Once in 6 months.	24,000
4.	Soil quality	2	Organic matter, C.H., N, Alkalinity, Acidity, heavy metals and trace metal, Alkalinity, Acidity.	Once in 6 months.	20,000

Cost of monitoring the above parameters once = Rs 89,000/-
Hence cost of monitoring during the construction period of 3 years = **Rs 5,34,000/-**

Table 30: Suggested Monitoring Plan for Caritas Hospital during the Operation Phase

SLNo.	Environmental Attribute	Frequency	Rate	Number of Locations	Total cost per year
1.	Noise	Once in a year	5,000	4	20,000
2.	Air	Once in a year	10,000	4	40,000
3.	Water	Once in a year	12,000	2	24,000
				Total	84,000

Annexure 1: *Area statement for the Caritas Hospital Project*

Details regarding the Built-up area of buildings constructed before 2006

Building Block Name		Maximum No. of floors	Maximum height of building [m]	Built-up area [m^2]
Main hospital building		B1+G+8	28.2	20676.53
Doctors quarters		B1+G+2	9	995.57
Doctors quarters		B1+G+2	9	995.57
Doctors quarters		G	3	143.49
Doctors quarters		G	3	239.46
College of Pharmacy		B1+G+1	6	1339.30
College of nursing	Block 1	B1+G+3	12	3255.10
	Block 2	B1+G+2	9	2828.90
Total Built-up Area				**30473.92**

Details regarding the Built-up area constructed after 2006 (which are exempted from the Purview of EIA Notification*)

Building Block Name	Maximum No. of floors	Maximum height of building [m]	Built-up area [m^2]
Devamatha visitation hostel	B1+G+3	12	3139.93
SI shalom hostel	G+2	9	2227.07
Total Built-up Area			**5367**

** Hostels are exempted by MoEF& CC as per Gazetted Notification dated 22-12-2014.*

Details regarding the Built-up area of the buildings to be demolished

Building Block Name	Maximum No. of floors	Maximum height of building [m]	Built-up area [m^2]
Psychiatry unit (a part)	-	-	185.30
Doctors quarters	G	3	167.94
Vianney Home	G+2	9	1427.42
Director Residence	G	3	228.65
Bank Building	G	3	151.80
Canteen	G	3	88.26
Coffee shop AB-15	G	3	30.19
Plant House AB-16 (Fire Pump House)	G	3	42.24
Total Built-up Area			**2321.8**

Details regarding the Built-up area of buildings constructed after 2006 [X]

Building Block/Sheds Name	Maximum No. of floors	Maximum height of building [m]	Built-up area [m^2]
Main hospital building [BM block, Heart Institute, New Administration block]	B1+G+8	28.2	23521.51
Plant house	G	2.7	34.40
Psychiatry unit	G	3	48.42
Pump House	G	3	30.59
Secular institute convent	G+1	6	1566.44

Secular institute bethsetha	B1+G+3	12	2647.50
SI guest house	G	3	95.05
ST Thomas (praysbetery)	B1+G	3	149.21
Visitation convent	B1+G+1	6	810.30
St joseph convent	G+1	6	496.18
Fusco convent	G	3	193.78
St Thomas church	G	5	294.0
St Thomas parish hall	G	3	159.60
Si kitchen	G	3	188.21
Laundry	G	3	34.20
Class room AB-1	G	3	87.79
Plant houseAB-2 (Electrical room	G	3	26.01
Plant house AB-3(Pump House)	G	3	12.87
Store house AB-4	G	3	21.10
Utility shed AB-5	G	3	28.07
Fire wood shed (AB-6)	G	3	17.35
Plant house AB-7 (Generator House)	G	3	34.02
Utility shed AB-8	G+1	6	37.24
Utility Shed AB-9	G+1	6	123.2
Store house AB-10	G	3	17.66
Cabin for watch & ward AB-11	G	3	9.89
Cabin for watch & ward AB-12	G	3	9.19
Plant house AB-13 (Pump house)	G	3	21.10
Coffee shop AB-14	G	3	28.09
Total Built-up Area [X]			**30742.97**

Details regarding the Built-up area of the Proposed Construction [Y]

Building Block Name	Maximum No. of floors	Maximum height of building [m]	Built-up area [m^2]
Extension to Hospital building Under construction	G+5	19	3221.82
Proposed Hospital building, Geriatric centre (Nursing Home) & Doctors quarters	2B+G+12	47.55	32716.56
Proposed Staff quarters building	2B+G+5	19	23670.5
Proposed Commercial Building	G+3	13.8	2044.57
Multi-Level Mechanical Car Parking System	--	--	769.14
Total Built-up Area [Y]			**62422.59**

Total Built-up area of the buildings to be sought for Environment Clearance, [X+Y] = 93165.56 m^2

Annexure 2: Site & Service Plan

Annexure 3: Geotechnical Investigation Report

S & R CONSULTANTS

STRUCTURAL DESIGN . GEOTECHNICAL . SOFTWARE DEVELOPMENT. PROJECT MANAGEMENT.
CONSTRUCTION ERP. TRAINING. SHOP DRAWING. QUANTITY SURVEY. QUALITY CONTROL.

