ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR

"IBC WISDOM WORLD"

CONSTRUCTION OF IT/BT OFFICE BUILDING

AT

SURVEY NO'S. 173/3, 173/5, 173/6, 176, 177, 178/1, 179, 183/1, 183/2, 184/1, 184/2, 184/3, 187/1, 189, 190, 197/1, 197/2, BELLANDUR AMANIKERE VILLAGE, VARTHUR HOBLI, BENGALURU EAST TALUK, BENGALURU DISTRICT

PROMOTER:

M/s. WISDOM WORLD DEVELOPERS PVT LTD
BENGALURU

PREPARED BY:

M/s. AM ENVIRO ENGINEERS

BENGALURU

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State Level Environment Impact Assessment Authority-Karnataka

(Constituted by MoEF, Government of India, under section 3(3) of E(P) Act, 1986)

No. SEIAA 32 CON 2016

Date: 10-09-2018

To,

Mr. Ziaulla Sheriff
Director
M/s. Wisdom World Developers Pvt. Ltd.
No 73/1, Sheriff Centre, 5th Floor,
St Marks Road, Bengaluru - 560 001.

Sir,

Sub: Proposed Development of Commercial (IT/BT) Office Building called "IBC Wisdom World" project at Survey Numbers 173/3, 173/5, 173/6, 176, 177, 178/1, 179, 183/1, 183/2, 184/1, 184/2, 184/3, 187/1, 189, 190, 197/1, 197/2 of Bellandur Amanikere Village, Varthur Hobli, Bengaluru East Taluk, Bengaluru District Karnataka by M/s. Wisdom World Developers Pvt. Ltd. - issue of ToRs and additional ToRs Regarding.

Ref:
1. Proceedings of the 203rd SEAC meeting held on 27th July 2018.
2. Proceedings of the 154th SEIAA meeting held on 18th August 2018.

* * * *

This has reference to your online application dated 19th June 2018 bearing proposal No.SIA/KA/NCP/10268/2016 addressed to SEIAA, Karnataka on the subject mentioned above along with Form-1, Form-1A, conceptual plan as per the EIA Notification, 2006.

2. The State Expert Appraisal Committee appraised the proposal during the meeting held on 1st, 2nd, and 3rd March 2016 and decided to recommend the proposal to SEIAA for issuing ToRs to conduct the EIA studies in accordance with the EIA Notification 2006 and relevant guidelines along with the additional ToRs. Accordingly ToRs were issued for the plot area of 80,936.51 Sqm vide letter dated 11-04-2016 and the Total Built up area was 2,38,701.28 Sqm.

3. It is inert-alia noted that the revised proposal seeking Environmental clearance for the proposed Development of Commercial (IT/BT) Office Building called "IBC Wisdom World" project at Survey Numbers 173/3, 173/5, 173/6, 176, 177, 178/1, 179, 183/1, 183/2, 184/1, 184/2, 184/3, 187/1, 189, 190, 197/1, 197/2 of Bellandur Amanikere Village, Varthur Hobli, Bengaluru East Taluk, Bengaluru District Karnataka of M/s. Wisdom World Developers Pvt. Ltd. This is a project falling under the category Sl.No. 8(b), Under Township and Area development Projects of the Schedule to EIA Notification 2006 and amendments made there on.

Room No. 706, 7th Floor, 4th Gate, M.S. Building, Bangalore - 560 001 Phone : 080-22032497 Fax: 080-22254377
Website : http://seiaa.kar.nic.in http://seiaa.karnataka.gov.in http://environmentclearance.nic.in
e-mail: msseiaakarnataka@gmail.com

4. It is inter-alia, noted that M/s. Wisdom World Developers Pvt. Ltd. have proposed for Development of Commercial (IT/BT) Office Building called "IBC Wisdom World" project on a plot area of 83,061.04 Sqm. The total built up area is 4,37,473.09 Sqm. The proposed project is having a Building configuration as mentioned in the table below:

Blocks	Building Configuration
Block-1	2 Basements + Ground Floor + 9 Upper Floors
Block-2	2 Basements + Ground Floor + 11 Upper Floors
Block-3	2 Basements + Ground Floor + 12 Upper Floors
Block-4	2 Basements + Ground Floor + 12 Upper Floors
Block-5	2 Basements + Ground Floor + 11 Upper Floors
Block-6	2 Basements + Ground Floor + 10 Upper Floors
Block-7	2 Basements + Ground Floor + 10 Upper Floors
Block-8	2 Basements + Ground Floor + 13 Upper Floors
Utility Building	2 Basements + Ground Floor + 1 Upper Floor

Total parking space proposed is for 4,862 Numbers of Cars. Total water consumption is 1,082 KLD. The total wastewater discharge is 866 KLD. It is proposed to construct Two Sewage Treatment Plants with a capacity of 300 KLD and 570 KLD. The Project cost is Rs.1250 crores.

5. The State Expert Appraisal Committee (SEAC), Karnataka has considered the proposal during its meeting held on 27th July 2018. Based on the consideration of the documents submitted and the presentation made by you, the Committee prescribed the following Terms of Reference (ToR) for preparing EIA/EMP report with latest one season baseline data other than monsoon for the above mentioned project.

6. The SEIAA Karnataka after due consideration of the relevant documents submitted by the project proponent, and the recommendation of the SEAC have in its meeting held on 18th August 2018 and decided to accord the Standard Terms of Reference (TOR) along with additional Terms of Reference, in accordance with the provisions of Environmental Impact Assessment Notification-2006 and its subsequent amendments made there on.

1) Examine details of land use as per Master Plan and land use around 10 km radius of the project site. Analysis should be made based on latest satellite imagery for land use with raw images. Check on flood plain of any river.
2) Submit details of environmentally sensitive places, land acquisition status, rehabilitation of communities/ villages and present status of such activities.
3) Examine baseline environmental quality along with projected incremental load due to the project.
4) Environmental data to be considered in relation to the project development would be (a) land, (b) groundwater, (c) surface water, (d) air, (e) bio-diversity, (f) noise and vibrations, (g) socio economic and health.
5) Submit a copy of the contour plan with slopes, drainage pattern of the site and surrounding area. Any obstruction of the same by the project
6) Submit the details of the trees to be felled for the project.

7) Submit the present land use and permission required for any conversion such as forest, agriculture etc.
8) Submit Roles and responsibility of the developer etc for compliance of environmental regulations under the provisions of EP Act.
9) Ground water classification as per the Central Ground Water Authority.
10) Examine the details of Source of water, water requirement, use of treated waste water and prepare a water balance chart.
11) Rain water harvesting proposals should be made with due safeguards for ground water quality. Maximize recycling of water and utilization of rain water. Examine details.
12) Examine soil characteristics and depth of ground water table for rainwater harvesting.
13) Examine details of solid waste generation treatment and its disposal.
14) Examine and submit details of use of solar energy and alternative source of energy to reduce the fossil energy consumption. Energy conservation and energy efficiency.
15) DG sets are likely to be used during construction and operational phase of the project. Emissions from DG sets must be taken into consideration while estimating the impacts on air environment. Examine and submit details.
16) Examine road/rail connectivity to the project site and impact on the traffic due to the proposed project. Present and future traffic and transport facilities for the region should be analysed with measures for preventing traffic congestion and providing faster trouble free system to reach different destinations in the city.
17) A detailed traffic and transportation study should be made for existing and projected passenger and cargo traffic.
18) Examine the details of transport of materials for construction which should include source and availability.
19) Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters.
20) Submit details of a comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster.
21) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
22) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
23) Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry website "http://moef.nic.in/Manual/Townships".

Additional TOR:

1) Management plan to utilise the entire earth generated within the site may be worked out and submitted.
2) Utilization of the entire terrace for solar power generation may be worked out and submitted.

STATE LEVEL ENVIRONMENTAL IMPACT ASSESSMENT AUTHORITY ★ KARNATAKA ★

3) Scheme for utilising maximum treated sewage water to reduce the demand on the fresh water may be worked out and submitted.
4) Rain water harvesting/storage details may be worked out.
5) Surface hydrological study of surrounding area may be carried out and the carrying capacity of the natural nalas may be worked out in order to ascertain the adequacy in the carrying capacity of the nalas.
6) To submit the details of trees to be felled and the scheme for development of greenery with the details of trees as per the norms.
7) The applicability of the Hon'ble National Green Tribunal order dated 4th May 2016 in original application No.222 of 2014 on buffer zone for water bodies and nalas may be studied and submitted.

The consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India/National Accreditation Board of Education and Training (QCI/NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and the data provided by other Organization(s)/Laboratories including their status of approvals etc. In this regard Office Memorandum No. F. No. J-11013/77/2004-IA.II(I) dated 30th June, 2011 available on the MoEF, GoI website http://www.moef.nic.in may please be referred.

The Terms of Reference (ToR) prescribed by the State Expert Appraisal Committee (SEAC), Karnataka should be considered for the preparation of EIA / EMP report for the above mentioned project in addition to all the relevant information as per the Generic Structure of EIA given in Appendix III and IIIA in the EIA Notification, 2006.

The ToRs prescribed will be valid for a period of three years for submission of the EIA/EMP report.

STATE LEVEL ENVIRONMENTAL IMPACT ASSESSMENT AUTHORITY ★ KARNATAKA ★
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10/9/18

Member Secretary,
State Level Environment Impact Assessment Authority,
Karnataka.

Copy to:

1. Chairman, Karnataka State Pollution Control Board, KSPCB, Parisara Bhavan, 4th & 5th Floor, church street, Bangalore for information.
2. Guard File.

COMPLIANCE TO TOR AND ADDITIONAL TOR CONDITIONS

TERMS OF REFERENCE FOR EIA STUDIES

COMPLIANCE TO TOR CONDITIONS

Sl. no.	Terms of reference	Compliance
1.	Examine details of land use as per Master plan and land use around 10 km radius of the project site. Analysis should be made based on latest satellite imagery for land use with raw images. Check on flood plain of any river.	Details are incorporated in chapter-2 which includes land use details around the project site and also land use allocation with in the project site. Land use and land cover map has been prepared by using the LISS – 3 image sourced from Bhuvan/NRSC.
2.	Submit details of environmentally sensitive places, land acquisition status, rehabilitation of communities/ villages and present status of such activities	Environmental settings of the site details are incorporated in Chapter-2 in page no. 15
3.	Examine baseline environmental quality along with projected incremental load due to the project	Details are incorporated in chapter-3
4.	Environmental data to be considered in relation to the project development would be (a) land (b) ground water (c) surface water (d) air (e) bio-diversity (f) noise and vibrations (g) socio economic and health	Details of environmental data with relation to the project development are incorporated in Chapter-3
5.	Submit a copy of the contour plan with slopes, drainage pattern of the site and surrounding area. Any obstruction of the same by the project	Contour plan of the project site is enclosed as **Annexure- 3.** Drainage pattern around the project site is detailed in the hydrology report attached as ANNEXURE-13.
6.	Submit the details of the trees to be felled for the project	There are no trees existing at the project site and as a part of the development, tree species have been proposed which are listed in the Chapter-4, Table-4.6.
7.	Submit the present land use and permission required for any conversion such as forest, agriculture etc.	The proposed project site area is a vacant land which is converted for the commercial usage and As per the CDP Master Plan 2015, the project site shown as Commercial area.
8.	Submit roles and responsibility of the developer etc for compliance of environmental regulations under the provisions of EP Act	Details are briefed in **Annexure-14**
9.	Ground water classification as per the Central Ground Water Authority	Details are briefed in **Annexure-17**
10.	Examine the details of source of water, water requirement, use of treated waste water and prepare a water balance chart.	The source of water supply during operation phase will be met from BWSSB and copy of the NOC is enclosed as **Annexure-4**. Total water requirement is 1082 KLD (Fresh water and flushing water). Treated sewage water will be used for flushing, gardening, car & floor washing purpose. Water balance chart is incorporated in chapter-2.
11.	Rain water harvesting proposals should be made	Details are incorporated in chapter-4

	with due safeguards for ground water quality. Maximize recycling of water and utilization of rain water. Examine details.	
12.	Examine soil characteristics and depth of ground water table for rain water harvesting.	Details are incorporated in chapter-4 and geotechnical investigation has been carried out and copy of same is attached as ANNEXURE – 7.
13.	Examine details of solid waste generation treatment and its disposal	Solid waste generation, treatment and its disposal from the proposed project is incorporated in chapter-2 & process flow chart is enclosed as **Annexure-15**
14.	Examine and submit details of use of solar energy and alternative source of energy to reduce the fossil energy consumption. Energy conservation and energy efficiency.	Details are incorporated in chapter-2 and solar panel layout in the terrace area is attached as Annexure-12
15.	DG sets are likely to be used during construction and operational phase of the project. Emissions from DG sets must be taken into consideration while estimating the impacts on air environment. Examine and submit details.	Estimating the impacts on air environment is detailed in chapter-4.
16.	Examine road/ rail connectivity to the project site and impact on the traffic due to the proposed project. Present and future traffic and transport facilities for the region should be analyzed with measures for preventing traffic congestion and providing faster trouble free system to reach different destinations in the city	Traffic management study report is enclosed as **Annexure-6**
17.	A detailed traffic and transportation study should be made for existing and projected passenger and cargo traffic	Details were explained in traffic report study
18.	Examine the details of transport of materials for construction which should include source and availability	Materials for construction will be sourced from locally and transported through trucks during day time and the vehicles will be operated only during non peak hours
19.	Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters	Details of construction and operation phases for Environmental Management Plan is detailed in chapter-9 and Environmental Monitoring Plan is detailed in chapter-6
20.	Submit details of the comprehensive Disaster management plan including emergency evacuation during natural and man-made disaster	Details are incorporated in **chapter-7.** On site emergency plan conducted for the proposed project is enclosed as **Annexure-11**
21.	Details of litigation pending against the project, if any, with direction/ order passed by any Court of law against the project should be given.	No litigation/court case pending against this proposed project in any court of law.
22.	The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out	The estimated project cost is Rs. 1,250 Crores. Cost details break up are incorporated in Chapter-2. EMP cost breakup is showed in chapter-9
23.	Any further clarification on carrying out the above studies including anticipated impacts due to the	Compiled

	project and mitigative measures, project proponent can refer to the model TOR available on Ministry website http://moef.nic.in/manual/Townships	

COMPLIANCE TO ADDITIONAL TOR CONDITIONS

Sl. no.	Additional Terms of reference	Compliance
1.	Management plan to utilize the entire earth generated within the site may be worked out and submitted.	Excavated top soil will be stored for reusing for landscaping. During the excavation, the surrounding area will be kept wet, so that there is no dust pollution in the air. Total quantity of excavation from the proposed project is 1, 47,748 Cum. The quantity of excavated earth generated from the activity is proposed to reuse within the project site for backfilling in buildings. Details of excavation is incorporated in chapter-4.
2.	Utilization of the entire terrace for solar power generation may be worked out and submitted.	Terrace area available for the generation of solar power is 30,009.74 Sqmt. Onsite roof top solar power generation which is planned by considering usable terrace areas after area provision for fire tanks, services, parapet shadow area, etc. Terrace plan for harnessing solar energy is enclosed as **Annexure-12**
3.	Scheme for utilizing maximum treated sewage water to reduce the demand on the fresh water may be worked out and submitted.	Provision for separate piping system will be provided for the treatment of sewage. Generated sewage will be treated in STP of capacity 300 KLD & 570 KLD by SBR technology. STP feasibility report is enclosed as **Annexure-5** STP treated water will be used for flushing, landscaping, car and floor washing purpose
4.	Rain water harvesting/storage details may be worked out.	➢ Roof rain water will be collected in roof rain water collection tank of capacity 50 cum, 70 cum – 2 Nos., 90 cum – 3 Nos., 95 cum & 100 cum and same will be utilized after prior treatment. 18 no's of Tube wells will be provided to recharge the ground water within the site.
5.	Surface hydrological study of surrounding area may be carried out and the carrying capacity of the natural nalas may be worked out in order to ascertain the adequacy in the carrying capacity of the nalas.	Hydrological study report is enclosed as **Annexure-13.**
6.	To submit the details of trees to be felled and the scheme for development of greenery with the details of trees as per the norms.	There are no trees existing at the project site and as a part of the development, tree species have been proposed which are listed in the Chapter-4, Table-4.6.
7.	Scheme for utilization of entire Rain water harvested in the project site (both from the	Details are incorporated in chapter-4.

	roof top and from the surface runoff) within the project premises only	
8.	The applicability of the Hon'ble National Green Tribunal order dated 4th May 2016 in original application No. 222 of 2014 on buffer zone for water bodies and nalas may be studied and submitted.	There is a nala located near the project site in North direction and as per the NGT order buffer of 50 meter has been left from the nala to the building line. It is also observed that, there was a nala passing through the project site as shown in the village map which was not in existence and which was shown as Kharab land. In the year of 2011, The Government of Karnataka converted this Kharab land for commercial usage and same as been sold to the proponent. Corresponding documents are attached as Annexure – 19
9.	Approval from the competent authority for diverting the nala.	There is a nala located near the project site in North direction and as per the NGT order, buffer of 50 meter has been left from the nala to the building line.
10.	NOC from BWSSB	No Objection Certificate from BWSSB has been obtained and copy of the same is enclosed as **Annexure-4.**
11.	Clarification from the BDA for the project site is not falling in the sensitive zone	Clarification letter from the BDA stating that the project site is not falling in the sensitive zone is enclosed as Annexure-18.
12.	Scheme for providing dual fuel generators for backup power with provision for CNG.	Diesel generators which will be installed at the project site is only for the purpose of backup and by considering the feasibility of the system, there will not be any provision for CNG
13.	Explore the possibility to provide fire escape chutes	As per the requirement, fire escape chutes will be provided in the proposed building.

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. PREAMBLE

M/s. Wisdom World Developers Pvt Ltd is proposed for development of Commercial (IT/BT) office building by name "IBC WISDOM WORLD" at Survey No's. 173/3, 173/5, 173/6, 176, 177, 178/1, 179, 183/1, 183/2, 184/1, 184/2, 184/3, 187/1, 189, 190, 197/1, 197/2 of Bellandur Amanikere Village, Varthur Hobli, Bengaluru East Taluk, Bengaluru District, Karnataka. The proposed project will be developed on a total plot area of 83,061.04 Sqmt (20 Acres 21 Guntas). Project requires EC for total built-up area is 4,37,473.09 Sqmt consisting of seven blocks of IT/BT office and another building with MLCP and convention center building with the configuration of 2B+G+13 UF with max height of 51m.

2. CURRENT PROPOSAL

Initially application has been submitted to State Environmental impact assessment proponent to obtain environmental clearance with the built-up area of 2,38,701.28 Sqmt on 31.2.2017 and obtained TOR copy from SEIAA, Karnataka on TOR Vide No. SEIAA: 32 CON 2016 dated 11.4.2016.

Due to change in the plan, again revised TOR application has been filed dated 19th June 2018 with the total built up area 4,37,473.09 Sqmt along with Form-1, Form-1A and proposed Terms of Reference (TOR). Based on the information furnished and presentation done before the State Expert Appraisal Committee (SEAC) members, proposal was appraised in the 203th State Expert Appraisal Committee (SEAC) meeting, held on 18th August, 2018. Subsequently Authority has issued the TOR (Terms of Reference) for preparing Environmental Impact Assessment (EIA) report vide letter No. SEIAA 38 IND 2016 dated on 10th 9, 2018.

3. PROJECT DESCRIPTION

The project is located in the co-ordinates of Latitude - 12º56'41.85"N, Longitude - 77º42'0.26"E. As per the Revised Master Plan of CDP-2015, the project site is a designated as Hi-tech Zone with mutation corridor. Total extent of land is measuring about 83,061.04 Sqmt (20 Acres 21 Guntas) having built up area of **4, 37,473.09 Sqmt**. Ground coverage area achieved is i.e., 41.55% & allowable is 45%. Achieved FAR is 3.236, permissible FAR is 3.25.

Blocks	Building configuration	Description	Height in m
Block-1	2B+G+9 UF	IT/BT office	43.8
Block -2	2B+G+11 UF	IT/BT office	46.8
Block -3	2B+G+11 UF	IT/BT office	51.0
Block -4	2B+G+12 UF	IT/BT office & 1 unit in 11th floor	51.0
Block -5	2B+G+11 UF	IT/BT office	46.8
Block -6	2B+G+10 UF	IT/BT office	46.8
Block -7	2B+G+10 UF	IT/BT office	46.8
Block -8	2B+G+13 UF	MLCP, convention center building	51.0
Utility building	2B+G+1 UF	--	17.10

Details of land use within the project site is given in below table,

Description of usage	Area in Sqmt	%usage
Total site area	83,061.04 Sqmt	--
Area left for road	2,521 Sqmt	--
Net site area	80,540.04 Sqmt	--
10% park and open space	8,306.13 Sqmt	--
Total site area for development	72,233.91 Sqmt	100
Ground coverage area	30,009.74 Sqmt	41.55
Landscape area	19,212.28 Sqmt	26.60
Driveway area	18,740.01 Sqmt	25.94
Surface parking area	4,271.88 Sqmt	5.91

The total water requirement during construction phase for construction activities is 50 KLD will be sourced from STP treated water and for domestic consumption for construction laborers is 14 KLD met through private water tankers. The total power required during this phase is 500 KVA sourced from BESCOM and as part of back-up power supply 1x500KVA DG sets will be installed. The total construction period is 5 years and approximately 300 laborers are employed.

The quantity of solid waste generated during the construction phase is 30Kg/day and the same is being handed over to local body after segregation for further processing. Excavated earth of about 1,47,748 Cum for all towers and the total quantity of construction debris of 300 Cum will be reused for various project activities within the site.

Water requirement for the project is proposed to be met by the BWSSB as drinking water. Total water consumption is 1082 KLD (Fresh water + recycling water). The total

wastewater discharge from the project is 866 KLD, which will be routed to the Sewage Treatment Plant to treat the sewage up to urban reuse standards using existing STP of capacity of 300 & 570 KLD using Sequencing Batch Reactor (SBR) Technology.

Traffic Management Plan has been proposed for construction as well as for operation phase, total parking space provided for 4,862 Nos. of cars. Rain water harvesting plan is proposed with Roof Rain Water collection Sump with capacities of 50, 2×70, 3×90, 95, 100 cum and 18 nos. of tube wells to recharge the ground water.

Power requirement for the project is 22,159 kW will be drawn from BESCOM. Transformer center of 1 x 1250 kVA, 1 x 1600 kVA, 2 x 2000 kVA, 7 x 2500 kVA capacities will be installed. Diesel engine driven generators of 14×2000 kVA will be used as a source of backup power. The proposed project encompasses the usage of non-conventional energy source i.e. use of solar energy. The overall energy savings from the proposed project is around 24.5%.

Proposal for scientific handling of solid waste, e-waste & hazardous waste will be examined and adequate safeguard will be proposed. Organic waste converter will be proposed to convert garbage into compost of about 1.2 MT/day & the generated in-organic waste will be given to the waste collectors for recycling for further processing of amount 4.8 MT/day. Sludge from STP will be around 43.5Kg/day will be used as manure for in-house landscaping.

The project planning includes extensive plantations along the site periphery and also professionally designed landscape and greenery which includes plantations of native or adapted trees and plants. The construction period of the proposed tower will be about 60 months. The total investment cost involved in setting up of the project is estimated to be about Rs. 1,250 Crores.

4. DESCRIPTION OF THE ENVIRONMENT

For the preparation of EIA, baseline study has been carried out as per the generic structure provided in the Appendix III of the EIA notification 2006 of MoEF & as per the EIA GUIDANCE MANUAL for Building, Construction, Township and Area Developmental Projects prepared by Administrative Staff College of India, Hyderabad dated February 2010 and as per the CPCB standard references.

Baseline study was conducted in the summer season during the month of January to March 2017, for an area covering 10km radius with project site as center. Secondary data/ Micrometeorological data have been collected from IMD, Bengaluru to assess the base line

environmental status. Collection & analysis of baseline environmental data have been done on ambient air quality, noise quality, surface & ground water quality attributes.

In addition to the baseline environmental monitoring, field inspection in the study area, collection of secondary information for the environmental components and discussion with the officials and local public were also conducted.

A total of 8 samples were collected from the study area. The samples have been analyzed for physio-chemical parameters. At the above mentioned sites, two kg of soil samples were collected by means of augur, filled in polythene bags and sent to the laboratory for analysis. The soil samples were collected at a depth of 10-15 cm (top soil).

Secondary information on meteorological conditions for the project study region was collected from the IMD station at Bangalore. Wind rose diagram shows that during the study period, average wind speed of 7.6km/hr was observed. Wind direction is also studied during different time of the day, during the study period, indicate that maximum windblown was from North East direction. Down wind direction is South West.

Ambient air quality monitoring (AAQM) was carried at 8 locations. The result of AAQM reveals that, measured values for PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO are well within the NAAQ, 2009 standards. This indicates that the ambient air quality of the study area is satisfactory in nature. Ambient noise levels monitoring was carried at 8 locations and results were found to be within the CPCB standards.

The results of hydro geological surveys reveal that, the phreatic aquifers are totally absent in the area. Ground water development in the area is through bore wells, ranging in depth from 50 – 200 m. Depth to water level range from 17.13 to 78.85 mbgl. Water levels of more than 80 mbgl are noticed in few isolated patches around Kodathi. Discharges of the bore wells range from 1,500 – 20,000 liters per hour sustaining pumping of more than 8 hours per day. High yielding bore wells of more than 20,000 liters are uncommon in the area. The potential water bearing zones are located as isolated patches along the nala courses and near the surface water bodies.

From the reconnaissance survey information on flora and fauna in the study area and project site was collected. Further, conservation status of the same were evaluated referring to IUCN website & Red Data Books of the Botanical Survey of India. Information on various groups of animal species found in the study area was collected by both direct and indirect observations. Later, by using IUCN Red List/ Wildlife (Protection) Act, 1972 Schedules was referred to know their conservation status. Trees, shrubs, herbs found at the site are common

and native to the region. There are no rare, endangered, threatened species found in the study area and also at site

5. ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURE

Land Environment:

During construction phase, site clearing activities and formation of approach roads will lead to air pollution due to dust and also cause minor secondary impact such as decreasing the water infiltration, loosening of soil. To mitigate the same, water sprinkling will be undertaken to reduce fugitive load and measures such as reuse of excavated top soil for greenery development, slope stabilization and construction of embankments, balanced cut and fill operations will be undertaken for effective area development.

During operation phase, if the sewage is not properly treated to the discharge norms of KSPCB and if used for greenery development or due to over usage will result infilthy/unaesthetic/odour nuisance conditions and indirectly affects soil and ground water of the region. Hence, to mitigate the above impacts, the sewage will be treated in scientifically designed STP that enables to treat in compliance to KSPCB discharge standards for secondary reuse applications.

Air Environment:

Site clearing, excavation work, transportation of raw materials, emissions from construction vehicles, etc., will result in generation of dust. Ambient air quality impacts from emissions during construction of the project are estimated using air quality dispersion modeling analysis. The modeling analysis considers the construction site location and the sources of emissions during construction, including vehicle and equipment exhaust and fugitive dust.

As part of the mitigation measures, periodic water sprinkling will be carried out in all the dust generating activities like site clearing, leveling, excavation, material handling, etc. to suppress the dust. Also, vehicles delivering loose and fine materials like sand and fine aggregates will be covered with tarpaulin to reduce spills on the roads and also to reduce fugitive emissions.

During operation phase of the project, the source of emission will be from DG sets, will be used as a backup power only during power failure and vehicular emissions.

As part of the mitigation measures, height of the Stacks/chimneys to D.G. Set as per KSPCB norms will be restricted to minimum 15m AGL for effective dispersion of pollutants

into atmosphere with HSD with sulphur content of <0.05%. Further trained security will take care of smooth entry/exit of vehicles to avoid traffic congestion within and near entry/exit. As advisory in nature, instructions will be displayed to the employers of the projects to undergo their vehicles for pollution control check time to time, which is also a mandatory under the Moto Vehicles Act, 1988.

Noise Levels: During construction phase, various sources of noise pollution will be mainly from operation of machineries like compactors, concrete plant, cranes, batch plants, material lifting operations, communication noise, DG sets, honking etc.,

As part of the mitigation measures, barricades will be erected all along the site boundary to avoid noise nuisance on the surrounding population, acoustic enclosures to DG sets will be ensured & trained security will be deployed for smooth entry/exit in & around the construction sites/blocks which also helps in reducing unnecessary honking. As a health measure, Ear plugs will be provided to the workers exposed to high noise prone activities.

Surface and Ground Water Quality:

During Construction phase, impacts are anticipated through disposal of sewage generated from the labour in the site if not managed properly. Also, improper treatment of sewage from labour in the site leads to infiltration into the subsurface soil and finally affects the ground water of the region. As part of the mitigation measures, sewage from the labour in the site is being treated in mobile STP & implemented as per the guidelines.

During operation phase, if the sewage is not properly treated to the discharge norms of KSPCB and used for greenery development or due to over application will result in filthy/unaesthetic/odour nuisance conditions and indirectly affects soil and ground water of the region. To mitigate the above impact, the sewage from the proposed project will be collected through an internal network of sewerage system and discharged into the STP of capacities 300 & 570KLD and treatment method is based on sequential Batch Reactor Technology. Treated wastewater will be reused for greenery development, toilet flushing, HVAC, within the site premises.

Solid and Hazardous Waste Management:

During Construction Phase, improper management of solid waste generated from the labour in the site leads to leachate formation under moisture conditions or when layers comes in contact with water will affect groundwater through percolation of leachate into subsurface

soil. Improper disposal of construction debris, used oil from DG sets and biomedical waste will result in causing ground water contamination and chances of spread of infectious diseases and increased health risks to labour force. As part of the mitigation measure, solid waste generated from labour in the site will be collected in separate bins and dispose to BBMP trucks.

Nearly 1,47,748 Cum of excavated earth & 300 cum of construction debris will be reused for various purposes within the site. Also, used oil/waste oil generated from DG sets & biomedical wastes will be collected/ stored in leak proof drums/barrels/bins and disposed to the KSPCB authorized reprocessors/recyclers.

During operation phase: Solid Waste - Domestic solid waste from the proposed commercial project will 6.0 MT/day. If this quantum of solid waste is not handled scientifically and disposed improperly will result in leachate formation and affects the ground water through percolation of leachate into subsurface soil. Out of which, organic wastes contributes to 20% i.e., 1.2MT/day will be composted using organic waste converters and compost will be reused within the project site & excess will be sold in the market and inorganic wastes contribute around 80% i.e, 4.8MT/day will be handed over to authorized recycle. Apart from the above, 43.5Kg/day of STP sludge will be dewatered and reused as manure within the project site.

Hazardous waste from the proposed commercial project, the hazardous waste namely used oil from DG Sets maintenance will be collected in leak proof barrels/drums/containers and disposed to KSPCB approved reprocessors/agencies.

Biomedical waste and E-waste is expected from to the project. Bio Medical wastes will be segregated in different colored Bins as per BMW Rules, 1998 & E-wastes will be segregated as per size and accordingly stored in closed rooms and finally disposed to KSPCB authorized/ approved agencies.

Ecology and Biodiversity:

Construction Phase - No protected areas, eco sensitive areas, etc are present within 5km of the project site. Impact on biological environment (flora and fauna) will be anticipated due to changes occurring on air, water and land environment. Impacts that are anticipated during construction phase on biological environment are due to clearing of vegetation, transportation of raw materials, disposal of raw materials and generation of noise from construction activities.

Operation Phase - No major impacts will be anticipated during operation phase of the project on biological environment. However, with the development of greenery within the project with various indigenous species (flowering, fruit bearing) will attract many birds, butterflies, etc. Maintenance of greenery will be undertaken throughout the year.

Socio-economics:

During construction period, socio-economic impacts are identified as

- Health impact due to dust, noise, improper sanitation during construction activities. Same will be mitigated through proper implementation of EMP.
- Generation of employment will benefit the local population. More than 200 labours including technical staff, workers etc will get employment
- Increase in commercial activities: Many small shops/vendors can offer their services to construction workers and people visiting the project site.
- Since, traffic density is very thin in the surrounding road network, therefore the increased traffic on the main road to the project will be very easily absorbed. Proper maintenance of construction vehicles will minimize health impacts due to noise, dust, emissions.

During operation phase, socio-economic impacts are identified as

- Health impact due to dust, noise, improper sanitation during operation phase. Same will be mitigated through proper implementation of EMP for operation phase.
- Generation of employment will benefit the local population. More than 100 persons will get employment for day to day maintenance activities in the project.
- Increase in commercial activities: Many small/medium/large shops/vendors can offer their services to residents/occupants of the project.
- Since, traffic density is very thin in the surrounding road network, therefore the increased traffic on the main road to the project will be very easily absorbed. More than sufficient parking will be provided, therefore no piling of vehicles near the entry/exit.

Overall evaluation of impacts on various environmental parameters indicates that, during construction phase without mitigation measures there will be a significant impacts and if suggested mitigation measures will be implemented, the impacts will be very minor in nature. Similarly, during operation phase, without mitigation measures, there will be a significant impacts and if suggested mitigation & management measures will be implemented, the impacts will be minor in nature.

6. ENVIRONMENTAL MONITORING PROGRAMME

Monitoring Schedule for Environmental Parameters

Sl. No.	Particulars	Monitoring frequency	Duration of monitoring	Important parameters for monitoring
I.	**Air Quality**			
1.	Ambient Air monitoring			
	Project premises	Once in a month	24 hourly sample	$PM_{2.5}$, PM_{10}, SO_2, NO_2, Ozone, lead, Carbon Monoxide, Ammonia, Benzene, Benzo (a) Pyrene, Arsenic, Nickel.
2.	Stack Monitoring	Once in a month	Grab	SO_2, SPM, NO_x,HC & CO
II	**Water and Wastewater Quality**			
1.	Water Quality			
i.	Ground water at two locations (up-gradient and down-gradient) of treated effluent discharge area/ land	Once in a month	Grab	As per KSPCB requirements
2.	Wastewater quality			
i.	Inlet to STP	Daily	Composite	-
ii.	Treated effluent prior to discharge	Daily	Composite	-
III	**Soil Quality**			
1.	Within project premises at 1 location on effluent discharging area / land	Once in a month	Composite Sample	As per KSPCB requirements
2.	Ecological preservation and up-gradation	Seasonal	Visual observation	Survival rate
IV	**Noise Monitoring**			
1.	Project premises	Once in a month	Day and Night	As per KSPCB requirements

7. ALTERNATIVE TECHNOLOGIES AND SPECIFIC STUDIES

Following are the specific studies carried out with respect to the proposed project which are as follows:

- Transportation (Traffic studies and Management measures)
- Building material and technologies
- Energy conservation analysis

8. PROJECT BENEFITS

- Generation of employment will benefit the local population. More than 300 construction labours including technical staff, workers etc will get employment

- More than 100 persons will get employment during operation phase for day to day maintenance activities in the project. Approximately 200 maids will get job for their lively hood
- Development of greenery within the project with various indigenous species (flowering, fruit bearing) will attract many birds, butterflies, etc
- Eco friendly handling of domestic solid waste, resulting in the organic manure, therefore minimizing the dependency on inorganic fertilizers.
- Excess organic manure can be given to nearby farmers/agricultural lands.
- Conservation of water by utilizing the treated wastewater for urban secondary reuse applications in the project.

9. ENVIRONMENTAL MANAGEMENT PLAN

During construction, as part of the EMP, erection of barricades around the periphery, water sprinkling, sewage management through mobile STP, storm water management through drainage arrangements, traffic management, scientific management of solid waste, hazardous waste, bio medical waste and e–waste measures will be undertaken towards better implementation of the project.

During operation phase, use of STPs, organic waste converters, energy conservation features, rain water harvesting and recharging, scientific disposal of hazardous waste, bio medical waste and e–waste, greenery development and corporate social activities around the project site will benefit the environment.

The total cost of implementing above EMP works out to Rs. 49.5 Crores. The operational cost of the same is estimated to be Rs. 142 Lakhs per Annum.

Overall, the project will have minimum impact on the environment, if the recommended/ suggested various environmental mitigation & management measures as stated in this report are implemented by the project proponents inspirit.

PROJECT AT A GLANCE

1.	Project name		***"IBC WISDOM WORLD"***
2.	Project type		*Development of Commercial (IT/BT) Building*
3.	Name & contact address of the project proponents		***Mr. Ziaulla Sheriff,*** *Director* ***M/s. Wisdom World Developers Pvt Ltd*** *At No. 73/1, Sheriff centre, 5th floor, St Marks Road, Bengaluru-560001*
4.	Project location		*At Survey No's. 173/3, 173/5, 173/6, 176, 177, 178/1, 179, 183/1, 183/2, 184/1, 184/2, 184/3, 187/1, 189, 190, 197/1, 197/2 of Bellandur Amanikere Village, Varthur Hobli, Bengaluru East Taluk, Bengaluru District*
	Latitude of the project site		*12º 56'41.85"N*
	Longitude of the project site		*77º42'0.26"E*
5.	Estimated cost of the project		*Rs 1,250 Crores*
6.	Total site area		*83,061.04 Sqmt (20Acres 21 Guntas)*
7.	Total Built-up area		*4,37,473.09 Sqmt*
8.	Total ground coverage area		*30,009.74 Sqmt*
9.	Total landscaping area		*27,518.41 Sqmt (36.6%)*
10.	Height of the building		*51m (maximum)*
11.	Status of the project		*Vacant site*
12.	Ground coverage		*41.55% (permissible = 45%)*
13.	FAR achieved		*3.236 (permissible = 3.25)*
Resource Requirements: Construction Phase			
14.	Total manpower required		*300 Nos.*
15.	Power requirement		*500 kVA*
16.	Water requirement for construction activities		*50 KLD*
17.	Domestic water requirement during construction		*14 KLD*
18.	Source of water for construction		*External authorized tanker water suppliers*
Resource Requirements: Operation Phase			
19.	Total number of occupants		*23,636 numbers of employers*
20.	Electrical details	Source	*Power requirement is sourced from BESCOM*
		Power requirement	*22,159 kW*
		Transformers	*1 x 1250 kVA, 1 x 1600 kVA, 2 x 2000 kVA, 7 x 2500 kVA*
		DG sets	*14×2000KVA*
21.	Total water requirement during operation phase		*1,082KLD*
22.	Net fresh water requirement		*601 KLD*
23.	Flushing/recycle water		*481 KLD*
Environmental Setting			
24.	Baseline study area		*Area covering 10 km radius around the project site.*
25.	Baseline study period		*Month of January to March 2017*
26.	Soil type in the study area		*Sandy*

27.	Water quality	*8 ground water samples including project site and one surface water sample. Analysis results are tabulated in the EIA report.*
28.	Ambient air quality	*In 8 stations, ambient air quality analysis was carried out as per the CPCB guidelines. Results are tabulated in the EIA report.*
29.	Baseline noise levels	*8 noise sampling locations were selected and analyses were carried out. Results are tabulated in the EIA report.*
30.	Nearest highway	*45m outer ring road connects to Sarjapur road and Marathahalli –approach road– (W)*
31.	Nearest railway station	*Bellandur Railway Station – 1.2 km (SE)* *Bengaluru city Railway Station - 19 km (NW)*
32.	Nearest airport	*Kempegowda International Airport - 28km (N)*
33.	Nearest lake	*Bellandur Lake-2.24 km (W)* *Varthur lake-2.5 km (E)* *Munekolala lake- 1.91 km (N)*
34.	Nearest Town/City	*City - Bengaluru*
35.	Seismic Zone	*Seismic Zone – II*
36.	Archaeologically important Places	*None within 10 km radius*
37.	Protected areas as per Wildlife Protection Act, 1972	*None within 10 km radius*
38.	Reserved/ protected forests	*None within 10 km radius*
39.	Defence Installations	*HAL Airport - 1.3 km (NW)*
40.	Interstate Boundary	*None within 10 km radius*
41.	Designated Land use of the Project site	*The project site is designated for Hi-tech zone with mutation corridor as per Revised Master Plan – 2015*
Environmental Management Plan: Construction Phase		
42.	*Soil Erosion*	*Temporary seeding will be done like planting of fast growing grasses to hold down the soils in disturbed areas so that they are less apt to be carried offsite by storm water runoff or wind.*
43.	Noise Pollution from Construction equipments	*Acoustic measures for the noisy equipments and limited construction activities during day time.*
44.	Quantity of Domestic sewage during construction	*11.2 KLD*
45.	Mode of treatment and disposal of domestic sewage (construction)	*Generated sewage will be collected in collection tank and will be treated in mobile STP*
46.	Air emissions from construction equipments	*Optimal usage of equipments and use of high quality fuel like HSD.*
47.	Air emissions and traffic volume due to raw materials transportation	• *Vehicles carrying construction materials will be well covered to avoid any spillage.* • *Raw material transportation vehicles will be*

		maintained in good condition. • *Traffic of 15 trucks/ day would be made to ply during less traffic hours.* • *Planning of optimal routes for the vehicles.*
48.	Labour management	*Skilled laborers will be sourced locally.*
	Environmental Management Plan : Operational Phase	
49.	Quantity of Sewage generated	*866 KLD*
50.	Mode of treatment for Sewage	*This sewage is treated in a sewage treatment plant to treat the sewage up to urban reuse standards using STP of capacities of 300 & 570 KLD of Sequential Batch Reactor (SBR) Technology.*
51.	Quantity of treated sewage and mode of disposal	*Quantity of treated sewage: 823 KLD.* *Out of this, 481 KLD will be used for flushing, 165KLD will be used for landscaping, 177 will be used for HVAC*
52.	Air & Noise pollution containment	• *DG sets meeting the emission norms prescribed by KSPCB will be used.* • *Adequate stack height will be provided.* • *Acoustic enclosures will be installed in order to attenuate the noise level.*
53.	Domestic solid wastes	*Total quantity: 6.0 MT/day* *Biodegradable wastes: 1.2 MT/day* *Non biodegradable wastes: 4.8 MT/day*
		The solid wastes generated shall be collected separately as organic and recyclable wastes in the respective bins provided. *The segregated organic wastes will be processed in organic waste converter.* *The segregated recyclable wastes will be given to authorized vendors for further processing.* *STP Sludge shall be used as manure for gardening and landscaping.* *Hazardous wastes like waste oil from DG sets, used batteries, CDs, computer etc. will be handed over to the authorized hazardous waste recyclers.* *Generated E-Wastes will be collected separately & handed over to the authorized & approved by KSPCB E-waste processors.*
54.	Sludge from STP	*43.5kg/day, which will be used as manure for landscaping & gardening.*
55.	Optimal utilization of natural resources and non-conventional energy sources	*Terrace runoff will be routed to roof rain water collection tank of capacity 1×50cum, 2×70cum, 3×90cum, 1×95cum, 1×100cum and will be used after pre-treatment. Surface runoff will be routed to 18 No's of tube*

		wells through internal garland drains to recharge the ground water and excess will be discharged to the existing storm water drain. *Energy conservation devices such as Solar street lights, LEED bulbs, High Frequency ballast, Copper wound transformer are proposed in the project.*
56.	Car Parking facility	*Required = 4,818 no's,* *Provided = 4,862 no's*
57.	Landscape development	*Native species are proposed for the landscape development.*

CHAPTER – 1

1.0 INTRODUCTION

1.1 PREAMBLE

M/s. Wisdom World Developers Pvt Ltd is proposed for development of Commercial (IT/BT) office building by name "IBC WISDOM WORLD" at Survey No's. 173/3, 173/5, 173/6, 176, 177, 178/1, 179, 183/1, 183/2, 184/1, 184/2, 184/3, 187/1, 189, 190, 197/1, 197/2 of Bellandur Amnikere Village, Varthur Hobli, Bengaluru East Taluk, Bengaluru District, Karnataka. The proposed project is having total plot area measuring of 83,061.04 Sqmt (20Acres 21 Guntas).

As per the schedule of EIA Notification - 2006; the proposed project comes under item 8(b) and apprised as B1 (since BUA ≥ 1, 50,000 Sqmt). Project requires EC for total built-up area 4,37,473.09 Sqmt consisting of seven blocks of IT/BT office and another building with MLCP and convention center building with the configuration of 2B+G+13 UF with max height of 51m.

Initially application has been submitted to State Environmental impact assessment proponent to obtain environmental clearance with the built-up area of 2,38,701.28 Sqmt on 31.2.2017 and obtained TOR copy from SEIAA, Karnataka on TOR Vide No. SEIAA: 32 CON 2016 dated 11.4.2016.

Due to change in the plan, again revised TOR application has been filed dated 19th June 2018 with the total built up area 4,37,473.09 Sqmt along with Form-1, Form-1A and proposed Terms of Reference (TOR). Based on the information furnished and presentation done before the State Expert Appraisal Committee (SEAC) members, proposal was appraised in the 203th State Expert Appraisal Committee (SEAC) meeting, held on 18th August, 2018. Subsequently Authority has issued the TOR (Terms of Reference) for preparing Environmental Impact Assessment (EIA) report vide letter No. SEIAA 38 IND 2016 dated on 10th 9, 2018.