S&R/FNR/16/453
Friday, February19, 2016
Elamkulam

Site : Thellakom
Project: Propsed building for Carithas Hospital
Soil Investigation: Axis Surveyors
Bore-hole Details: 1,2,3(20/01/16,23/01/16. 30/01/16)

Recommendation

1. At a depth of 1.0-2.0 m, footing with safe bearing capacity of 20T/m2 can be used in soft laterite with clay with N value > 50. Ensure that the same strata is available throughout the site.
2. Foundation to be constructed as per latest IS codes and to be certified by a qualified site engineer. Authenticity of the lab report with respect to the site also to be verified by the client, before construction.
3. Above recommendations are based on the soil investigation report based on the actual bore hole data. Any difference in soil profile to be referred to the consultant to modify the recommendation or to the designer to change the design

Reji Zachariah, B.Tech, M.S., IIT Chennai

S & R CONSULTANTS 19 FEB 2016 KOCHI

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Tel: 0484 3241537, Fax: 0484 2322532, E-mail: rejizac2004@gmail.com,
www.sandrconsultants.com www.aadspro.com

PROJECT:- SOIL INVESTIGATION FOR THE PROPOSED BUILDING FOR CARITHAS HOSPITAL AT THELLAKOM.

Date of boring –20-1-2016
Type of boring –Rotary Drilling

Description of Soil	Classification	Bore Log	Depth in M.	No. of bows	N-value
			1.0	29,50,-	>50
Hard laterite			2.0	19,50,-	>50
Lateritic clay with sand (red)	CH		3.0	23,50,-	>50
Lateritic clay (reddish white)	CH		4.0	16,27,41	68
Silty clay (white)	CH		5.0	9,12,15	27
			6.0	5,9,12	21
Clayey silt (yellowish white)	MH		7.5	6,10,12	22
Clayey sand (yellowish red)-lateritic	SC		9.0	19,44,42	86
			10.5	20,21,29	50
Clayey silt (white)	MH		12.0	24,26,31	57
Clayey silt with sand (light grey)	ML		13.5	14,20,22	42
			15.0	9,16,23	39
Silty sand (brownish white/white)	SM		18.0	27,50,-	>50
			21.0	50,-,-	>50
			23.0	50,-,-	>50
			29.13		
Hard rock			30.74		

Standard penetration test Result
No. of blows N/30 cms.
10 20 30 40 50

W.L = 5.0M

BORE LOG OF BORE HOLE NO. 1

Contractor: Axis Soil Investigation, Kottayam.

PROJECT:- SOIL INVESTIGATION FOR THE PROPOSED BUILDING FOR CARITHAS HOSPITAL AT THELLAKOM.

Date of boring –23-1-2016
Type of boring–Rotary Drilling

Description of Soil	Classification	Bore Log.	Depth in M.	No. of bows	N-value	Standard penetration test Result No. of blows N/30 cms. 10 20 30 40 50
						W L = 5.0M
Lateritic clay (red)	CH		1.0	4,7,21	28	
			2.0	20,50,50	>50	
			3.0	15,33,46	79	
Soft laterite with clay (red)	SC		4.0	16,33,40	73	
			5.0	11,23,22	55	
Lateritic clay with sand (reddish white)	CH		6.0	16,31,42	73	
Silty sand (reddish white)	SM		7.5	20,50,-	>50	
Lateritic clay (reddish white)	CH		9.0	11,25,30	55	
			10.5	9,13,25	38	
Clayey silt with sand (yellow)-lateritic	MH		12.0	17,30,50	>50	
			13.5	13,18,20	38	
Clayey silt (white)	MH		15.0	9,12,22	34	
			18.0	10,18,39	57	
Sandy silt with clay (light grey)	ML		21.0	50,-,-	>50	
			23.76	50,-,-	>50	
			34.7			
Hard rock			36.7			

BORE LOG OF BORE HOLE NO. 2

Contractor: Axis Soil Investigation, Kottayam.