Environmental Protection and Sustainable Development have been the cornerstones of the policies and procedures governing the industrial and other developmental activities in India. Ministry of Environment & Forests has taken several policy initiatives and enacted environmental and pollution control legislations to prevent indiscriminate exploitation of natural resources and has promoted integration of environmental concerns in developmental projects. One such initiative is the Environmental Impact Notification S.O. 1533 (E), dated 14th September 2006, as amended 2009, and amended in 2016 issued under Environment

(Protection) Act, 1986, and has made it mandatory to obtain Environmental Clearance for specified categories of developmental projects.

EIA is an important tool for incorporating environmental concerns at the project level. It is a planning tool which is generally accepted as an integral component of sound decision-making. Its overall purpose is to establish a coherent policy and provide a basis for the co-ordinated work of various Government agencies with operational responsibility for the Environment & Natural resources. The objective of EIA is to foresee and address potential environmental problems/concerns at an early stage of project planning and design, early identification and characterization of critical environmental impacts allow the public and the Government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts.

1.2 PURPOSE AND NEED OF THE PROJECT

In the fast developing world these days the population is also increasing rapidly, so that the small towns and cities are changing into metropolitan cities there is scarcity of land in the cities and the business is growing and expanding very rapidly.

In the present scenario most of the countries over the world have relied upon Indian Software Company and firms or Software Companies for the software development activities, as the country possesses a global competency in the IT sector.

The Software development companies in India comprise of businesses related to the production and maintenance of computer software. The roots of the Software Industry in India lie in the IT phenomenon. Services regarding software such as training, consulting and maintenance are a part of this ever-growing industry. The Software companies are witnessing a rapid growth and offers lucrative job opportunities making IT a premium career option for the youth.

Bengaluru is one of the fast growing cities in Asia and one of the most sought after cities in India by people, companies, multinationals and Tourist. Bengaluru has come a long way. It has been able to carve a niche for itself as the most preferred one with IT/BT/BPO and other tech companies. There has been an upsurge in the demand for office realty in Bengaluru.

Therefore, in order to assess the potential environmental impacts arising due to the proposed commercial building project, M/s. Wisdom World Developers Pvt Ltd has appointed M/s. AM Enviro Engineers, Bengaluru to undertake Environmental Impact Assessment (EIA) study which covers a wide range of technical disciplines and incorporates baseline data for

various environmental components, viz. air, noise, land, water quality & hydrology, ecology & biological parameters along with the parameters of human interest for the Environmental Impacts Assessment and to prepare Environmental Management Plan (EMP) for mitigating the adverse impacts along with improvement and alternatives including delineation of post project Environmental Monitoring Programme.

An Environmental Impact Assessment (EIA) is prepared, based on studies carried out during the month of January to March 2017. The environmental attributes like ambient air, water, noise, land including biological and socio-economic components of environment for an area covering 10km radius with project site as centre.

1.3 BACKGROUND OF THE PROMOTERS

Wisdom World Developers Pvt Ltd is a private company incorporated on 24th September 2013. It is classified as Indian Non-Government Company and is registered at Registrar of companies, Bengaluru. It is involved in building of complete constructions or parts thereof; civil Engineering. Directors of Wisdom World Developers Pvt Ltd are Mr. Ziaulla Shariff and Ms. Sayeeda Hina.

Over the past half a decade, IBC Wisdom Group has built and operated a wide range of state-of-the-art projects. Wisdom projects are renowned for their innovation, award winning design & build approach and adherence to the most contemporary global standards.

1.4 OBJECTIVES OF THE EIA STUDY

The purpose of Environmental Impact Assessment (EIA) is to assist in the decision making process and to ensure that the projects under consideration are environmentally sound and sustainable. EIA identifies the ways of improving project environmentally by preventing, minimizing, mitigating or compensating for adverse impacts.

Urban development projects including housing and office complexes do have the potential in altering environmental resources of any urban area. They cause stress on local environmental assets of the urban area and could become the potential source for limiting the growth of the city. Unplanned construction and operation of such projects usually result in impacts on various facets of Environment keeping above issues under considerations, an Environmental Impact Assessment (EIA) study is conducted which incorporates into development and planning process, a plan for environmental protection and conservation. The procedure identifies the possible positive and negative impacts on the environment likely to emanate as a result of construction and operation of a project. The EIA thus, provides for a

plan which, upon implementation, will reduce or offset the negative impacts of a project resulting in a minimum level of environmental degradation. This minimization may be a result of implementation of a project or environmental protection measures which simply reduces the severity or number or magnitude of negative impacts. The plan may also result in utilization of positive impacts for enhancement measures which offset negative impacts.

To measure the level of plan implementation and the degree of effectiveness of the above environmental protection provisions, the EIA provides a monitoring programme. This programme is so designed that it identifies the parameters of uncertainty and measures the related impacts.

It is necessary that there is close integration of EIA with various aspects of a project including financial and engineering aspects which ensures environmental consideration are given due weight in project selection, sitting design and operation.

Analysis of past experiences indicate that it is necessary to examine a number of problem areas in order to ensure that environmental concerns can be effectively integrated in the development process. Similar approach has been adopted while conducting the EIA study for the proposed IT office building.

1.5 STAGES IN THE EIA STUDY

The purpose of this section is to itemize the methodology for Environmental Impact Assessment (EIA) which has been followed for this study. Any activity relating to construction and operation is expected to cause impacts on surrounding environment. The impacts may be adverse or beneficial, short term or long term, and reversible or irreversible. In order to assess the significance of impacts, various steps that are used in conducting an EIA within core and buffer zone around the proposed project construction site are divided into the following phases:

- Identification of significant environmental parameters and assessing the existing status within the impact zone with respect to air, water, noise, land, biological, and socioeconomic components of environment.
- Study of various activities of the proposed project components to identify the areas leading to impact/change in environmental quality.
- Identification of potential impacts on various environmental components due to the activities envisaged during pre-construction, construction, and operational phases of the proposed project.

- Prediction of significant impacts on the major environmental components using qualitative / quantitative techniques.
- Preparation of environmental impact statement based on the identification, prediction and evaluation of impacts.
- Delineation of environmental management plan (EMP) outlining preventive and curative strategies for minimizing adverse impacts during pre-construction, construction and operational phases of the proposed project.
- Formulation of environment quality monitoring programme for construction and operational phases to be pursued by the project proponent.

The environmental impact assessment in India was started in the year 1976-77 when the Planning Commission asked the Department of Science and Technology to examine the river-valley projects from environmental angle. This was subsequently extended to cover those projects, which required approval of the Public Investment Board. These were administrative decisions, and lacked the legislative support. The Government of India enacted the Environment (Protection) Act on 23rd May 1986. To achieve the objectives of the Act, one of the decisions that were taken is to make environmental impact assessment statutory. After following the legal procedure, a notification was issued on 27th January 1994 and subsequently amended on 4th May 1994, 10th April 1997, 27th January 2000, 7th July 2004 and 14th September 2006 making environmental impact assessment statutory for 32 projects /activities. This is the principal piece of legislation governing environmental impact assessment. As per the EIA Notification, 14th September 2006 published in the Gazette of India, Extraordinary, Part-II and Section-3, Sub-section (ii) Ministry of Environment and Forests, proposed project is listed as Category 'B1' as per Item No. 8(b) mentioned in the schedule (Covering an area = 50 ha and or built up area $\geq$ 1,50,000 Sqmt). So, the category B1 Projects requires preparation of EIA Report.

In order to get an idea about the existing state of the environment, various environmental attributes such as meteorology, air quality, water quality noise level, soil quality, ecology and socio-economic environment were studied / monitored. Details of flora and fauna were identified in the study area comprising of core and buffer zone for identification of existing species and classifying them as per Wildlife (Protection) Act, 1972.

1.6 SCOPE OF ENVIRONMENTAL IMPACT ASSESSMENT

EIA study includes determination of baseline conditions, assessment of the impacts on the environment due to operation of the project and making recommendations on the preventive measures to be taken, to minimize the impact on the environment to acceptable levels. A suitable post-study monitoring program will be outlined. Scope has been so evolved that the data meets all MoEF requirements for conducting Environmental Impact Assessment (EIA). Various components covered in the baseline environmental studies & methodologies adopted are given below.

EIA study shall cover the following aspects,

- Evaluation of present environmental factors through analysis of generated and collected baseline data for one complete non-monsoon season (3 months).
- Assess the probable impact on the environmental factors due to implementation of the project with respect to existing scenario.
- A thorough study of the process including provisions of pollution control, and Environmental Management Plan that includes prediction of impacts and relevant mathematical modelling.
- Assess the probable risk at the proposed plant.
- Preparation of Environmental monitoring program.
- Develop an Environmental Management Plan and on site Disaster Management Plan for the proposed project to mitigate the negative significant impacts that would arise from the proposed project and controlling the pollution levels
- Environmental Monitoring Plan is suggested for monitoring the pollution loads at various facilities in the premises and to ensure compliance with the statutory requirements.
- The baseline data has been collected for the following environmental components, during January to March, 2017.
    - Air quality
    - Meteorology
    - Noise environment
    - Water use & quality
    - Soil quality
    - Land use, crop pattern, Agricultural practices

- Demographic aspects
- Ecology & Biodiversity

An Environmental Impact Assessment and Environment Management Plan comprising an overall assessment of the impact due to project activity over baseline condition of the existing environment and a mitigating action plan to counter the adverse impact as defined. An environmental monitoring program is also prepared to provide scientific support to future actions of environmental protection.

1.7 STRUCTURE OF EIA REPORT

The EIA report has been structured covering various aspects like project description, baseline conditions, environmental impacts, mitigation measures, environmental management plan as directed by SEIAA vide letter of awarded ToR. Copy of ToR and its compliance is provided at the beginning of this report. Further, the present EIA report has been prepared chapter-wise in accordance with generic structure suggested by MoEF in EIA notification.

TABLE-1.1: Proposed TOR For Environmental Impact Assessment

Sr. No.	EIA structure	Contents
Chapter – 1	Introduction	➢ Identification of project and project proponent ➢ Need, objectives & purposes of EIA study ➢ EIA structure & Regulatory frame work
Chapter – 2	Project Description	➢ Description & Justification of the project ➢ Project location & salient features of the project site ➢ Maps showing project location, plant layout & Description of facilities, infrastructure need, resource requirement, pollution potentials & management
Chapter – 3	Description of the Environment	➢ Approach & methodology of baseline study ➢ Establishment of baseline status for valued environmental parameters as identified in scope ➢ Maps of study area showing sampling & monitoring locations and land use pattern
Chapter – 4	Anticipated Impacts and Mitigation Measures	➢ Identification & prediction of environmental impacts during construction as well as operation phases of the proposed project ➢ Evaluation of impacts on air environment using mathematical model ➢ Mitigation measures for minimizing and/or avoiding adverse impacts during construction as well as operation phase
Chapter – 5	Analysis of site alternatives	➢ Alternative technologies ➢ Justification of site selection
Chapter – 6	Environmental Monitoring Program	Technical aspects of monitoring the effectiveness of mitigation measures including measurement methodologies, frequency, location, data analysis, reporting schedules
Chapter – 7	Additional Studies	--
Chapter – 8	Project Benefits	➢ Employment opportunity and corporate social responsibility CSR ➢ Socio-economic development and improvements in the physical & social infrastructure ➢ Employment & other tangible benefits
Chapter – 9	Environmental Management Plan	➢ Environmental Management Plan for various project activities ➢ Illustration of greenbelt development plan, rain water harvesting system ➢ Budgetary allocation for environment protection
Chapter – 10	Summary and	➢ Salient features of the project covering, project

	Conclusion	description, location, mitigation measures, costing, etc., ➢ Overall conclusion for the proposed project
Chapter – 11	Disclosure of Consultant Engaged	Details of the EIA consultant, laboratory engaged
Chapter – 12	Corporate Environmental responsibility	Details of initiative planned under Corporate Environmental responsibility.

1.8 APPLICABLE ENVIRONMENTAL REGULATIONS AND STANDARDS

With respect to prevention and control of environmental pollution, the proposed project is governed by the following Acts and Rules.

- ☞ Water (Prevention and Control of Pollution) Act, 1974 as amended in 1978 and 1988;
- ☞ Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987;
- ☞ Environment (Protection) Act, 1986 amended 1991 and Environment (Protection) Rules, 1986 and amendments thereafter;
- ☞ Hazardous Waste (Management & Handling) Rules, 1989, as amended in 2000, 2003.
- ☞ The Noise Pollution (Regulation and Control) Rules, 2000 and as amended in 2002, 2006 and 2010.
- ☞ EIA notification dated 07.07.2004 as amended in 14.09.2006 and 01.12.2009 and amended as on 9th December 2016.
  - → Stating that for any project or activity specified in category 'B' in the item 8 of schedule i.e. building/construction projects/area development projects and townships crossing the built up area of more than 1,50,000 Sqmt, TOR should be conveyed to SEIAA, based on the approved TOR, EIA studies should be conducted which also includes an Environmental Management Plan for the mitigation of these impacts.

CHAPTER – 2

2.0 PROJECT DESCRIPTION

This chapter encompasses the details of the proposed project, material and resource requirement during construction and operation phases, utilities, sources of waste generation, estimation of pollution loads and associated infrastructures etc.

2.1 TYPE OF THE PROJECT

M/s. Wisdom World Developers Pvt Ltd is proposed for development of Commercial (IT/BT) office building by name "IBC WISDOM WORLD" also MLCP with Convention Centre building, coming up on a land measuring 83,061.04 Sqmt (20 Acres 21 Guntas) at Survey No's. 173/3, 173/5, 173/6, 176, 177, 178/1, 179, 183/1, 183/2, 184/1, 184/2, 184/3, 187/1, 189, 190, 197/1, 197/2 of Bellandur Amanikere Village, Varthur Hobli, Bengaluru East Taluk, Bengaluru District, Karnataka. The proposed project provides ever green and modern office facility.

2.2. NEED FOR THE PROJECT

Bengaluru is a major city of India and a great place to live. As Bengaluru is teeming with cash-rich young professionals with a considerable amount of disposable incomes; the retail sector has smelt a great opportunity and has increased the demand for residential property even more.

After almost a year of lull due to the economic downturn, the real estate sector in the country's IT capital is slowly picking up and is all set to focus on the middle and upper middle segments, where it envisages huge potential. Customizing their offerings, builders are keen to capture these segments, which are witnessing increasing demand.

Majority of IT activity in Karnataka is concentrated in Bengaluru. Bengaluru is also known as the Silicon Valley of India. Bengaluru has established itself at a pre-eminent position as the nation's leading IT employer and exporter. Rich in its cultural heritage, it has also earned the distinction of being India's major economic hubs. Little wonder it is always counted among the fastest growing metropolis in India. The onset of more and more multinational companies has seen a sudden jump in the number of commercial projects in Bengaluru.

The burgeoning outsourcing and IT industry in Bengaluru have contributed to the demand for quality office space. With most of the blue-chip MNCs setting shop in the

country, the estimated demand from IT sector alone is expected to be 150 million sq ft of space across the major cities.

Bengaluru for their ancient times was shining as the stars by the well famous name of Silicon Valley in India, Which represents all the sides of Bengaluru's position, weather it was historical, financial and related to real estate. In the turf of Bengaluru property, IT (information technology) companies of international status from the whole world have fixed the centers in the city and builders are achieving a golden time catering to their various types of requirements. The IT field as an appearance of commercial real estate, in took special substantial burnt of the immediate recession, but things have backed to almost simply again ending whatever the Bengaluru property area have during the recessionary period.

With the unparalleled increment of the IT sector in Karnataka capital, the demand has increased for both type of commercial and residential real estate for leading in to existence of Bengaluru real estate, in the destination of the city and its near able area.

As the result, property builder in Bengaluru are growing towards boom for achieving success in the field of Bengaluru property market. They are making themselves reserve, building new, ever green and modern office construction.

2.3. PROJECT SITE LOCATION

The proposed commercial development project is located at Bellandur Amanikere Village, Varthur Hobli, Bengaluru East Taluk, Bengaluru district of Karnataka. The environmental setting of the project site, location map and photography of the project site are as follows;

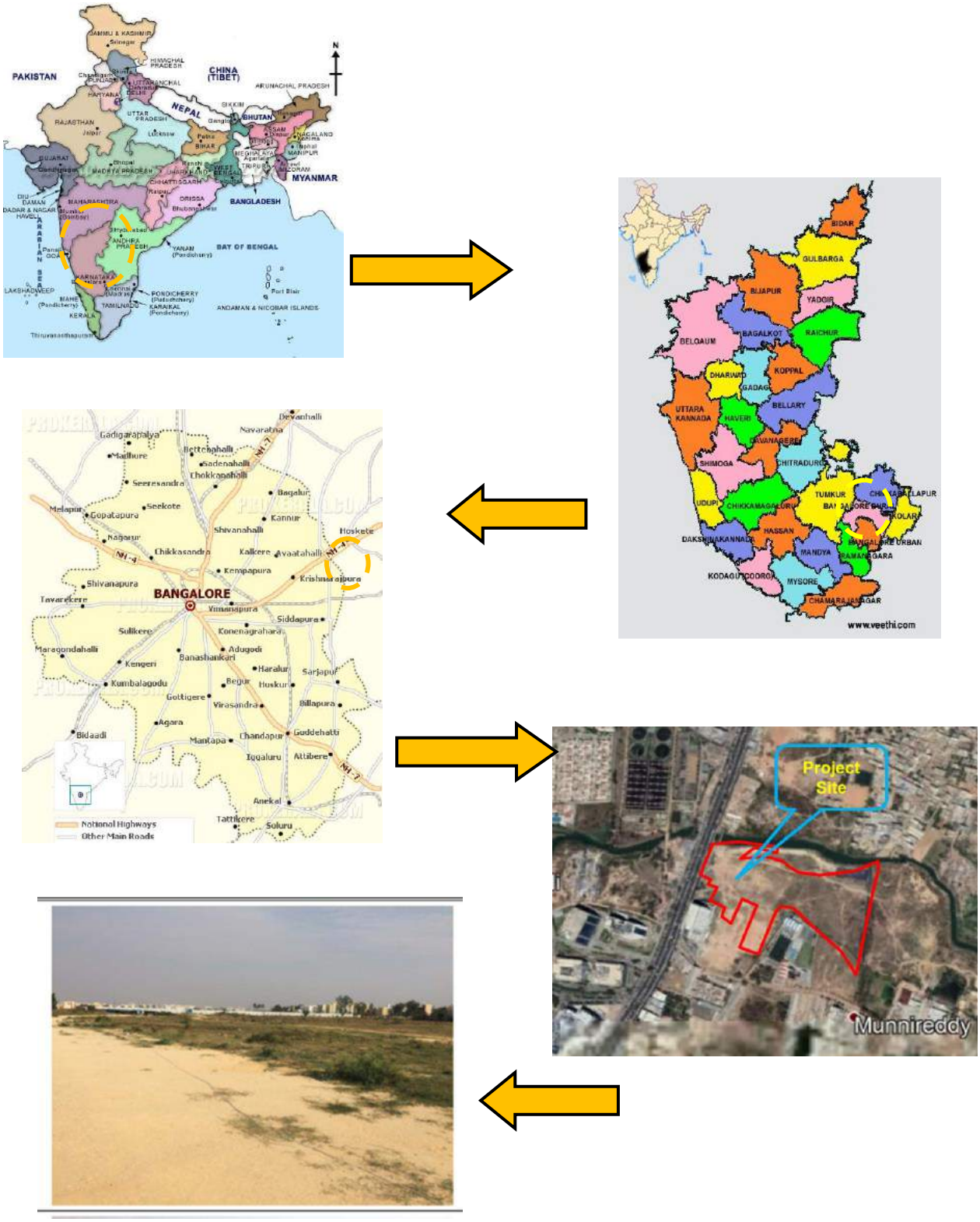


FIGURE-2.1: Vicinity of the project site

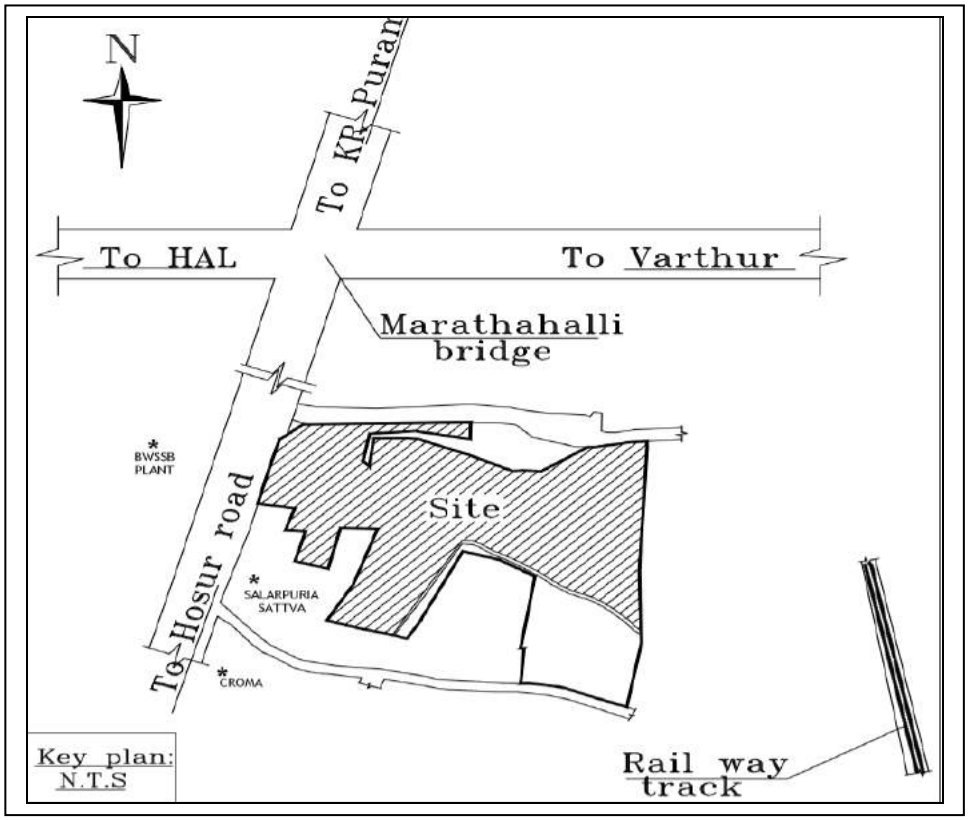


FIGURE-2.2: Location of the proposed project site

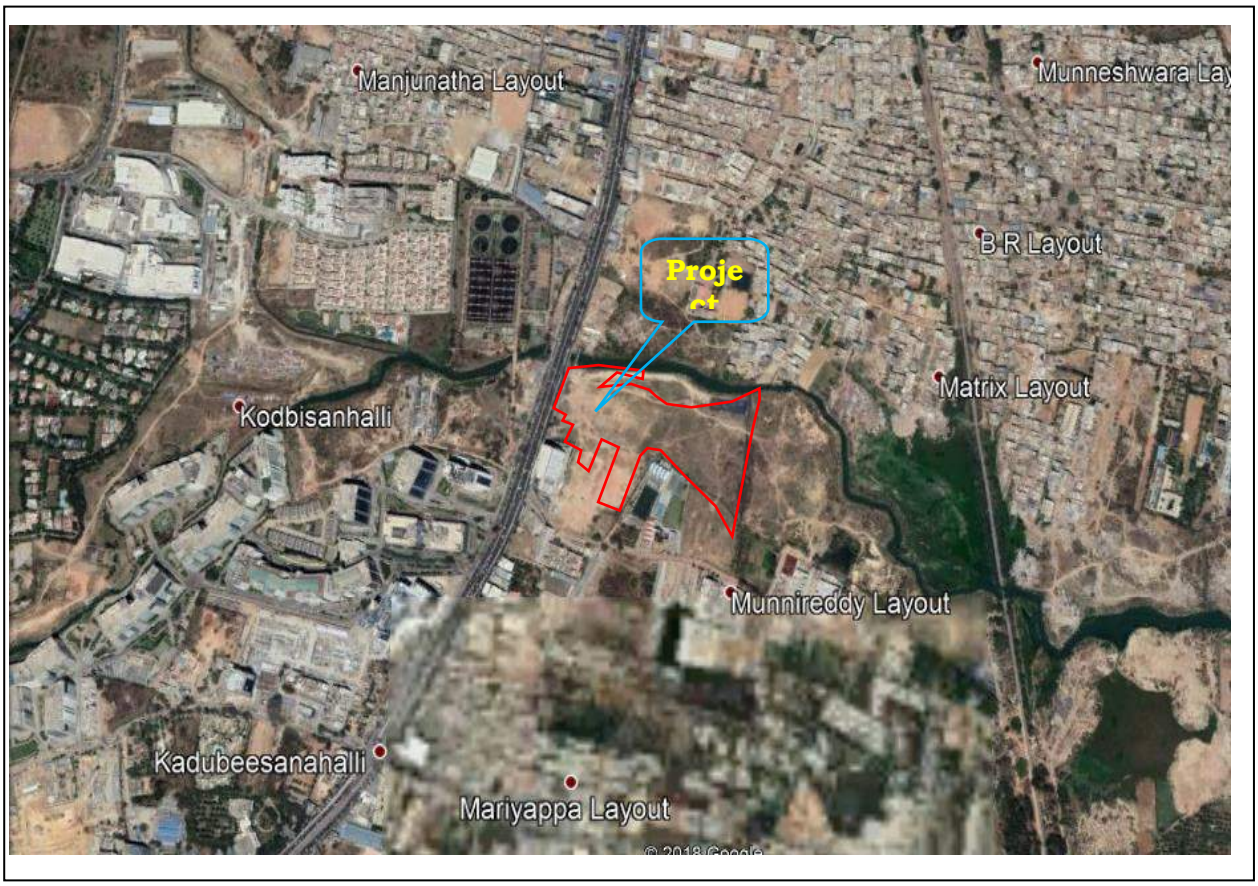
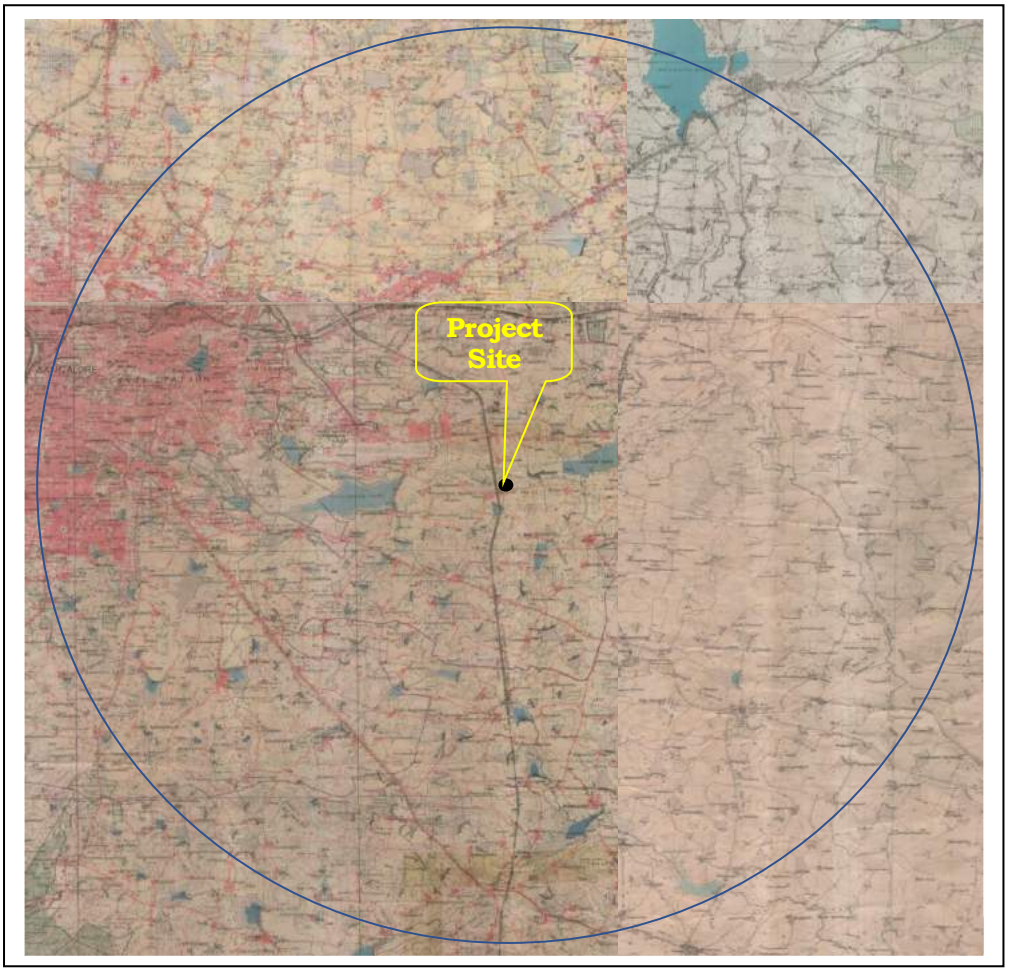


FIGURE-2.3: Aerial view of the project site



*Source: Survey of India (*TOPO SHEET NO: 57 H/9, 57 G/12, 57 H/13, 57 G/16*)*

FIGURE-2.4: Topo map of the project site

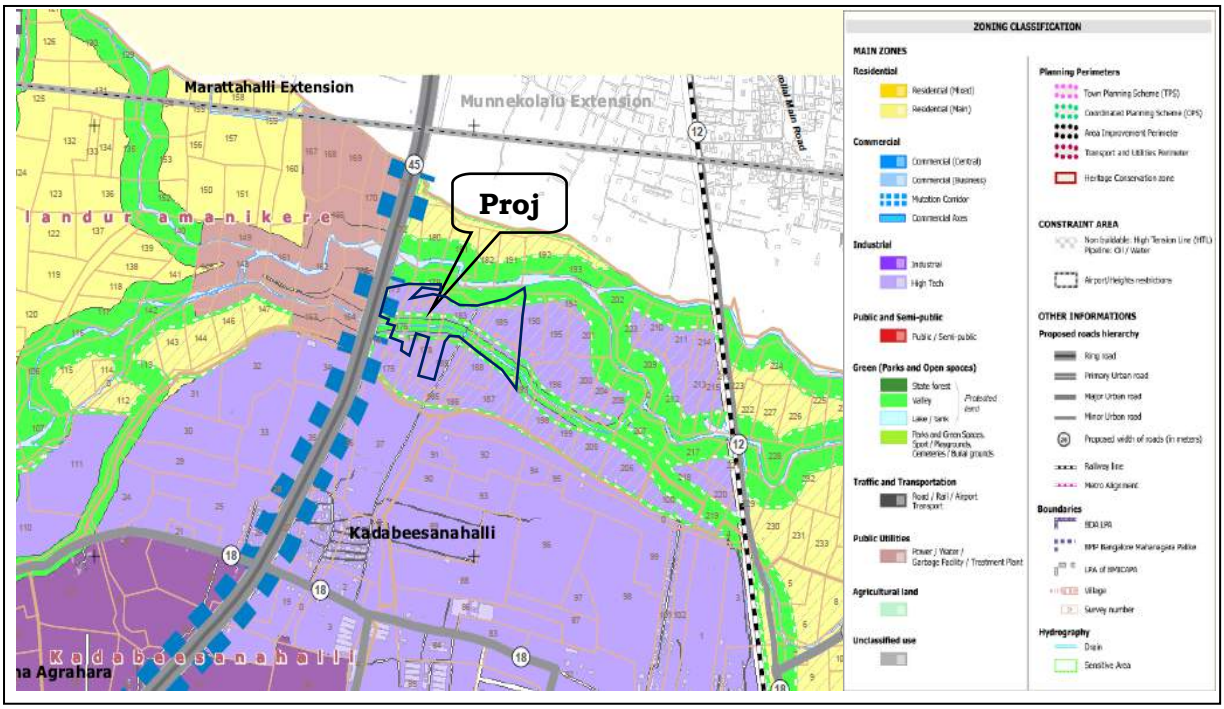


FIGURE-2.5: CDP map of the project site

TABLE-2.1: Environmental setting of the site

SL No	Particulars	Details
1.	Present land use	*As per the Revised Master Plan of BDA-2015, the project site is designated as Hi-tech Zone with mutation Corridor*
2.	Survey of India top sheet No.	*57 H/9, 57 G/12, 57 H/13, 57 G/16*
3.	Site topography	*Project site is a vacant land and is sloping towards Southwest direction.*
4.	Nearest Highway	*45m outer ring road connects to Sarjapur road and Marathahalli –approach road– (W)*
5.	Nearest Railway station	*Bellandur Railway Station – 1.2 km (SE)* *Bengaluru city Railway Station - 19 km*
6.	Nearest Airport	*Kempegowda International Airport - 28km (N*
7.	Nearest Lakes	*Bellandur Lake-2.24 km (W)* *Varthur lake-2.5 km (E)* *Munekolala lake- 1.91 km (N)*
8.	Nearest fire station	*Sarjapur fire station – 4.05km (SW)*
9.	Nearest Town/City	*Town - Marathalli* *City – Bengaluru*
10.	Nearest Villages	*Kadabeesanahalli village*
11.	Seismic Zone	*Seismic Zone – II*
12.	Defense installations	*HAL Airport - 1.3 km (NW)*
13.	Others	*Marathalli Sewage Treatment Plant – 250m (NW)*

Note: All distances mentioned are aerial distance

2.4. PROPOSED SCHEDULE AND APPROVAL FOR IMPLEMENTATION

Successful execution of the project largely depends on the coordinated approach of the project implementing agencies. Proper coordination between the various project execution agencies, monitoring of project schedules, appropriate mobilization of manpower and other resources can achieve affective cost control and timely completion of the project. The broad time frame required for implementation and completion of the project would be approximately 60 months, after obtaining the all necessary clearances.

2.5. DESCRIPTION OF THE PROJECT

The site is abutting 56.5 m road. The present land use of the site as per CDP is Hi-tech zone with mutation corridor. The land use is converted from agricultural usage to non-residential land use by the project proponent. Out of 83,061.04 Sqmt (20 Acres 21 Guntas) of total site area, 2 Acre 12 Guntas of land is B Kharab land which has lost its existence has been purchased & converted for nonresidential purposes. Land documents are enclosed as Annexure-1.

TABLE-2.2: Details of b kharab land

Survey Nos.	Area	Survey Nos.	Area
174	04 Guntas	196/2	01 Guntas
176	01 Guntas	196/3A	01 Guntas
177	01 Guntas	197/1	01 Guntas
178/2	01 Guntas	198/2	01 Guntas
179	05 Guntas	199	02 Guntas
184/1	02 Guntas	201/1A	02 Guntas
478	27 Guntas	201/2	01 Guntas
180/3	01 Guntas	202	05 Guntas
182	01 Guntas	203	03 Guntas
188/3	1.5 Guntas	205	02 Guntas
188/4	1.5 Guntas	206/1A	04 Guntas
191	04 Guntas	206/1B	01 Guntas
193	01 Guntas	206/1C	01 Guntas
195/1	0.5 Guntas	206/2	04 Guntas
195/3	0.5 Guntas	207	05 Guntas

Project requires EC for total built-up area is **4,37,473.09 Sqmt** consisting of seven blocks of IT/BT office and another building with MLCP and convention center building with max height of 51m. The site plan showing proposed components is presented in **Annexure-2.**

The topography of the land at project site sloping towards West direction with an average contour level difference of 1.3m, depending on the detailed contour survey and safe grade elevation/storm water drainage studies with respect to the general grade level of the area. There is a primary nala passing in the north side of the project site by leaving buffer about 50m from the site boundary. Contour plan showing existing contour levels, drainage line etc which is attached as **Annexure-3.**

Construction will be started after obtaining approvals for the existing land. Excavation will be done for basement preparation and it will be restricted to minimize the excavation. The total quantity of excavation from the site is 1,47,748 m^3, the quantity of excavated earth generated from the activity is proposed to reuse within the project site for backfilling, for formation of building & road. Excavated top soil will be stored for reusing for landscaping. During the excavation, the surrounding area will be kept wet, so that there is no dust pollution in the air.

TABLE-2.3: Details of excavated earth and its management

Description	Quantity in Cum	%usage
Total Excavated earth	1,47,748	100
Management		
Backfilling in foundation	36,012	24.37
For landscaping	44,188	29.91
Roads & walkways	41,421	28.04
For compound wall stabilization	26,127	17.68

Layout of the project components have been optimized within the site premises, considering the space requirement for all the services, buildings, structures, raw water storage tank, fire water storage tank, wastewater treatment plants, solid waste management yard etc. Details of the projects are mentioned below:

TABLE-2.4: Project planning details

Project Planning	Details
Total Site area	83,061.04 Sqmt (20 Acres 21 Guntas)
Total Built up Area	4,37,473.09 Sqmt
Height of Building	51 m (maximum)
Ground coverage Area	30,009.74 Sqmt (41.55%)
Latitude	12º 56'41.85"N
Longitude	77º42'0.26"E
Width of the approach Road (m)	56.5m (RoW)
Car Parking required	4,818 Nos.
Car Parking provided	4,862 Nos.

TABLE-2.5: Area Statement

Total site area	83,061.04 Sqmt (20Acres 21 Guntas)
Park and open space area	8,306.13 Sqmt (10% of site area)
Permissible F.A.R	3.25
Achieved F.A.R	3.236
Permissible ground coverage	45%
Proposed ground coverage	30,009.74 Sqmt /72,233.91 Sqmt = 41.55%
Maximum height of the building	51 m (Max.)

TABLE-2.6: Building -wise distribution of blocks

Blocks	Building configuration	Description	Height in m
Block-1	2B+G+9 UF	IT/BT office	43.8
Block -2	2B+G+11 UF	IT/BT office	46.8
Block -3	2B+G+11 UF	IT/BT office	51.0
Block -4	2B+G+12 UF	IT/BT office & 1 unit in 11th floor	51.0
Block -5	2B+G+11 UF	IT/BT office	46.8
Block -6	2B+G+10 UF	IT/BT office	46.8
Block -7	2B+G+10 UF	IT/BT office	46.8
Block -8	2B+G+13 UF	MLCP, convention center building	51.0
Utility building	2B+G+1 UF	--	17.10

TABLE-2.7: Details of land use within the site

Description of usage	Area in Sqmt	%usage
Total site area	83,061.04	--
Area left for road	2,521	--
Net site area	80,540.04	--
10% park and open space	8,306.13	--
Total site area for development	72,233.91	100
Ground coverage area	30,009.74	41.55
Landscape area	19,212.28	26.60
Driveway area	18,740.01	25.94
Surface parking area	4,271.88	5.91

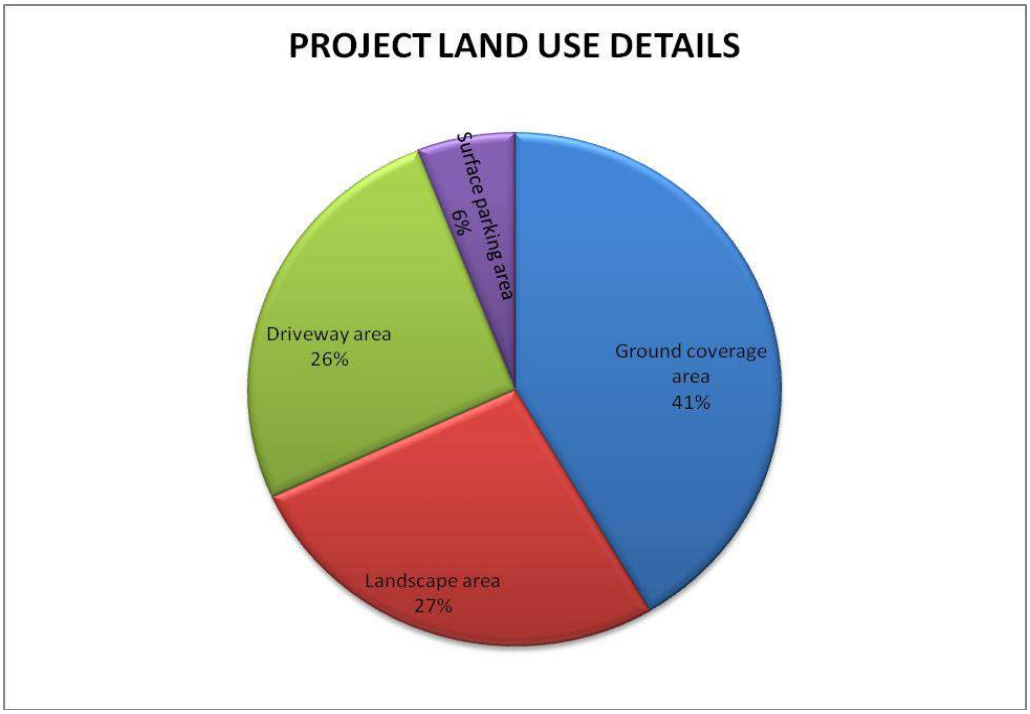


FIGURE-2.6: Details of land use within the site

2.6 COST OF THE PROJECT:

The total investment cost involved in setting up of the project is estimated to be about Rs.1,250 Crores. Expenditure will be spend on land, land development, building plant, electrification, utilities, other fixed assets, preliminary and pro-operation, contingencies, etc.,

2.7 RESOURCE REQUIREMENTS

Requirement of various resources and utilities for the project during both the construction and operational phases are discussed in detail in the succeeding sections.

2.7.1 CONSTRUCTION PHASE

2.7.1.1 RAW MATERIAL:

The catalog of Class "A" materials proposed to be used for the construction towards project with the tentative quantity is presented in below table

TABLE-2.8: Details of materials required for construction

CONSTRUCTION MATERIAL RESOURCES			
Sl. No.	**DESCRIPTION**	**UNIT**	**QUANTITY**
1.	Concrete	Cum	151717
2.	Steel	MT	26103
3.	Windows	Sqmt	37799
4.	Tiles	Sqmt	282807
5.	Doors	Nos.	29743
6.	Aluminum shuttering	Sqmt	344615
7.	Structural steel	MT	180

2.7.1.2 WATER REQUIREMENTS:

The water utilized during the construction phase gets consumed either by the chemical reaction with cement and also partly gets evaporated. Hence, there will be no wastewater generation from curing or mixing processes. However, there will be discharge of domestic wastewater to the tune of 11.2 KLD will be treated in mobile STP.

TABLE-2.9: Water requirement during construction purpose

Average Water Consumption (for Construction)	50 KLD
Average water Consumption (Domestic)	14 KLD
Total water requirement during construction phase	64 KLD
No. of Laborers	300
Discharge of domestic wastewater	11.2 KLD
Source of water for Construction	STP treated water
Source of water for Domestic	Tanker water

2.7.1.3 SOLID WASTE GENERATION:

Construction waste will be generated during construction works and it mainly comprises of earth, stones, bricks, inert and non-biodegradable material such as concrete, plaster, metal, wood, plastics etc & small quantity of domestic solid waste. The retrievable items such as bricks, wood, metals are recycled. Wherein the domestic waste will be segregated and will not be allowed to mix with the construction waste. The construction earth and other wastes will be reused for backfilling and road formation within the site premises. Proponents are not going to provide labour colony within the site, so there will not be any generation of domestic solid waste during the construction phase.

TABLE-2.10: Solid waste generation during construction

No. of Laborers	300
Solid waste generation	[300 no's labors/day X 0.1 kg] = 30 kg/day
Quantity of organic waste generated	18 kg/day (60%)
Quantity of In-organic waste generated	12 kg/day (40%)
Disposal	Solid waste will be collected manually and handed over to local body for further processing

2.7.1.4 ENERGY REQUIREMENTS:

The power requirement during construction phase is 500 KVA which will be temporarily met by supply from BESCOM and 1x500KVA capacity of D.G. Sets provided during construction phase.

2.7.2 OPERATION PHASE

2.7.2.1 WATER REQUIREMENT:

During operation phase, water requirement will be drawn from the BWSSB and a copy of NOC from BWSSB is enclosed as **Annexure-4**. The detailed total water requirement, based on type of project, during operational phase is estimated as in below.

- Total water requirement to be considered as per NBC is 45 LPCD
- Domestic water demand (55% of total consumption) = 45×0.55 = 25 LPCD
- Flushing water demand (45% of total consumption) = 45×0.45 = 20 LPCD

The total water requirement for the project during operation phase is around 1,082 KLD. It is proposed to use the treated sewage for secondary purposes such as toilet flushing to the amount of 481 KLD. Hence, the net fresh water demand would be about 601 KLD. Water balance chart during the operation phase is shown in the below Fig-2.6.