PROJECT:- SOIL INVESTIGATION FOR THE PROPOSED BUILDING FOR CARITHAS HOSPITAL AT THELLAKOM.

Date of boring –30-1-2016
Type of boring –Rotary Drilling

Description of Soil	Classification	Bore Log.	Depth in M.	No. of bows	N-value
Clayey sand with gravel (red)-lateritic	SC		1.0	12,15,15	30
			2.0	18,38,50	>50
Soft laterite with clay (red)			3.0	174,18,34	52
			4.0	10,16,28	44
Lateritic clay (whitish red/ reddish white)	CH		5.0	10,13,17	30
			6.0	9,10,17	27
			7.5	7,15,23	38
			9.0	13,20,24	44
			10.5	10,23,40	63
Clayey silt (pink)-lateritic	MH		12.0	5,9,13	22
			13.5	7,11,18	29
			15.0	8,13,19	32
			18.0	15,21,50	>50
Very fine silty sand (reddish white)	SM		21.0	25,50,-	>50
			24.0	50,-,-	>50
			25.5		
Soft rock					
			32.0		
Hard rock			33.7		

Standard penetration test Result No. of blows N/30 cms.

10 20 30 40 50

W L = 8.50M

BORE LOG OF BORE HOLE NO. 3

Contractor: Axis Soil Investigation, Kottayam.

SSL Engg **SHARP SOIL LAB (ENGG)**
Near Avila Convent, Kandanad
Pin: 682 305, Mob: 9847923045

Project : Soil investigation for the proposed building for Carithas Hospital at Thellakom.

Test Results

Note : samples are provided to us
M.C., density & shear test of SPT samples are done on remolded specimen

Date of boring 20-1-16

W.L=5.0M

Bore Hole No:1

Termination Depth in M. 30.74

N VALUE	Depth in M. from G.L	SAMPLE No	Description	GRAIN SIZE ANALYSIS					LIQUID LIMIT	PLASTIC LIMIT	DRY DENSITY GM/CC	WET DENSITY GM/CC	WATER CONTENT	SPECIFIC GRAVITY	SHEAR PARAMETERS		
				I.S Classification	GRAVEL %	SAND %	SILT %	CLAY%							TEST METHOD	Cohesion C Kg/cm2	ϕ Degree
>50	1.0	SPT-1	Hard laterite														
>50	2.0	SPT-2	-do-														
>50	3.0	SPT-3	Lateritic clay with sand (red)	CH	6	15	31	48	81	29							
68	4.0	SPT-4	Lateritic clay (reddish white)	"	2	6	47	45	76	31				2.55	Triaxial	1.8	2
27	5.0	SPT-5	Silty clay (white)	"	0	0	56	44	75	34					"	0.8	0
21	6.0	SPT-6	-do-	"													
22	7.5	SPT-7	Clayey silt (yellowish white)	MH	0	6	56	38	63	40							
86	9.0	SPT-8	Clayey sand (yellowish red)-laterite	SC	3	74	13	10									
50	10.5	SPT-9	-do-	"													

Contd....

Test done by

Verified by

JAIN. P. ABRAHAM
Reg. No: E-5312/15/SB-3025/KLM
Pallathara (H), Parampuzha
Kottayam-04
Mob: 9446200979, 9446500979

Contractor(Axis Soil Investigation, Kottayam)

SSL Engg

SHARP SOIL LAB (ENGG)
Near Avila Convent, Kandanad
Pin: 682 305, Mob: 9847923045

Test Results

Date of boring 20-1-16

Bore Hole No:1

Project : Soil investigation for the proposed building for Carithas Hospital at Thellakom.
.....2.....

Note : samples are provided to us M.C., density & shear test of SPT samples are done on remolded specimen