TABLE-2.11: Water requirement break up

Sl. No.	Description	Occupants @45 lpcd	Domestic water, in KLD @25lpcd	Flushing water, in KLD@20lpcd	Total water Demand, in KLD
1	Building -1	2,010	50229	40183	90412
2	Building -2	2,679	66963	53571	120534
3	Building -3	2,539	63478	50782	114260
4	Building -4	3,421	85529	68424	153953
5	Building -5	3,390	84745	67796	152540
6	Building -6	4,367	109164	87331	196495
7	Building -7	4,543	113572	90858	204430
8	Building -8	1,089	27232	21786	49018
	Total	**24,038**	**601**	**481**	**1,082**

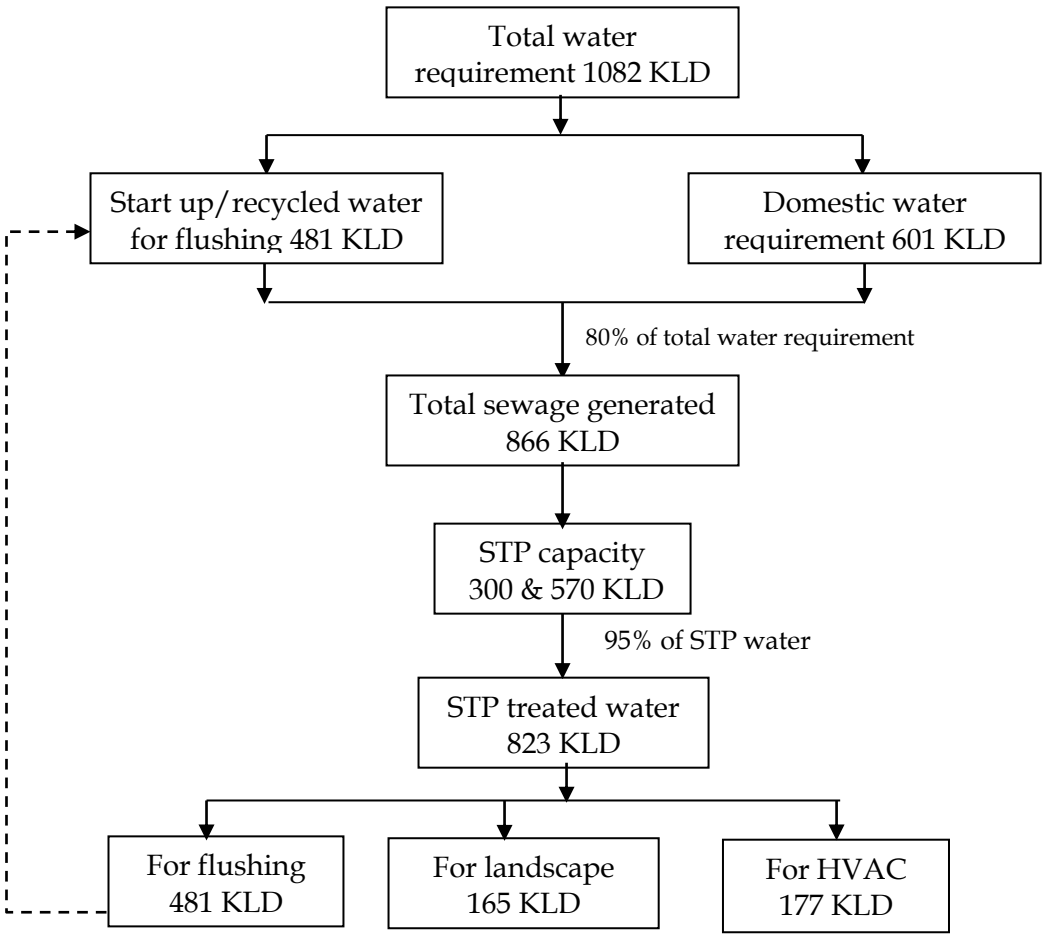


FIGURE-2.6: Water balance chart

2.7.2.2 SEWAGE TREATMENT PLANT

The sewage generated from the project is about 866 KLD i.e. 80% of the total water requirement. This raw sewage will be treated in the STP of capacity 300 (Building -1,2,3,8) & 570 KLD (Building-4,5,6,7) using Sequence Batch Reactor (SBR) Technology. The treated water will be utilized for secondary purposes like flushing, gardening and for HVAC. Technical report on Sewage treatment plant is attached as **Annexure-5.**

2.7.2.3 SOLID WASTE GENERATION:

The solid wastes generated during operation phase can be categorized under four groups:

- Wet Garbage like Food waste, Lawn mowing wastes etc.
- Dry Garbage such as Paper, Plastic, Bottles, etc.
- Sludge from Sewage Treatment Plant (STP).
- Hazardous waste like CDs, used batteries etc.

DOMESTIC/RESIDENTIAL WASTE:

This category of waste comprises the solid wastes that originate from office building. These wastes are generated as a consequence of domestic activities such as food preparation, cleaning, old newspapers, writing/new paper, and old furnishings etc. A nominal value estimated for Bengaluru is 0.25 kg/person/day and the same has been considered to estimate the quantity of domestic solid waste generated due to this proposed project.

TABLE-2.12: Estimation of solid waste generation

Sl. No.	Description	Occupants	Total Waste in MT/day	Organic Waste MT/day	In-Organic Waste MT/day
1	Commercial building	24,038 @0.25	6.00	1.2 (20%)	4.8 (80%)

Disposal:

The solid waste generated from the project will be collected in separate bins from each block and separated as Organic and In-Organic waste in the respective bins within the campus.

Management:

- ✓ Organic wastes will be segregated & collected at household levels in each floor and will be processed in organic waste converter.
- ✓ The recyclable portion like paper, plastics, glass, metals etc. will be given to the waste collectors for recycling for further processing.
- ✓ STP sludge will be used as manure for gardening within the site.
- ✓ Hazardous wastes like waste oil generated from the DG sets will be stored in barrels and handed over to the authorized waste oil recyclers/processors.
- ✓ Generated E-wastes will be collected separately & handed over to the authorized & approved by KSPCB E-waste processors.

2.7.2.4 ENERGY REQUIREMENTS:

Energy requirements:

The maximum power demand estimated for the facilities will be drawn from BESCOM.

TABLE-2.13: Details of power requirement & backup details

Sl.No	Description	Capacity
1.	Power requirement	22,159 kW
2.	Transformers capacity	1 x 1250 kVA, 1 x 1600 kVA, 2 x 2000 kVA, 7 x 2500 kVA
3.	DG Sets	14 X 2000 kVA

Waste oil from DG:

It is estimated that the amount of waste oil generated from the DG sets would sum up to about 1 liter per running hour of DG. These wastes generated are stored in identified location in a closed leak proof containers under roof within the building premises for its safe disposal. The same is disposed to KSPCB authorized waste recyclers.

Energy Saving Details:

The proposed project will use the non-conventional energy source i.e. use of solar energy for common area lighting, hence utilizing maximum solar energy. Apart from this other alternative energy efficient devices are also used and the energy saving details is depicted in below table. The overall energy savings from the proposed project is around 24.5%.

TABLE-2.14: Energy savings details of each blocks

Description	Block - 1	Block - 2 & 3	Block - 4 & 5	Block - 6 & 7	Block - 8	Utility Block
By using copper wound transformer	1.2	1.2	1.2	1.2	1.2	1.2
With Solar Energy for Common area lighting	5.8	3.2	3.6	5.3	5.3	--
By using HF Ballast	0.6	2.2	2.2	2.2	2.2	0.1
Savings on Lifts	6.2	3.1	2.6	2.3	2.9	--
Savings on PHE Pumps	7.7	2.1	1.8	1.8	3.9	1.1
Savings through LED	5.6	14.0	14.0	12.6	10.0	0.4
HVAC With Water Cooled Chillers	--	--	--	--	--	19.5
Total Saving	**27.23**	**25.83**	**25.26**	**25.43**	**25.63**	**22.16**

TABLE-2.15: Details of overall energy savings

S. No.	Block	Total Load in kW	Savings in kW	Percentage Savings
1	Block - 01	782	213	27.2%
2	Block - 02 & 03	3576	921	25.8%
3	Block - 04 & 05	4887	1230	25.2%
4	Block - 06 & 07	4799	1220	25.4%
5	Block - 08	1425	365	25.6%
6	Utility Block	6690	1480	22.1%
		22,159	**5,429**	**24.5%**

Onsite roof top solar power generation which is planned by considering usable terrace areas after area provision for fire tanks, services, parapet shadow area, etc. Terrace plan for harnessing solar energy is enclosed as Annexure-12. Total solar power generation by utilizing terrace area from each blocks is mentioned below

TABLE-2.16: Details of solar energy

S. No.	Block	Wp of each module	Number of panels	Total power saving in kW	Total unit generated per annum
1	Block - 01	320	120	38.4	73,920
2	Block - 02 & 03	320	304	97.3	1,87,264
3	Block - 04 & 05	320	456	145.9	2,80,896
4	Block - 06 & 07	320	672	215.0	4,13,952
5	Block - 08	320	200	64.0	1,23,200
			1,752	**560.6**	**10,79,232**

2.8 FIRE SAFETY MANAGEMENT SYSTEM

Fire Protection scheme has been designed based on all the relevant fire safety as per NBC norms. The proposed office building development in 8 Blocks & the height of the building is 51m (maximum).

The project has been designed based on all the relevant fire safety as per NBC norms.

- Fire extinguishers systems are deployed throughout the residential building.
- Fire hydrants all around the building will be provided.
- Fire hose cabinets will be provided at every floor.
- Sprinkler System, Automatic fire detection & Alarm system will be provided.

Precautions & safety measures proposed are:

- Nearby Fire Station contact numbers will be displayed
- Fire water tank capacities 2×60cum, 3×80cum, 3×100cum will be provided for immediate action to arrest the fire accident
- Portable fire extinguishers are proposed to be placed at Strategic locations.
- Electrical Fire Alarm system is placed at Strategic locations.
- Public Address system.
- Landing Hydrants on all floors near each staircase with necessary accessories.

2.9 COMPATIBILITY WITH LOCAL BUILDING REGULATIONS

- As per BDA norms, for all building above 50m, all around the building set back of 16m is followed.
- Maximum height of the building is 51m
- Nearest fire station is located at Sarjapura fire station is at a distance of 4.05 Km from the project site.
- Existing RoW for the approach road is 56.5m.
- Fire driveway of 8 m wide all around the building is followed.
- 10% of total land is reserved for park and space as applicable
- 5.91% of land is reserved for civic amenities
- 50m buffer to tertiary nala incorporated in the site plan (considering from the edge of the nala/drain)
- Green area of 26.6% is earmarked in the site plan.
- Ground coverage permissible is 45% and achieved is 41.55%

2.10 ROAD CONNECTIVITY

The proposed project site is located along outer ring road which connects to Silk board on one side and Marathalli on other side. Traffic impact study and its management report are enclosed in **Annexure-6.**

TABLE-2.17: Parking summary details

No. of car parking required for commercial (1car park/50Sqmt)	240176.49/50 = 4804
No. of car parking required for residential (1 flat > 50Sqmt <1780 Sqmt)	12
10% for visitors	2
Total	14
Total number of Car Parking required	**4,818 cars**
First Basement	1450
Second Basement	1583
Ground floor	409
First floor	286
Second floor	296
Third floor	299
Fourth to Tenth floor	(77*7) = 539
Total number of Car parking provided	**4,862 cars**

CHAPTER – 3

3.0 DESCRIPTION OF THE ENVIRONMENT

3.1 INTRODUCTION

Baseline data describes the existing environmental status of the identified study area with reference to the prominent environmental attributes. An area covering 10km radius, with project site as center, is considered as the study area. The study area of 10km radius around project is covered in Survey of India topo sheet no. 57H/9, 57H/13, 57G/12, 57G/16 (1:50,000).

The existing environmental setting is considered to establish the baseline conditions which are described with respect to geology, hydrogeology, climatic & atmospheric conditions, water quality, noise quality, soil quality, vegetation pattern, ecology, land use and socioeconomic profile of people.

Collecting the baseline environmental status of the project helps to predict the magnitude of impacts that are likely to be caused due to the proposed project on different environmental components of the project in the study area. It also helps to identify critical environmental attributes required to be monitored during and after the proposed development. The site-specific primary data were monitored for the identified parameters and supplemented by the available secondary data. Baseline Environmental status is the most important study based on which probable impacts from the project are predicted. The Baseline study was conducted during the month of January to March 2017.

In addition to the baseline environmental monitoring, field inspection in the study area, collection of secondary information for the environmental components and discussions with the officials and local public were also conducted. The baseline environmental status presented below comprises the following.

a. Description of study area: Project site is considered as Hi-tech zone with mutation corridor as per the CDP. The study area is 10km radius from the project site comprising of mixed land use –residential and commercial activities. The baseline environmental status of the study area are presented in the below sections.

- ✓ Physical Environment
- ✓ Biological Environment
- ✓ Socio – Economic Environment

b. Physical Environment: The Components of physical environment discussed in this section includes,

TABLE-3.1: Environmental Attributes & Frequency Of Monitoring

Attribute	Parameters	Frequency of Monitoring
Climatology & Meteorology	Surface: Wind Speed, direction, temperature, relative humidity and rainfall	Surface continuous monitoring station for entire study period and also data collection from secondary sources.
Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study season
Ambient Air Quality	PM_{10}, $PM_{2.5}$, SO_2, NO_x, O_3, Pb, CO, NH_3, C_6H_6, BaP, As, Ni	24 hourly twice a week for three months during study period
Noise Levels	Noise Levels in db (A)	Hourly observations for 24 hours per location.
Ecology	Existing terrestrial Flora and Fauna within the study area	Through field visit during the study period and substantiated through secondary sources.
Soil Characteristics	Physical & Chemical	Once during the season.
Land Use	land use change for different categories	Data from various Government agencies
Socio-economic aspects	Socio-economic characteristics	Census Handbooks, 2011.

3.2 LAND ENVIRONMENT

The first feature which influence the development of a project is the existing land use pattern of the project site and neighborhood of the project, whether the proposed development conform to the development for that area or not.

An area covering 10km radius, with project site as center, is considered as the study area. The detail study of the land environment will includes the following study areas.

- Study of land use pattern, habitation, cropping pattern, forest cover, environmental sensitive places etc, employing remote sensing techniques (if available) and ground truth and also secondary data sources.
- Study about trend of change in land use pattern, if any, with reasons thereof for the last 10 years and its extrapolation to future 10 years with and without the project.

3.2.1 Topography of the study area:

The project site is located at the Southeast side from the Bengaluru city with the distance of 17 km. Full portion of the land is plain where there is no existing trees and sloping towards North side. An area covering 10km radius, with project site as center, is considered as the study area.

3.2.2 LAND USE PATTERN

The main objective of this section is to provide an environmental baseline status of the study area covering 10km radius around the proposed project site so that the temporal changes due to the proposed commercial activity on the surroundings can be assessed.

The main objectives of land use studies are:

* To determine the present land use pattern.
* To ascertain the temporal changes in land use pattern due to construction and operation phase and
* To scrutinize the impacts on land use due to proposed project in the study area.

The use of land is determined both by physical factors such as topography, climate, and soil types as well as human factors such as population density, technological capability, culture & tradition etc. Land use has a major impact on natural resources including water, soil, nutrients, plants and animals.

<u>EXISTING LAND USE</u>:

The proposed project site comes under the Revised Master Plan (RMP) – 2015 of BDA (Bengaluru Development Authority) for Bellandur Amnikere Village, Varthur Hobli, and proposed project site is designated as Hi-tech zone with mutation corridor. And also land has been converted from agricultural to commercial purpose.

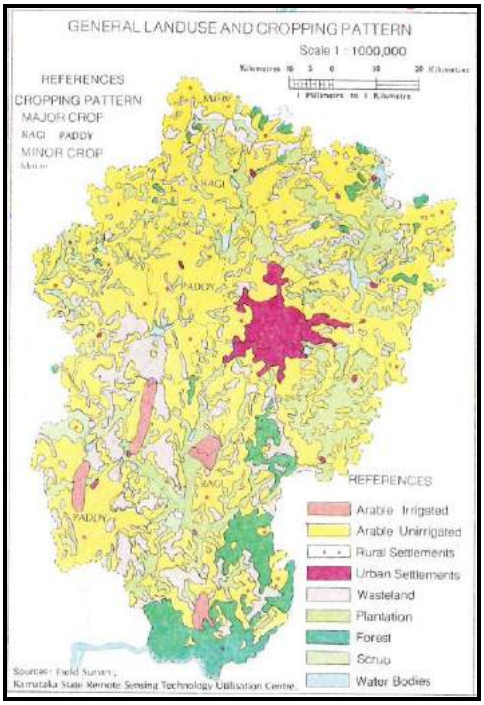


FIGURE-3.1: General land use and cropping pattern of Bengaluru (urban & rural) district (source: gsi).

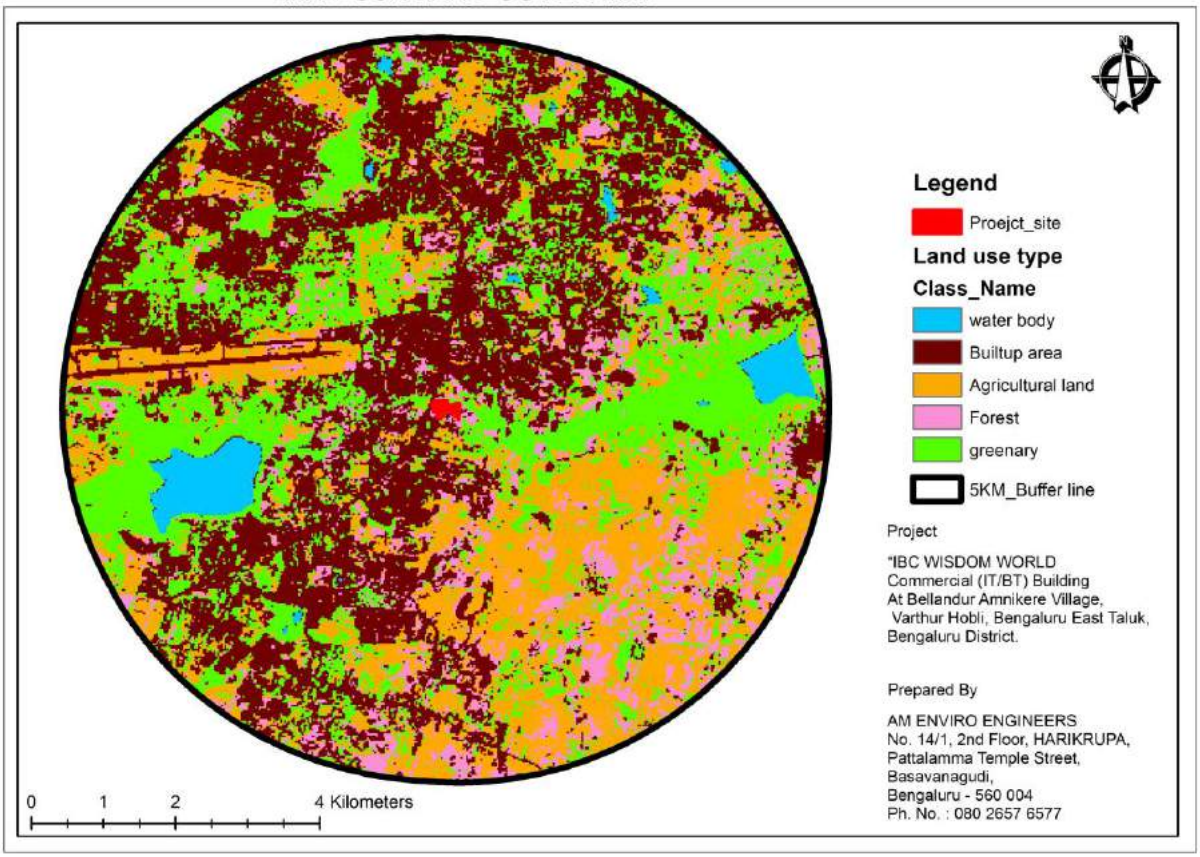


FIGURE-3.2: Land Use And Land Cover 5km Radius Around The Project Site.

3.2.3 GEOLOGICAL SETTING

The geological setting of entire Bengaluru district is as described below, based on Taluk wise observations.

The entire Anekal Taluk is composed of only one type of rock viz. gneissic granites belonging to Precambrian age. The gneissic granites are exposed as a continuous chain of mounds raising 90 to 150 m above the general ground level on the western portion of the Taluk. These form the Bannerghatta group of hills. Rocky outcrops are few and far between the middle and eastern portions of the Taluk. Inclusions of quartz and pegmatite veins are common. The depth of weathering varies greatly. The central and eastern portions of the Taluk show maximum thickness of the weathered mantle, extending to more than 12 m. The western portion of the taluk is deeply dissected and rocky.

The chief rock types occurring in Bengaluru North Taluk are granites and gneisses. These are prominently exposed as a ridge running NNE and SSW almost in the middle of the Taluk. The granitic gneisses are crisscrossed by pegmatitic and aplitic veins. Basic xenolithic patches are common. Banding is prominent. The rocks are highly jointed. Sheet joining parallel to the exposed surface is particularly characteristic of the Bengaluru gneisses. On

weathered surfaces, the longitudinal joints are prominently seen giving an appearance of titled beds. The regional strike is NNW-SSE with local variations. These rock formations have suffered considerable weathering particularly in the low lying areas as could be seen in the nala sections. Granites and gneisses are intruded by a number of basic dykes. Dykes are oriented east-west and as well as north-south. Cappings of laterites are found at the highest point in Bengaluru, generally above 915 m MSL. Beneath the Laterite, the gneisses are deeply weathered giving into various shades of clay. Laterite exposures are well seen near Yelahanka and neighborhood.

Bengaluru South Taluk comprises granites and granitic gneisses belonging to pre-Cambrian age. The granitic gneisses are exposed as continuous chains of mounds raising 30 to 70 m above ground level in the southern region of the Taluk. Granites are medium to coarse grained hard, compact and massive. Granitic gneisses are distinctly banded and are in various shades of gray color. The strike of foliation is usually NNW-SSE. They are traversed by pegmatitic and aplitic veins. Sheet jointing is very common. Granites and gneisses have undergone different degree of alteration and decomposition. Southern and eastern regions of the Taluk show maximum thickness of weathered mantle extending up to about 20 m while the depth of the weathered zone is maximum generally in the valleys, in highly cut-up terrain, as in the southern parts of the Taluk. Granites and granitic gneisses are traversed by vertical and horizontal joints and are intruded by dolerite dykes. Lateritic capping is confined to higher elevations such as Whitefield and Ramagondanahalli.

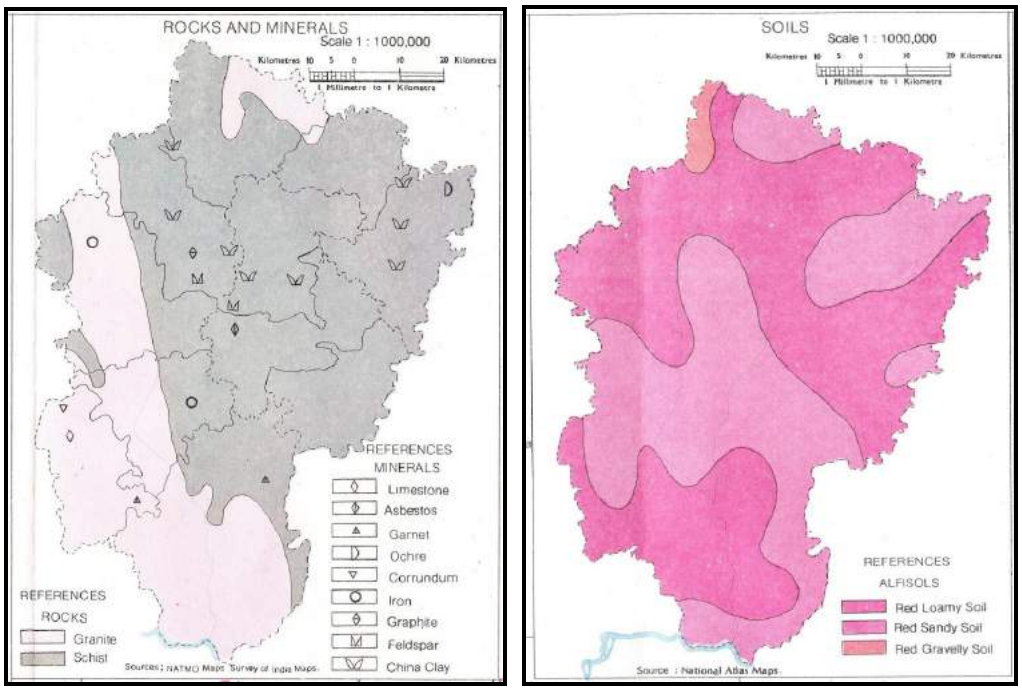


FIGURE-3.3: Geological Settings Of Bengaluru (Urban & Rural) District (Source: Gsi)

Bengaluru district does not possess mineral deposits of any commercial importance. The district accounts for small deposits of a few minor minerals like clay, quartz, feldspar and ornamental and building stones. The minerals, rocks and soil distribution of Bengaluru district is presented in figure 3.3.

3.2.4 SOIL STRATA

Bengaluru urban district is predominantly covered by Red loamy and Laterite soil. Red loamy and sandy soils generally occur on hilly to undulating land slope on granite and gneissic terrains. The soils are light textured and are highly leached in nature with good infiltration rate. They are mainly seen in the eastern and southern parts of Bengaluru North and South Taluks. Laterite soils occur on undulating terrain forming plain to gently sloping topography of peninsular gneissic region. It is mainly covered in Anekal Taluk and western parts of Bengaluru North and South Taluks.

Soil data including type, classification, characteristics, soil properties etc., are important from engineering considerations for design of structures. Changes in parameters of soil also may affect plantation and vegetative growth, which in turn may endanger the health of local habitat.

Baseline data of the soil ascertained by way of soil investigations carried out is to be provided. Field surveys usually involve a combination of hand auger boring and drilling over the site in a systematic grid pattern, with more focus on specific areas of interest. Soil surveys should consider both the physical and engineering properties of the soil.

3.2.5 PHYSICO-CHEMICAL CHARACTERISTICS OF THE SOIL:

The primary objective of this investigation is to establish the Geotechnical conditions at the site, the soil sample from the proposed project site was analyzed for important parameters and the results were compared with standard classification and to evaluate the net safe bearing capacities and other geotechnical design parameters through the various field and laboratory tests.

LABORATORY TESTING

Following laboratory tests were conducted on the soil samples collected from boreholes at the project site.

Tests conducted on soil samples:

- ✓ Standard Penetration test

- ✓ Gran size analysis by sieve analysis
- ✓ Determination of Specific gravity

Ground studies were conducted to identify the land use in and around 10 km radius of the site. Representative soil samples were collected from- eight sampling locations within an area of 10 km radius in and around the proposed project site for analysis of the physico chemical characteristics to assess the cropping pattern, microbial growth etc. standard procedures were followed for sampling and analysis.

Soil samples were collected at different locations (Boreholes) within the Study area; the sampling locations location's on Topo sheet are shown in figure 3.4.

TABLE-3.2: Soil Sampling Locations around The Study Area

Sample No.	Name of Sampling station	Distance & direction from project site	Co-ordinates
S1	Project Site	--	12° 56' 41.85" N 77° 42' 0.26" E
S2	Marathahalli	1.48 km (NNW)	12° 57' 32.61" N 77° 41' 50.66" E
S3	Varthur	4.3 km (E)	12° 56' 19.73" N 77° 44' 28.33" E
S4	Whitefield	5.87 km (NE)	12° 58' 10.43" N 77° 44' 59.82" E
S5	Kodathi	6.39 km (S)	12° 53' 17.01" N 77° 42' 58.64" E
S6	Kasavanahalli	4.8 km (SW)	12° 54' 23.55" N 77° 40' 32.52" E
S7	Vimanapura	3.8 km (NW)	12° 57' 54.24" N 77° 40' 10.59" E
S8	Garudacharpalya	4.9 km (SE)	12° 59' 15.69" N 77° 42' 2.97" E

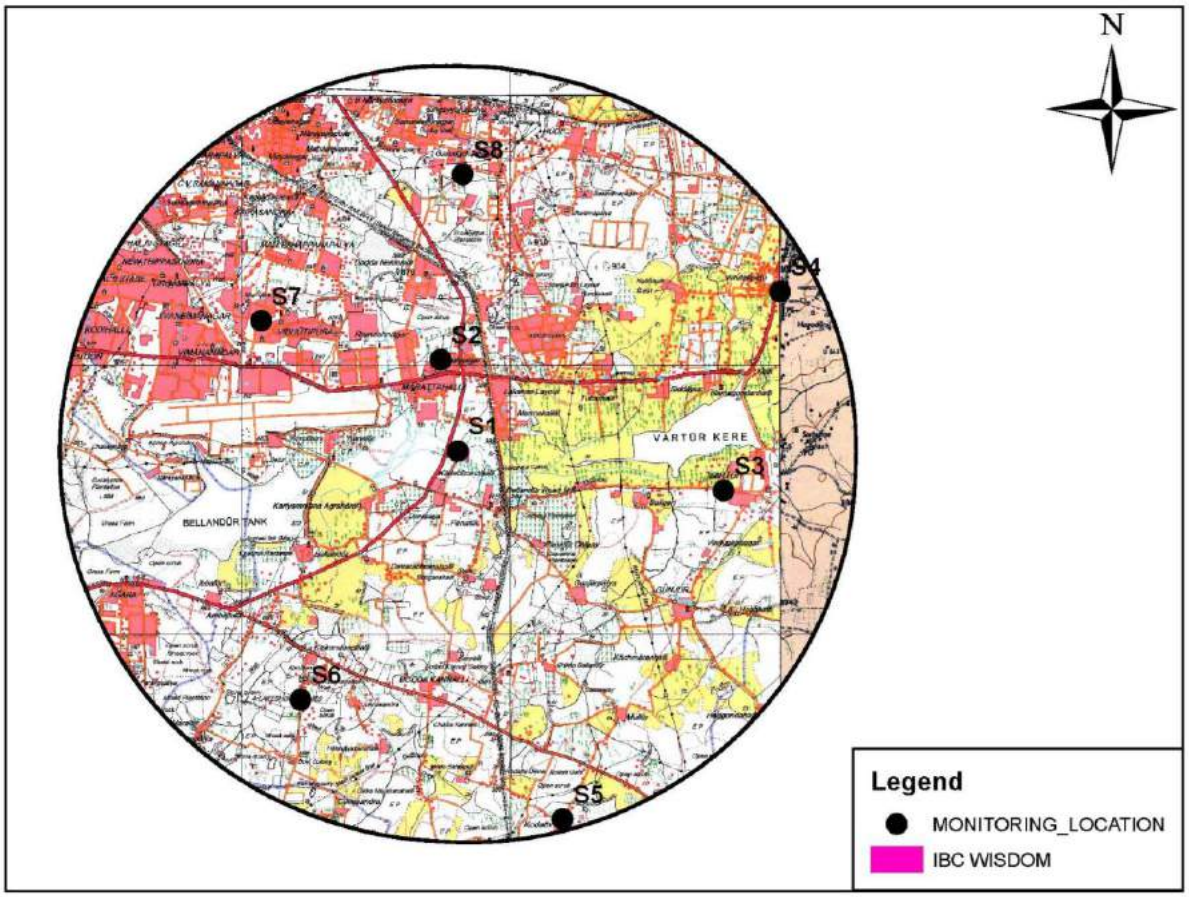


FIGURE-3.4: Soil sampling locations in the study area.

TABLE-3.3: Physico-chemical characteristics of the soil

S.	Parameters	Units	S1	S2	S3	S4	S5	S6	S7	S8
1	pH Value	--	7.86	7.73	7.68	7.70	7.82	7.88	7.81	7.71
2	Color	--	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
3	Sand	%	54	60	59	52	58	56	61	55
4	Silt	%	32	18	22	21	17	23	28	27
5	Clay	%	14	22	19	27	25	21	11	18
6	Conductivity	µS/cm	776.0	691.0	687	685	755	849	788	721
7	Moisture	%	2.4	2.3	3.1	3.0	2.5	2.9	2.0	2.3
8	Organic	%	4.9	3.7	4.2	4.1	4.0	3.8	5.0	4.3
9	Calcium as Ca	mg/kg	0.32	0.30	0.37	0.51	0.42	0.35	0.50	0.31
10	Chlorides as	mg/kg	0.20	0.23	0.22	0.32	0.15	0.50	0.21	0.31
11	Magnesium as	mg/kg	0.035	0.038	0.022	0.039	0.028	0.03	0.04	0.026
12	Nitrogen as N	mg/kg	0.06	0.07	0.07	0.05	0.05	0.06	0.05	0.04
13	Phosphorus	mg/kg	0.012	0.015	0.013	0.015	0.011	0.017	0.012	0.011
14	Potassium as	mg/kg	1.2	1.1	1.8	1.2	1.4	1.6	1.2	1.1
15	Sulphur as	mg/kg	1.0	1.0	0.9	0.8	0.78	0.9	1.1	1.5
16	Iron as Fe	%	0.4	0.7	0.6	0.5	0.6	0.8	0.4	0.7
17	Copper as Cu	mg/kg	0.01	0.02	0.01	0.03	0.02	0.04	0.02	0.3
18	Mercury as	mg/kg	0.002	0.004	0.001	0.002	0.001	0.001	0.002	0.003
19	Cadmium as	mg/kg	0.001	0.003	0.002	0.001	0.002	0.001	0.003	0.001
20	Selenium as	mg/kg	0.02	0.03	0.01	0.02	0.01	0.02	0.03	0.03
21	Arsenic as As	mg/kg	0.001	0.005	0.003	0.001	0.002	0.001	0.003	0.004
22	Lead as Pb	mg/kg	0.02	0.015	0.01	0.01	0.02	0.009	0.03	0.02
23	Zinc as Zn	mg/kg	1.5	1.8	1.2	1.3	1.4	1.0	1.6	1.1
24	Manganese as	mg/kg	0.01	0.02	0.01	0.02	0.01	0.02	0.03	0.01
25	Cyanide as Cn	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND

3.3 WATER ENVIRONMENT

Water environment includes two environmental settings, i.e. ground water and surface water. Baseline data with regard to these environmental settings should be generated. Selected water quality parameters of ground water resources and surface water resources within 5km radius of the study area have been studied for assessing the hydrological environment to evaluate anticipated impact of the proposed commercial development. It also assists to identify critical issues with a view to suggest appropriate mitigation measures for implementation.

The significant representative sampling locations for ground water and surface water are chosen through reconnaissance of project area to determine the pre-project status of the water quality in the study area. Physico-chemical and biological parameters having relevance to public health and aesthetic significance are selected to assess the water quality status with special attention to raw water resources for proposed project. The standard methods prescribed for surface, groundwater sampling as well as the analytical procedures for individual parameters is followed in this study.

3.3.1 GROUND WATER TABLE

Ground water in the district occurs under water table conditions in the weathered mantle of the granitic gneisses and in the joints, cracks and crevices of the basement rock. The depth to water though dependent on topography, shows variation depending on the depth of weathering. The depth to water in the low lying areas ranges from one to three meters and some of the wells in the valleys start overflowing in the rainy seasons. The depth to water may be as high as ten meters. Main source of ground water is through infiltration of rainwater. Taking note of the climatic water balance, soil characteristics, fluctuation in water tables etc., it is estimated that surface run off and evapotranspiration account for nearly 80% allowing only 20% of rainfall to recharge the ground water body.

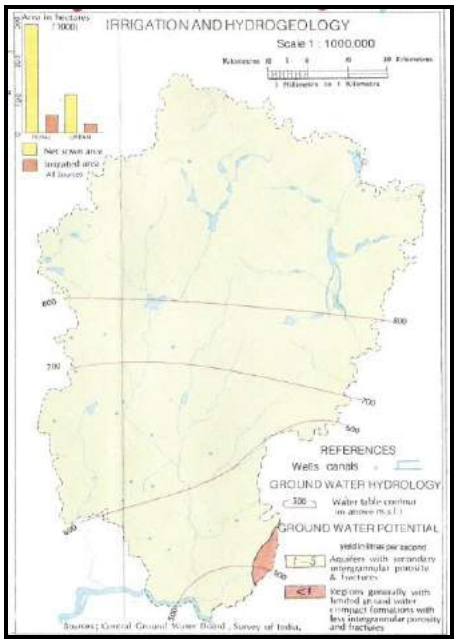


FIGURE-3.5: Irrigation & Hydrology (Source: GSI)

3.3.2 SURFACE WATER QUALITY

Varthur Lake is 2.23 km from the eastern side & Bellandur Lake is 1.96 km from the western side of the project site. Water from these lakes are sampled using grab sampling technique and analyzed for various chemical and physical parameters. The results are listed in below table. The sewage from household and effluents from the STP's are been discharged into these lakes, hence the water quality is too deterioted. The water from the lake is used for agriculture and cattle washing. Since water from the lake is not used for domestic.

3.3.3 WATER QUALITY

To establish the baseline status of water environment, existing representative sampling locations for surface water and ground water within a radial distance of 5Km radial from the site, have been selected as per CPCB guidelines of Water Quality Monitoring through an adequate survey of the project area. The prevailing status of water quality at eight sampling locations each for ground water and surface water has been assessed during January to March, 2017.

Grab samples were collected once during the study period. Physico-chemical and microbiological parameters have been analyzed to establish the baseline status of ground water resources in the study area. Methods as per IS (IS 10500:2012) were adopted for analysis of these parameters. The sampling protocol specified in the Guidelines for Water

Quality Management, of CPCB was followed for sampling, preservation and transport of samples to the lab.

Following are the water quality monitoring stations where the water samples were collected for analysis during the study period.

TABLE-3.4: Water Sampling Locations

Sample No.	Name of Sampling station	Distance & direction from project site	Co-ordinates
W1	Project Site	--	12° 56' 41.85" N 77° 42' 0.26" E
W2	Marathahalli	1.48 km (NNW)	12° 57' 32.61" N 77° 41' 50.66" E
W3	Varthur	4.3 km (E)	12° 56' 19.73" N 77° 44' 28.33" E
W4	Whitefield	5.87 km (NE)	12° 58' 10.43" N 77° 44' 59.82" E
W5	Kodathi	6.39 km (S)	12° 53' 17.01" N 77° 42' 58.64" E
W6	Kasavanahalli	4.8 km (SW)	12° 54' 23.55" N 77° 40' 32.52" E
W7	Vimanapura	3.8 km (NW)	12° 57' 54.24" N 77° 40' 10.59" E
W8	Garudacharpalya	4.9 km (SE)	12° 59' 15.69" N 77° 42' 2.97" E
W9	Varthur Lake	2.23 km (E)	--
W10	Bellandur Lake	1.96 km (W)	--

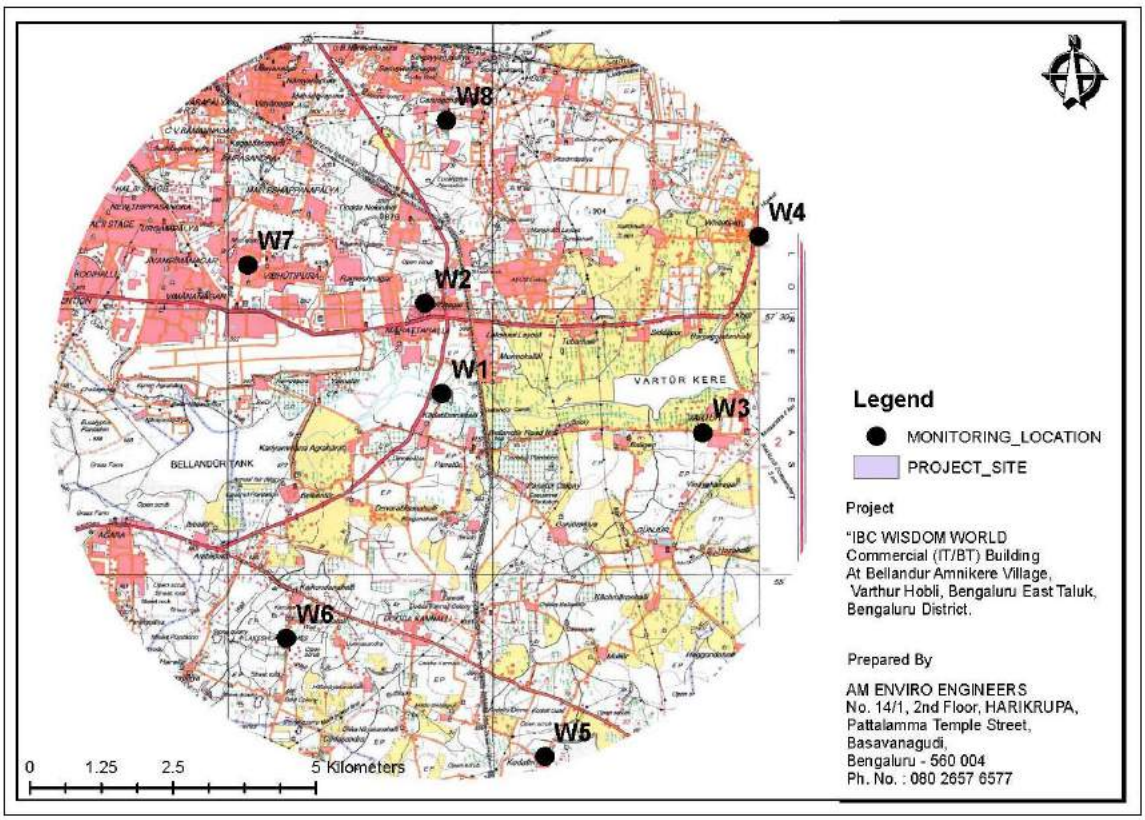


FIGURE-3.6: Water Sampling Locations In The Study Area

TABLE-3.5: Ground Water Quality Standards

Sl. No	Parameter	Maximum Desirable Limit IS 10500: 2012	Maximum Permissible Limit IS 10500: 2012	Protocol
1	Colour (Hazen units)	5	15	IS 3025 (Part– 4): 1983
2	Odour	Unobjectionable	Unobjectionable	IS 3025 (Part– 5): 1983
3	Taste	Agreeable	Agreeable	IS 3025 (Part– 8): 1984
4	p^H Value	6.5 to 8.5	No Relaxation	IS 3025 (Part– 11): 1983
5	Turbidity, NTU	1	5	IS 3025 (Part– 10): 1984
6	Chlorides as Cl, mg/l	250	1000	IS 3025 (Part– 32): 1988
7	Total Hardness as $CaCo_3$, mg/l	200	600	IS 3025 (Part– 21): 2009
8	Calcium as Ca, mg/l	75	200	IS 3025 (Part– 40): 1991
9	Magnesium as Mg, mg/l	30	100	IS 3025 (Part– 46): 1994
10	Dissolved solids mg/l	500	2000	IS 3025 (Part– 16): 1984
11	Sulphate as SO_4, mg/l	200	400	IS 3025 (Part– 24): 1986
12	Fluoride as F, mg/l	1.0	1.5	APHA 22nd Edition
13	Chromium as Cr^+, mg/l	0.05	No relaxation	IS 3025 (Part– 52): 2003
14	Residual free chlorine, mg/l	0.2	1	IS 3025 (Part– 26): 1986
15	Alkalinity as $CaCo_3$, mg/l	200	600	IS 3025 (Part– 23): 1986
16	Nitrate as NO_3, mg/l	45	No Relaxation	IS 3025 (Part– 34): 1988
17	Copper as Cu, mg/l	0.05	1.5	IS 3025 (Part– 42): 1992
18	Iron as Fe, mg/l	0.3	No Relaxation	IS 3025 (Part– 53): 2003
19	Manganese as Mn, mg/l	0.1	0.3	IS 3025 (Part– 59): 2006
20	Phenolic Compounds as C_6H_5OH, mg/l	0.001	0.002	IS 3025 (Part– 43): 1992
21	Mercury as Hg, mg/l	0.001	No relaxation	IS 3025 (Part– 48): 1994
22	Cadmium as Cd, mg/l	0.003	No relaxation	IS 3025 (Part– 41): 1992
23	Selenium as Se, mg/l	0.01	No relaxation	IS 3025 (Part– 56): 2003
24	Arsenic as As, mg/l	0.01	No relaxation	IS 3025 (Part– 37): 1988
25	Cyanide as CN, mg/l	0.05	No relaxation	APHA 22nd Edition
26	Lead as Pb, mg/l	0.01	No relaxation	IS 3025 (Part– 47): 1994
27	Zinc as Zn, mg/l	5	15	IS 3025 (Part– 49): 1994
28	Anionic detergents as MBAS, mg/l	0.2	1.0	Annex K of IS: 13428: 2005
29	Aluminium as Al, mg/l	0.03	0.2	IS 3025 (Part– 55): 2003
30	Boron as B, mg/l	0.5	1.0	APHA 22nd Edition