W.L=5.0M

Termination Depth in M. 30.74

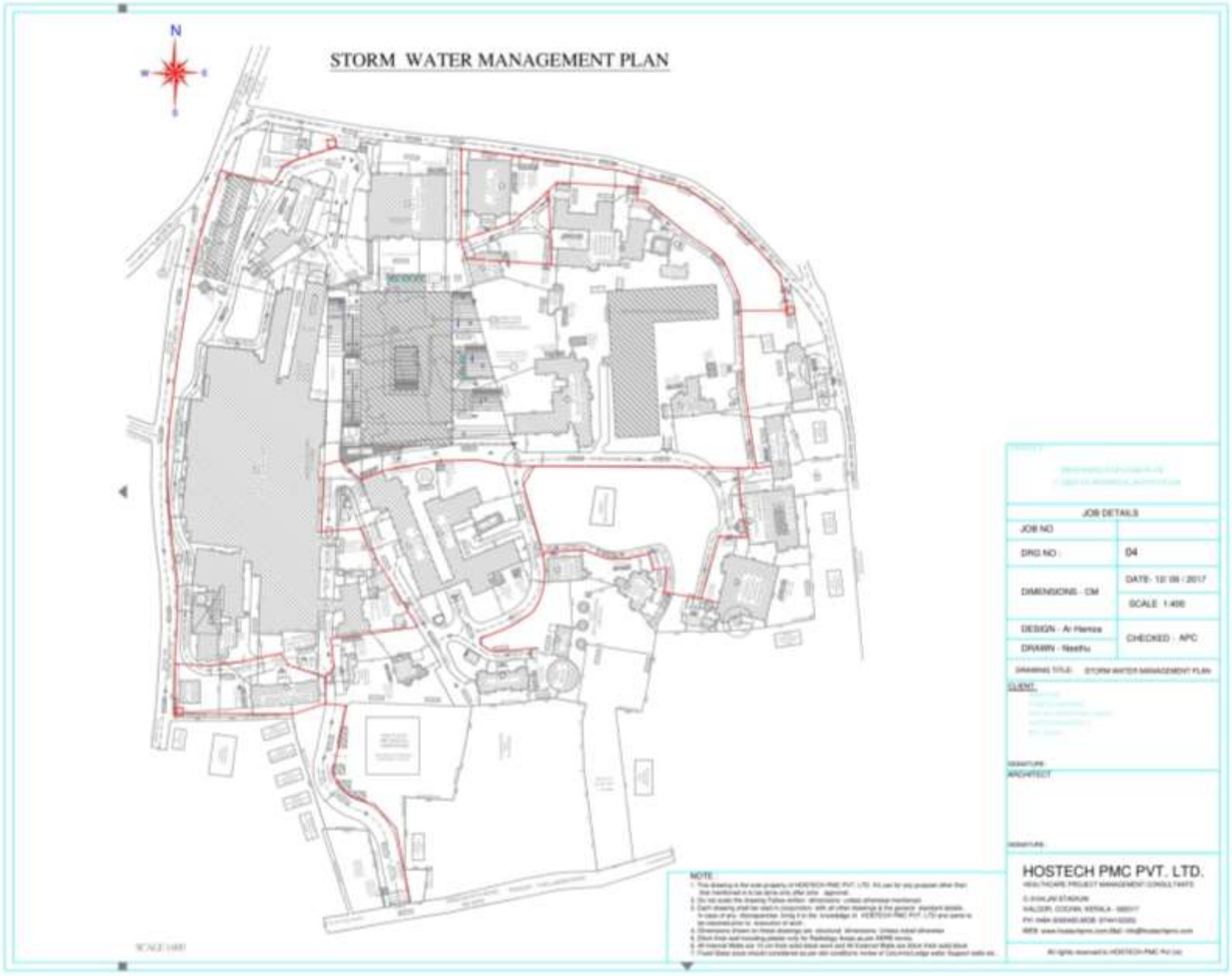
N VALUE	Depth in M. from G.L.	SAMPLE No.	Description	GRAIN SIZE ANALYSIS					LIQUID LIMIT	PLASTIC LIMIT	DRY DENSITY GM/CC	WET DENSITY GM/CC	WATER CONTENT	SPECIFIC GRAVITY	SHEAR PARAMETERS		
				I.S Classification	GRAVEL %	SAND %	SILT %	CLAY%							TEST METHOD	Cohesion C Kg/cm2	ϕ Degree
57	12.0	SPT-10	Clayey silt (white)	MH	0	5	70	25	61	36							
42	13.5	SPT-11	Clayey silt with sand (light grey)	ML	0	17	67	16	No limit								
39	15.0	SPT-12	-do-	"	0	31	57	12									
>50	18.0	SPT-13	Silty sand (brownish white)	SM	0	73	27	0									
>50	21.0	SPT-14	-do-	"													
>50	23.13	SPT-15	Silty sand (white)	"	0	70	26	4									
	29.13		Hard rock														

Test done by

Verified by
JAIN. P. ABRAHAM
Reg. No: E-5312/15/SB-3025/KLM
Pallathara (H), Parampuzha
Kottayam-04
Mob: 9446200979, 9446500979

Contractor(Axis Soil Investigation, Kottayam)

Annexure 4: Storm Water Management Layout



Annexure 5: Disaster Management Plan [Emergency Evacuation Plan]