TABLE - 3.6: Surface Water Quality Standards

		Units	A	B	C	D	E
1.	Colour	Hazen	10	300	300	-	-
2.	Turbidity	NTU	-	-	-	-	-
3.	pH		8.5	8.5	8.5	8.5	8.5
4.	Conductivity	µS/cm	-	-	-	1000	2250
5.	Total Dissolved Solids	mg/l	500	-	1500	-	2100
6.	Alkalinity as CaCO3	mg/l	-	-	-	-	-
7.	Total Hardness as CaCo3	mg/l	300	-	-	-	-
8.	Calcium as Ca	mg/l	80.10	-	-	-	-
9.	Magnesium as Mg	mg/l	24.28	-	-	-	-
10.	Sodium	mg/l	-	-	-	-	-
11.	Potassium	mg/l	-	-	-	-	-
12.	Chloride as Cl	mg/l	250	-	600	-	600
13.	Sulphate as SO4	mg/l	400	-	400	-	1000
14.	Phosphate mg/l	mg/l	-	-	-	-	-
15.	Nitrate as NO3	mg/l	20	-	50	-	-
16.	Fluorides as F	mg/l	1.5	1.5	1.5	-	-
17.	Cyanide	mg/l	0.05	0.05	0.05	-	-
18.	Arsenic	mg/l	0.05	0.2	0.2	-	-
19.	Cadmium	mg/l	0.01	-	0.01	-	-
20.	Chromium, Total	mg/l	0.05	0.05	0.05	-	-
21.	Copper	mg/l	1.5	-	1.5	-	-
22.	Iron	mg/l	0.3	-	50	-	-
23.	Lead	mg/l	0.1	-	0.1	-	-
24.	Zinc	mg/l	15	-	15	-	-
25.	Manganese	mg/l	0.5	-	-	-	-
26.	Selenium	mg/l	0.01	-	0.05	-	-
27.	Mercury	mg/l	0.001	-	-	-	-
28.	Dissolved Oxygen	mg/l	6	5	4	4	-
29.	COD	mg/l	-	-	-	-	-
30.	BOD	mg/l	2	3	3	-	-

TABLE 3.7 Ground Water Qualities Results

S.No	Parameter	W1	W2	W3	W4	W5	W6	W7	W8
1	Colour (Hazen units)	4.0	4.0	4.2	4.1	4.0	4.3	4.0	4.0
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	p^H Value	6.89	6.90	6.85	6.86	6.87	6.89	6.82	6.91
5	Turbidity, NTU	0.5	0.49	0.51	0.45	0.39	0.44	0.42	0.52
6	Chlorides as Cl, mg/l	155.7	154.3	155.2	152.6	151.9	154..8	153.4	155.1
7	Total Hardness as $CaCo_3$, mg/l	342.0	341.0	341.2	338.0	339.2	338.4	341.5	340.2
8	Calcium as Ca, mg/l	105.1	104.3	103.8	104.8	104.6	105.5	103.8	104.4
9	Magnesium as Mg, mg/l	19.2	18.7	17.6	18.5	17.5	16.9	17.2	18.4
10	Dissolved solids mg/l	860.8	858.2	856.4	857.5	862.3	860.4	855.4	860.7
11	Sulphate as SO_4, mg/l	26.2	25.4	25.8	26.0	24.2	25.7	24.9	26.1
12	Fluoride as F, mg/l	0.4	0.42	0.43	0.4	0.41	0.45	0.40	0.42
13	Chromium as Cr^+, mg/l	0.03	0.03	0.02	0.02	0.03	0.03	0.02	0.02
14	Residual free chlorine,mg/l	0.2	0.1	0.15	0.19	0.18	0.12	0.11	0.2
15	Alkalinity as $CaCo_3$, mg/l	302.4	301.5	302.1	302.4	302.5	302.6	300.9	301.7
16	Nitrate as NO_3, mg/l	34.5	34.1	34.2	33.8	34.2	33.6	33.9	34.3
17	Copper as Cu, mg/l	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
18	Iron as Fe, mg/l	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
19	Manganese as Mn, mg/l	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
20	Phenolic Compounds as C_6H_5OH, mg/l	BDL(DL -0.001)	BDL(DL -0.001)	BDL(DL -0.001)	BDL(DL -0.001)	BDL(DL -0.001)	BDL(DL -0.001)	BDL(DL -0.001)	BDL(DL -0.001)
21	Mercury as Hg, mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
22	Cadmium as Cd, mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
23	Selenium as Se, mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
24	Arsenic as As, mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Cyanide as CN, mg/l	ND	ND	ND	ND	ND	ND	ND	ND
26	Lead as Pb, mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	Zinc as Zn, mg/l	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
28	Anionic detergents as MBAS, mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
29	Aluminium as Al, mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
30	Boron as B, mg/l	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
31	Coliform organism/100 ml	<1	<1	<1	<1	<1	<1	<1	<1
32	Escherichia coli/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

TABLE - 3.8: Surface Water Quality Results

Sl No	Parameter	Units	Bellandur Lake	Varthur Lake
1.	Colour	Visible	Greyish Black	Greyish Black
2.	Turbidity	NTU	12	9
3.	pH		8.09	7.94
4.	Conductivity	µS/cm	1120	1070
5.	Total Dissolved Solids	mg/l	641	557
6.	Alkalinity as $CaCO_3$	mg/l	280	104
7.	Total Hardness as $CaCO_3$	mg/l	320	311
8.	Calcium as Ca	mg/l	64	67
9.	Magnesium as Mg	mg/l	24	19
10.	Sodium	mg/l	BDL	BDL
11.	Potassium	mg/l	6	5
12.	Chloride as Cl	mg/l	102	117
13.	Sulphate as SO_4	mg/l	28	25
14.	Phosphate mg/l	mg/l	31	22
15.	Nitrate as NO3	mg/l	14	11
16.	Fluorides as F	mg/l	1.3	1.2
17.	Cyanide	mg/l	BDL (DL 0.01)	BDL (DL 0.01)
18.	Arsenic	mg/l	<0.01	<0.01
19.	Cadmium	mg/l	BDL (DL 0.01)	BDL (DL 0.01)
20.	Chromium, Total	mg/l	BDL (DL 0.01)	BDL (DL 0.01)
21.	Copper	mg/l	ND	ND
22.	Iron	mg/l	4.0	2.7
23.	Lead	mg/l	BDL (DL 0.01)	BDL (DL 0.01)
24.	Zinc	mg/l	<0.01	<0.01
25.	Manganese	mg/l	BDL (DL 0.01)	BDL (DL 0.01)
26.	Selenium	mg/l	BDL (DL 0.005)	BDL (DL 0.005)
27.	Mercury	mg/l	<0.001	<0.001
28.	Dissolved Oxygen	mg/l	3.5	4.1
29.	COD	mg/l	97	82
30.	BOD	mg/l	26	13

3.4 AIR ENVIRONMENT

3.4.1 LOCAL METEOROLOGY

The meteorological data recorded during the study period is very useful for proper interpretation of the baseline information and selection of air quality monitoring locations. Historical data on meteorological parameters will also play an important role in identifying the general meteorological regime of the region.

The representative months for climate a divided into four seasons winter lasts from January to February, summer lasts from March to May, South-West monsoon rains from June to September and North-East monsoon rains from October to December. (Ref: Assessment of

Impact to Air Environment: Guidelines for Conducting Air Quality Modelling, Central Pollution Control Board).

OBJECTIVE:

The prime objective of the baseline air monitoring is to evaluate the existing air quality of the study area. This will also be useful for assessing the conformity to standards of ambient air quality during the operation phase.

This section describes the selection of sampling locations, methodology adopted for sampling, analytical techniques. The results of monitoring carried out during study period are presented in table 3.13.

METHODOLOGY:

The methodology adopted for monitoring surface weather parameters is as per the norms laid down by Bureau of Indian Standards (IS:8829) and India Meteorological Department (IMD). The study of micro-meteorological conditions of a particular region is of utmost importance to understand the variations in ambient air quality status in that region. The prevailing micrometeorology at project site plays a crucial role in transport and dispersion of air pollutants released from the pollution sources. The persistence of the predominant wind direction and wind speed at the project site will decide the direction and extent of the air pollution impact zone.

Secondary information on meteorological conditions for the project study region was collected from the IMD station at Bangalore. Data of previous years have been collected and analyzed. Meteorological parameters such as wind speed, wind direction, maximum, and minimum temperatures, Relative humidity, atmospheric pressure, recorded on monthly basis continuously covering the entire months. Wind speed & Wind direction data recorded during the study period were used for computation of relative percentage frequencies of different wind directions. The meteorological data thus collected has been used for interpretation of the existing Ambient Air Quality status, and the same data has been used for prediction of impacts of future scenario due to the activities of the proposed scheme.

The wind rose generated from the Meteorological data collected from IMD Bengaluru is shown in the following figure 3.7. From the wind rose diagram it can be observed that the predominant wind direction is blowing towards Southwest.

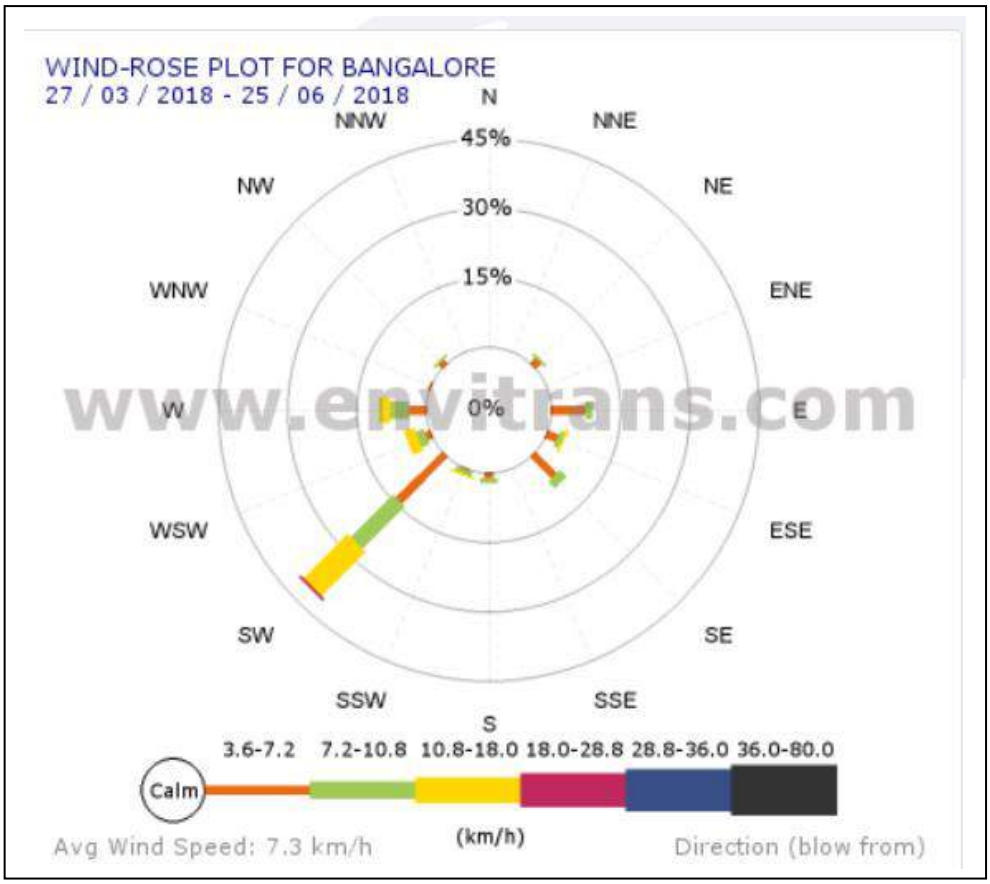


FIGURE-3.7: Wind Rose Diagram

3.4.2 CLIMATOLOGY AND METEOROLOGY

TEMPERATURE:

The records of the City Central Observatory may be taken as representative of the meteorological conditions in the district in general as they pertain to long period. The mean monthly values of air temperature were obtained by taking the half-sums of the mean maximum and mean minimum temperatures. On the basis of mean monthly temperatures, April is usually the hottest month with the mean daily maximum temperature at 33.4^{0}C and the mean daily minimum at 21.2^{0}C. On individual days, in hot seasons, the temperatures often go above 36^{0}C. With the onset of the monsoon early in June, there is appreciable drop in the day temperatures but that in night temperature is only slight. In October, the temperatures are as in the south-west monsoon season. Thereafter temperature decreases. December is generally the coolest month with the mean daily maximum temperature at 25.7^{0}C and the mean daily minimum at 15.3^{0}C. Nights during January are however slightly colder than

during December. On individual days during the period December to February, the minimum temperature drops down to about 8^0C. The highest maximum temperature recorded at Bengaluru is 38.9^0C on 1931 May, 22. The lowest minimum was 7.8^0C on 1884 January, 13. The mean annual range of temperature (defined as mean temperature of the warmest month minus the mean temperature of the coolest month) is only about 7^0C. The curves of mean monthly maximum and minimum temperature indicate that the mean maximum temperature is the highest in April (36.2^0C) and the mean minimum temperature is the lowest in January (11.4^0C). Thus the mean of the extreme annual range of the temperature is i.e., of the difference between the highest and lowest temperature recorded in a year is about 24^0C. The monthly mean diurnal range of temperature is maximum (about 15^0C) in February-March and minimum in July-August (about 9^0C). The maximum temperature of the day occurs at about 3 p.m. and the minimum temperature at about 6 a.m. except from May to July when it occurs about an hour or so earlier. The temperature at 9-30 a.m. and 9 p.m. is the mean temperature of normal day within half a degree Celsius.

RELATIVE HUMIDITY:

The humidity aspect of climate is a crucial study depending on the nature and purposes of the activity through almost in all cases low relative humidity are most desirable. The mean monthly relative humidity is the lowest in the month of March (44%), the morning and evening observations being 63% and 24% respectively. Relative humidity is high during the period June to October, being between 80% and 85% on the average. Humidity decreases thereafter and in the period February to April, the air is comparatively drier, the afternoon relative humidity being 25% to 35%. From May, the relative humidity increases. The maximum relative humidity during the day occurs at about 6 a.m. and the minimum at about 3 p.m. The total annual range between the maximum morning and minimum evening observations is 64% which is of significance in several industrial operations such as textiles, plastics, fertilizers, etc. the vapour pressure which represents the absolute moisture content of the atmosphere is however minimum in January, being equal to 12 mm. The largest number of hours of bright sunshine (9.5 hours) occurs in February-March. The number of sunshine hors decreases in later months reaching a minimum of 3.8 hours in July and increases later. The decrease in the sunshine hours between May and June by about 3.9 hours is the most marked.

RAINFALL:

The average annual rainfall observed based on the 10 years IMD data is 979.8mm. Bengaluru has three different rainy periods covering eight months of the year followed closely one after the other. Of these, June to September is the principal rainy season. The annual variation of rainfall shows two maxima and two minima. The principal maximum is in September and the secondary maximum in May. These are also the months with the maximum frequency of thunderstorms. Bengaluru receives 54% of the total annual rainfall in the south-west monsoon period (June to September) with a rainfall of 496 mm and 34 rainy days. The rainfall increases from June to September. During the north-east monsoon period, the mean rainfall is 241 mm which is a quarter of the annual total rainfall and the mean number of rainy days is 14. Thus about 80% of the annual rainfall falls during the six months June to November. In April-May, the mean rainfall is 156 mm and the number of rainy days is 10. December to March is a comparatively rainless period, with a mean rainfall of 33mm and about 3 rainy days.

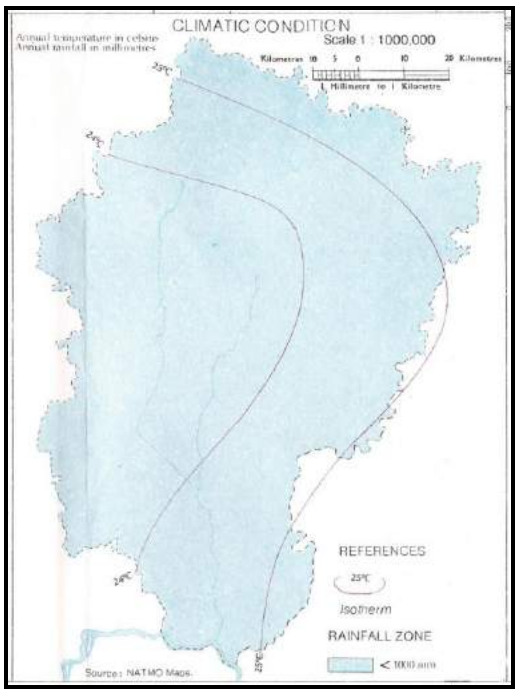


FIGURE-3.8: Temperature and rainfall pattern (Source: GSI)

WIND:

The surface winds over a Bengaluru have a fairly clear cut seasonal character with easterly components predominating in one period and westerly component in the other. During the period May to September, the winds are WSW to W while during the period from November to March, they are ENE to ESE. April and October are transition months when the

change over from the easterly to the westerly wind regime and vice versa take place. The annual variation of the monthly mean wind speed shows two maxima and minima. The primary minimum is in July when the westerly winds are prominent, with a mean speed of is about 17 kmph and the secondary maximum in January when the easterly winds are prominent, with a mean speed of about 10 kmph. The two minima occur in the two transition months, April and October when the mean velocity is about 8-9 kmph. The diurnal variation of wind speed also shows two maxima and minima. The principal maximum occurs generally between mid-day and 2 p.m. and the principal minimum between 4 and 6 a.m. The subsidiary minimum occurs between 7 and 9 a.m. The diurnal variation in wind direction is not prominent during June to September when the direction is mainly WSW or in November to February. The direction is mainly ENE in November, ENE to E in December and January and ESE to E in February. In March and April, winds have a slight southerly component in the morning and night after 6 p.m. and northerly component in the morning. The highest wind speed recorded so far is 106 kmph at 3.20 p.m. in a squall from NE on May 1950. Two other severe squalls occurred on 10 May 1948 and 26 May 1947 when the highest wind speed reached was 102 and 99 kmph respectively. The mean daily wind speeds in kmph at Bengaluru (based on the data 1969-80, height of sensor 19.2 m above ground level) are as follows. January 8.8, February 8.3, March 7.8, April 6.8, May 9.2, June 13.1, July 13.3, August 12.4, September 8.6, October 7.1, November 7.7, December 9.2 and Annual 9.4.

Note: Sourced from gazetteer of India & IMD, Bengaluru district.

TABLE-3.9: Humidity Rainfall & Temperature

Month	Average Minimum Temperatures in Bangalore, India (°C)	Average Maximum Temperature in Bangalore, India (°C)	Bangalore Average Temperature (°C)	Average Precipitation/ Rainfall mm	Wet Days (>0.1 mm)	Average Sunlight Hours/ Day	Relative Humidity (%)
January	15	27	21	3	1	8.6	59
February	17	30	23.5	10	1	9.1	47
March	19	32	26	6	1	9.5	43.0
April	21	33	27	46	5	8.6	51
May	21	33	27	117	11	7.4	61
June	20	29	25	80	13	4.8	73
July	19	27	23	117	18	3.0	78
August	19	27	23	147	18	4.1	77
September	19	28	24	143	15	5.2	75
October	19	28	24	185	15	5.6	74
November	17	26	22	54	7	7.2	69
December	15	26	20.5	16	3	7.9	65

3.4.3 AMBIENT AIR QUALITY MONITORING

The major objective of baseline air monitoring is to evaluate the existing air quality of the area. Formulation of baseline Ambient Air Quality (AAQ) data of the study area occupies a significant role in the Environmental Impact Assessment studies in assessing the conformity to standards of the ambient air quality during the construction and operation of the proposed project.

RECONNAISSANCE:

The predominant monsoon winds persisting in India dictates the transport and dispersion of air pollutants during different seasons. As per the Climatological conditions prevailing in India, the seasons accounted for carrying out air pollution studies are winter, summer and post-monsoon seasons. After reconnaissance of the area and observing the topographical features and review of the available meteorological data and local conditions the sampling sites were chosen which will be the representative of the local areas under study.

A preliminary survey was conducted at 8 AAQM locations along with the project site (within the radius of 5Kms) that were chosen based on the well-designed ambient air quality stations network. The baseline status of air environment has been assessed through ambient air quality monitoring (AAQM) network covering 8 sampling locations considered based on the following criteria:

- Micrometeorological conditions-Persistence of wind direction and speed, atmospheric stability
- Predominant upwind and downwind directions
- Identification of regional background
- Location of industries, their emission magnitude and topography of the study area.
- Determination of sensitive receptors such as hospitals, schools, thickly populated residential localities.
- Consideration of all the major conventional air pollution parameters as per latest NAAQS (National Ambient Air Quality Standards)

An intensive monitoring was carried out as per CPCB guidelines (twice a week sampling and 24 hour continuous sampling) to generate the baseline monitoring status of air environment within the study area during the period of January to March 2017.

The ambient air quality has been monitored for all the parameters as per NAAQS notified on 16th September, 2009. The major air pollutants monitored on 24 hourly bases are, Particulate matter (PM_{10} and $PM_{2.5}$ µg/m^3), Sulfur dioxide and oxides of Nitrogen. Sampling

and analysis of the above variables is according to the guidelines of Central Pollution Control Board. Following are the air quality monitoring stations which were identified during the study period.

3.4.4 AMBIENT AIR QUALITY STATUS

The prime objective of baseline air quality survey was to assess the existing air quality of the project site. This study will also be useful for conformity to standards of the ambient air quality during the project operations.

This section describes the selection of sampling locations, methodology & analytical techniques adopted for sampling. The ambient air quality was monitored at five locations in and around the proposed project site. The air quality monitoring was conducted as per revised NAAQ standards 2009.

SAMPLING AND ANALYTICAL TECHNIQUES:

Following methodology adopted for the analysis of the various parameters at the sampling locations:

TABLE-3.10: Air Analysis Method

Sl. No.	Test Parameters	Test Method
1.	Sulphur dioxide (SO_2)	Modified West and Gaeke method
2.	Nitrogen dioxide (NO_2)	Modified Jacob & Hochheiser method
3.	Particulate Matter 10 µg/m^3	Gravimetric method
4.	Particulate Matter 2.5 µg/m^3	Gravimetric method
5.	Ozone (O_3)	Direct Instrument Reading
6.	Lead (Pb)	AAS method
7.	Carbon Monoxide (CO)	Direct Instrument Reading
8.	Ammonia (NH_3)	Spectrophotometric method
9.	Benzene (C_6H_6)	Gas Chromatography method
10.	Benzo (a) Pyrene (BaP) – particulate phase only	Solvent extraction by GC method
11.	Arsenic (As)	AAS method
12.	Nickel (Ni)	AAS method

Note: AAS – Atomic Absorption Spectro-photometric Method

Following are the air quality monitoring stations which were identified for the AAQ study within the study area.

TABLE-3.11: Ambient Air Quality Monitoring Locations

Sample No.	Name of Sampling station	Distance & direction from project site	Co-ordinates
A1	Project Site	--	12° 56' 41.85" N 77° 42' 0.26" E
A2	Marathahalli	1.48 km (NNW)	12° 57' 32.61" N 77° 41' 50.66" E
A3	Varthur	4.3 km (E)	12° 56' 19.73" N 77° 44' 28.33" E
A4	Whitefield	5.87 km (NE)	12° 58' 10.43" N 77° 44' 59.82" E
A5	Kodathi	6.39 km (S)	12° 53' 17.01" N 77° 42' 58.64" E
A6	Kasavanahalli	4.8 km (SW)	12° 54' 23.55" N 77° 40' 32.52" E
A7	Vimanapura	3.8 km (NW)	12° 57' 54.24" N 77° 40' 10.59" E
A8	Garudacharpalya	4.9 km (SE)	12° 59' 15.69" N 77° 42' 2.97" E

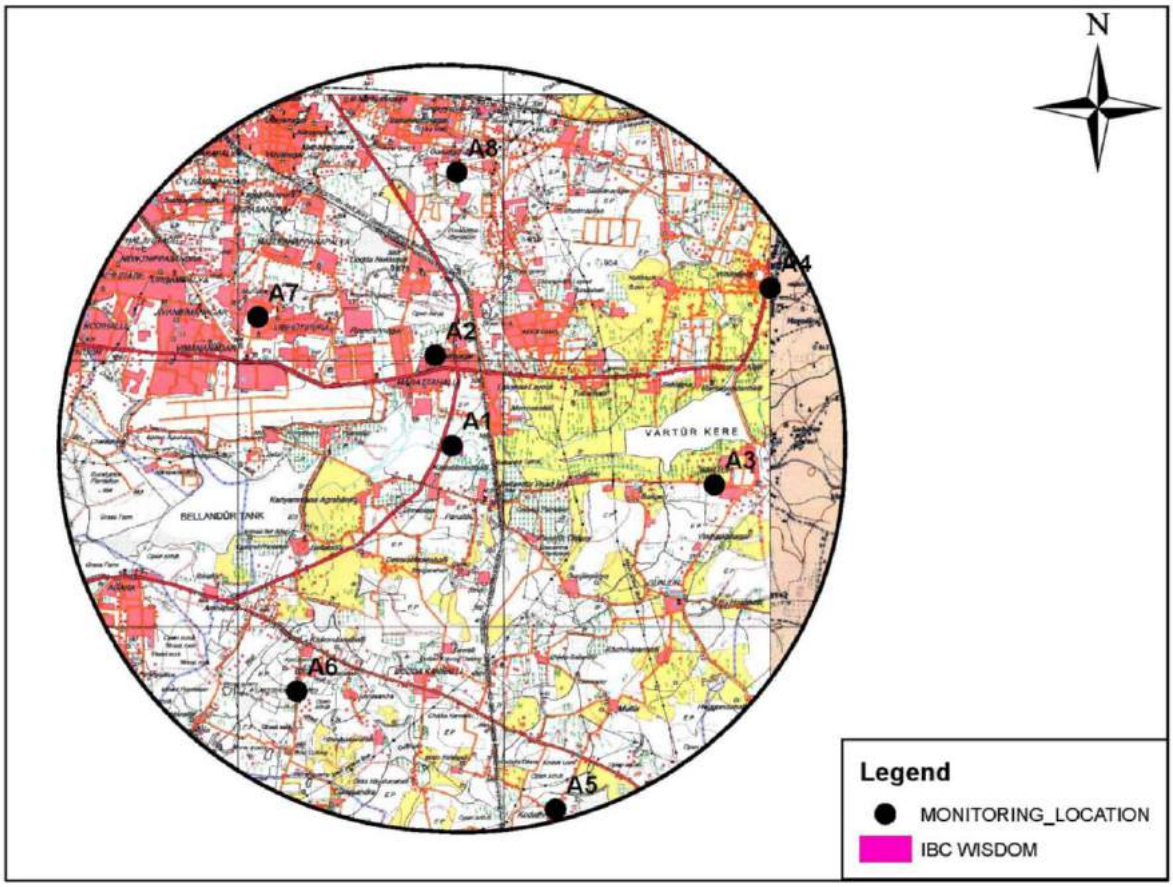


FIGURE-3.9: Air Sampling Locations In The Study Area

TABLE-3.12: National Ambient Air Quality Standards (NAAQS)

Pollutant	Units	Time Weighted Average	Concentration in Ambient Air (µg/m^3)		
			Industrial, Residential, Rural And Other Area	Ecologically Sensitive Area (Notified by Central Government)	Methods of Measurement
Sulphur dioxide (SO_2)	µg/m^3	Annual*	50	20	- Improved West and Gaeke - Ultraviolet fluorescence
		24 Hours**	80	80	
Nitrogen dioxide (NO_2)	µg/m^3	Annual*	40	30	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
		24 Hours**	80	80	
Particulate Matter (Size < 10 µm) or PM_{10}	µg/m^3	Annual*	60	60	- Gravimetric - TOEM - Beta attenuation
		24 Hours**	100	100	
Particulate Matter (Size < 2.5µm) or $PM_{2.5}$	µg/m^3	Annual*	40	40	- Gravimetric - TOEM - Beta attenuation
		24 Hours**	60	60	
Ozone (O_3)	µg/m^3	8 Hours**	100	100	- UV photometric - Chemilminescence - Chemical Method
		1 Hour**	180	180	
Lead (Pb)	µg/m^3	Annual*	0.5	0.50	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
		24 Hours**	1.0	1.0	
Carbon monoxide (CO)	mg/m^3	8 Hours**	02	02	- Non Dispersive Infra Red (NDIR) spectroscopy
		1 Hour**	04	04	
Ammonia (NH_3)	µg/m^3	Annual*	100	100	- Chemiluminescence - Indophenol blue method
		24 Hours**	400	400	
Benzene (C_6H_6)	µg/m^3	Annual*	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
Arsenic (As)	ng/m^3	Annual*	06	06	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
Nickel (Ni)	ng/m^3	Annual*	20	20	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

TABLE-3.13: Ambient Air Quality Parameters Results

Details	A1	A2	A3	A4	A5	A6	A7	A8
PM_{10}, µg/m^3	51.5	46.7	49.3	53.7	52.4	47.5	49.8	48.9
$PM_{2.5}$, µg/m^3	20.7	23.4	18.6	21.6	22.5	19.5	22.4	23.5
NO_x, µg/m^3	18.4	18.3	14.2	16.8	16.6	15.7	14.5	18.2
SO_2, µg/m^3	10.6	11.6	9.8	10.3	11.4	8.5	11.2	9.5
Carbon Monoxide,as CO, mg/m^3	0.3	0.7	0.4	0.5	0.4	0.6	0.7	0.3
Lead as Pb, µg/m^3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ozone as O_3, µg/ m^3	8.2	9.2	7.7	9.8	7.5	8.5	9.3	7.4
Ammonia as NH_3, in µg/m^3	12.7	12.4	11.6	13.2	11.8	12.9	13.1	11.7
Benzene as C_6H_6, µg/m^3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Benzo (a) Pyrene as BaP, ng/m^3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic as As, ng/m^3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel as Ni, ng/m^3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: *All other parameters of Ozone, Lead (<0.05), Ammonium (<0.1), Benzene (<0.01), Benzo (a) Pyrene (BaP) (<0.01), Arsenic (<0.1), Nickel (<0.1) are below detectable level (BDL).*

3.5 NOISE ENVIRONMENT

3.5.1 NOISE LEVEL SURVEY

The source of most outdoor noise worldwide is mainly evolved from industries, constructions and transportation systems, including motor vehicle noise, aircraft noise and rail noise, poor urban planning may give rise to noise pollution.

The noise generated due to operation of individual process units at project site cause significant impacts on the surrounding environment including nearby human habitats. There are also some secondary noise sources associated with almost all types of large scale projects, which are mainly vehicles and DG set equipment at the project site. However, such sources could be categorized as intermittent/continuous noise sources depending on frequency/intensity.

A reconnaissance survey was conducted with a view to establish the baseline status of the environment with respect to the noise levels in the region particularly with respect to industrial activity in the region, sound pressure levels (SPL) were measured using precision sound level meter.

Survey was carried out in the following steps:

- Reconnaissance
- Measurement of background noise levels in the study area

- Identification and characterization of noise sources
- Measurement of prevailing noise levels due to vehicular movements

The impact of noise on the health of an individual depends on physical dose of noise viz. Noise level, frequency spectrum, annoyance etc and human factors viz sex, age health status, type of activity, occupational exposure etc. The impacts also depends on psychological and physiological status of individuals, the impact due to noise do not undergo seasonal variations except some directional changes depending upon the environmental wind direction.

The environmental impact assessment w.r.t noise for the proposed project was carried out by taking various factors into consideration like potential physiological responses, annoyance and general community responses and also the existing status of noise levels within the study area. Existing noise levels have been monitored at different places within the study area. Ambient noise monitoring was carried out in residential, commercial, silence zones and roadside in the study area. Sound Pressure Level (SPL) measurements were undertaken at the project area & surrounding 10 km study area.

The prevailing ambient noise levels were monitored using precision noise level meter in and around 10Km distance in 8 locations during January to March 2017.

TABLE-3.14: Noise Quality Monitoring Locations

Sample No.	Name of Sampling station	Distance & direction from project site	Co-ordinates
N1	Project Site	--	12° 56' 41.85" N 77° 42' 0.26" E
N2	Marathahalli	1.48 km (NNW)	12° 57' 32.61" N 77° 41' 50.66" E
N3	Varthur	4.3 km (E)	12° 56' 19.73" N 77° 44' 28.33" E
N4	Whitefield	5.87 km (NE)	12° 58' 10.43" N 77° 44' 59.82" E
N5	Kodathi	6.39 km (S)	12° 53' 17.01" N 77° 42' 58.64" E
N6	Kasavanahalli	4.8 km (SW)	12° 54' 23.55" N 77° 40' 32.52" E
N7	Vimanapura	3.8 km (NW)	12° 57' 54.24" N 77° 40' 10.59" E
N8	Garudacharpalya	4.9 km (SE)	12° 59' 15.69" N 77° 42' 2.97" E

PARAMETERS CONSIDERED DURING MONITORING

For noise levels measured over a given period of time interval, it is possible to describe important features of noise using statistical quantities. This is calculated using the percent of the time certain noise levels are exceeded during the time interval. The notation for the statistical quantities of the noise levels are described below:

L_{10} is noise level exceeded 10% of the time;

L50 is noise level exceeded 50% of the time; and

L90 is noise level exceeded 90% of the time.

The measured noise level parameters for the project site are presented in table – 3.16.

TABLE-3.15: Ambient Noise Standards

Area Code	Category of Area	Noise Levels dB(A) L_{eq}	
		Day Time*	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone**	50	40

Source: CPCB

TABLE-3.16: Measured Ambient Noise Levels Db (A)

Sampling station	Sound level dB (A)		Result dB (A)
	Min	Max	
Project Site	57.4	68.1	62.8
Marathahalli	59.8	69.8	64.8
Varthur	57.1	67.2	62.2
Whitefield	56.9	65.9	61.4
Kodathi	59.6	69.2	64.4
Kasavanahalli	58.8	68.6	63.7
Vimanapura	58.8	68.2	63.5
Garudacharpalya	59.8	69.6	64.7

3.6 BIOLOGICAL ENVIRONMENT

3.6.1 INTRODUCTION

Study of biological environment is one of the most important aspects for Environmental Impact Assessment, in view of the need for conservation of environmental quality and biodiversity. Ecological systems show complex inter-relationships between biotic & abiotic components including dependence, competition and mutualism. Biotic components comprises of both plant and animal communities which interact not only within and between

themselves but also with the abiotic components viz. Physical and Chemical components of the environment.

Generally, biological communities are the good indicator of climatic and edaphic factors. Studies on biological aspects of ecosystems are important in environmental impact assessment for safety of natural flora and fauna information on the impact of environmental stress on community structure serves as an inexpensive and efficient early warning system to check the damage to a particular ecosystem. The biological environment includes mainly terrestrial ecosystem and aquatic ecosystem.

3.6.2 OBJECTIVES AND METHODOLOGY

The present study was undertaken with following objectives:

- To assess the distribution of animal life spectra;
- To assess the biodiversity and to understand the resource potential.
- To assess the nature and distribution of vegetation in and around the existing project site;

Methodology of Data Collection:

Following methods are being adopted for the ecological study:

- Generation of primary data through systematic ecological studies in the study area;
- Secondary data collected from publications of various Government agencies like Forest Department, Agriculture Department etc.; and
- Consulting local people for gathering information on ethnobotany, local plants and animals.

3.6.3 BASELINE ECOLOGICAL DATA: FLORA DETAILS

The topographical and climatic features of the district are subjected to small regional variations and are, by and large, favorable for the growth of a variety of plants, shrubs and trees. Most of the area in Bengaluru urban district was under cultivation for centuries and now there has been felling of all woody plants for fuel resulting in the growth of scrub vegetation. Vast areas are covered by thickets of extensive growth of lantana and other xenomorphic thorny shrubs rendering the area impenetrable and forming a most striking feature of the vegetation.

The vegetation in general regarded as deciduous jungle type with the exception of the valleys, and a majority of species inhabiting these areas exhibit xeromorphy. The Bannerghatta forests in Anekal Taluk represent the original flora typical to this region, which

includes dry deciduous and thorny shrub trees. The natural vegetation of the region may be broadly grouped into seasonal vegetation, roadside and avenue trees which are planted and cultivated flora.

SEASONAL VEGETATION:

Seasonal vegetation is common in open waste lands and cultivated fields. This type of vegetation is active during the major part of the year and remains dormant only for a few months, starting from November or December and extending to May. After the first showers of monsoon in May, the ground, which is completely barren, becomes covered completely by green grass, and a few pioneer members such as Cassia hirsute (Kadu Uttarani), Cassia kleinii, Cynodon dactylon (garike hullu, perennial herb) etc…

As the monsoon advances, the ground vegetation becomes dominant and completely covered by many annual weeds, which continue to flower till date in November or December. This vegetation consists of Ammannia baccifera (kallarive, procmbent marsh herb), Angallis arvensis (suryakanti soppu, common weed), Argemone mexicana (datturada gida, pricky herb), Corhorus aestuans (hairy herb), Crotalaria bifaria (spreading hairy herb), Fimbristylis ovata (densely tufted shrub), Imperata cylindrical (sanna dabbe hullu, thatching grass), Ocium cacum (aeromatic herb, nayitulasi), Rotala fimbriata (aquatic/semiaquatic herb), Cyanotis axillaries (negalakanne soppu, aquatic or marshy shrub), Sphaeranthus indicus (aromatic marsh herb) etc..

There are several small puddles on the plateau on top of Bannerghatta which are mostly inhabited by Aponogeten natans (aqueous tuberous herb). The tanks inside the study region possess a pure association of Typha angustata (anejondu, common water weed) and Polygonum glabrum (niruganigalu, stoloniferous herb).

The common roadside trees planted in the district are Alstonia scholaris (jantale, evergreen tree), Artocarpus heterophyllus (halasu), Azadirachta indica (bevu, evergreen), etc. Parthenium, a new pernicious weed, is a native of tropical South and North America and has moved gradually from one place to another by virtue of the light seeds blown by the wind. This weed is rampant in uncultivated areas and is observed to suppress the useful vegetation like grasses.

3.6.4 BASELINE ECOLOGICAL DATA: FAUNA DETAILS

Since the forest cover is quite scarce and most of the forest areas are small and are surrounded by agricultural lands, very few species of wild animals are found in the forests of

the district. Occasionally, herds of elephants make an appearance in the forests and villages of Anekal Taluk from forests of neighbouring district. The larger game consisting mainly of cheetah or panther and the wild dog and animals such as the porcupine, jackal, wild cat etc. are mostly confined to the forests of Anekal Taluk. Domestic animals consists principally of horses, cows, bullocks, buffaloes, sheep, goat, asses, pigs, dogs and cats. The avifauna in the region is rich and varied. The birds which are regularly seen in the district are as listed in the below table 3.17.

TABLE-3.17: List Of Fauna Sighted In The Region

Sl. No.	Common Name	Botanical Name
1.	Whiteheaded Babbler	*Turdoides affinis*
2.	Redvented Bulbul	*Pyconotus cafer*
3.	Domestic Crow	*Corvus Splendens*
4.	Spotted Dove	*Streptopelia chinensis*
5.	Pond Heron	*Ardeola grayii*
6.	Pied Kingfisher	*Ceryle rudis*
7.	Koel	*Eudynamys scolopacea*
8.	Myna, Greyheaded	*Sturnus malabaricus*
9.	Myna, Jungle	*Acridotheres fuscus*
10.	Owl, barn	*Tyto alba*
11.	Pigeon, blue rock	*Columbia livia*
12.	Indian Robin	*Saxicoloides fulicata*
13.	Flycatcher, brown	*Muscicapa latirostris*
14.	Asiatic sparrow	*Accipiter nisus*
15.	Grey wagtail	*Motacilla cinerea*
16.	Large Indian Cuckoo	*Coracina novaeholandiae*
17.	Painted Snipe	*Rostratula benghalensis*
18.	Whitebacked vulture	*Gyps benghalensis*
19.	Indian Weaverbird	*Ploceus phillippines*

3.7 SOCIO-ECONOMIC ENVIRONMENT

Major developmental activities in commercial sector are to meet the basic as well as luxurious requirements of civilized modern society, economical development, creation of employment opportunities (direct as well as indirect), which ultimately results in improvement of quality of life through upliftment of social, economical, health, education, infrastructure etc. status in the project region. Almost all commercial developments are also expected to generate/discharge different forms of pollutants in the surrounding environment. This may cause natural resource degradation, ecological and human health risks, unless the development is planned and implemented in a sustainable manner through implementation of pollution prevention and control measures. In this manner all developmental projects have direct as well as indirect relationship with socioeconomic aspects. Thus the study of socio-

economic component incorporating various facets related to social & cultural conditions and economic status in the project region is an important part of EIA study. The study includes demographic structure, population dynamics, infrastructure resources, status of human health and economic attributes like employment, per-capita income, agriculture, trade and industrial development etc. The aesthetic environment refers to the scenic value of the area, tourist attraction, forest and wildlife, historic and cultural monuments. The studies of these parameters help in identifying, predicting and evaluating the likely impacts on socioeconomic aspects due to proposed project developments.

The Methodology adopted for the study mainly includes review of published secondary data of the study area of 5km radial distance from the periphery of the proposed project site, which comes under Bengaluru East Taluk of Bengaluru in Karnataka state.

The study of socio-economic component of environment incorporating various facets related to socio-economic conditions in the area forms an integral part of EIA process. The study includes demographic structure, population dynamics, infrastructure, resources and economic attributes refers to employment, industrial development and financial sustainability of the project. The aesthetic environment refers to scenic value of the area, tourist attraction, forest and wild life, historic and cultural monuments.

RECONNAISSANCE:

The proposed developmental projects will be commissioned within the commercial zone. The study area covering 5km radial distances around the project site fall under Bengaluru East Taluk. Major part of study area is covered with highly undulated/hilly terrain mostly covered with natural vegetation as well as agro forestry especially in lower parts of hill slopes. In the study area, this is covered with number of small/medium scale industries. The infrastructure facilities including road network consisting Sarjapur Main road, Bengaluru Airport and Bengaluru Railway (network) are well developed in project region. Keeping in view the existing residential/commercial activities, this belt has been merged into urban agglomeration of Bengaluru city in 2011 census. The study area falls under Bengaluru East Taluk limits. Besides the study area covers both urban settlements and rural region.

M/s. Wisdom World Developers Pvt Ltd is proposed to develop a office building by name ***"IBC WISDOM WORLD"*** also MLCP with convention center building, coming up on a land measuring about 83,061.04 Sqmt (20Acres 21 Guntas) at Survey No's. 173/3, 173/5, 173/6, 176, 177, 178/1, 179, 183/1, 183/2, 184/1, 184/2, 184/3, 187/1, 189, 190, 197/1, 197/2 of Bellandur Amanikere Village, Varthur Hobli, Bengaluru East Taluk, Bengaluru District,

Karnataka. The site is notified as commercial zone is not inhabited hence rehabilitation and resettlement of people in the region due to the proposed project is not envisaged.

BASELINE STATUS:

The latest available data has been complied to delineate the baseline socio- economic profile in study area. The data base thus compiled from secondary sources of various official records, viz. Census records, District statistical abstract, Primary Health Centres etc. and primary data collection through field survey as well as the observations by survey team study period include:

- Demographic structure
- Infrastructure base road network, communication, electricity,
- Education
- Health Status
- Economic attributes
- Socio economic status with reference to quality of life
- Awareness and opinion of people about the proposed project

The sample villages identified for socioeconomic survey in study area are shown in while they are listed in subsequent sections.

DEMOGRAPHIC STRUCTURE:

An official Census 2011 detail of Bengaluru, a district of Karnataka has been released by Directorate of Census Operations in Karnataka. Enumeration of key persons was also done by census officials in Bengaluru District of Karnataka.

In 2011, Bengaluru had population of 9588910 of which male and female were 5025498 (52.4%) and 4563412 (47.6%) respectively.

The district is rural in character-- 77 per cent of the population lives in rural areas. The total population of the district is 15.02 lakh (2.84 per cent of state's population). The rural population is highest in taluk (93.55 per cent). The density of population is 276 and the sex ratio is 949, which is below the state average of 964. The demographical pattern in the study region shows that the percentage of males and females is nearly 52.4% and 47.6% respectively. The literacy rate in the study area is as high as 88.48%.

Demographical pattern comprising the details of literacy, child & adult population are delineated in the table.3.18.

TABLE-3.18: Demographical Pattern

State/District/ Taluk	T/R/U	Population			0-6 Population			Literates		
		Persons	Males	Females	Persons	Males	Females	Persons	Males	Females
Bengaluru	Total	9588910	5025498	4563412	988482	509268	479214	7609962	4146709	3463253
Bengaluru	Rural	868971	464122	404849	94272	48287	45985	608655	352228	256427
Bengaluru	Urban	8719939	4561376	4158563	894210	460981	433229	7001307	3794481	3206826
Bengaluru North	Total	302754	158669	144085	32849	16931	15918	216839	123396	93443
Bengaluru North	Rural	269266	141172	128094	29145	15052	14093	191217	109124	82093
Bengaluru North	Urban	33488	17497	15991	3704	1879	1825	25622	14272	11350
Bengaluru South	Total	185594	98699	86895	20255	10446	9809	129090	74258	54832
Bengaluru South	Rural	154750	81466	73284	17084	8812	8272	104771	59807	44964
Bengaluru South	Urban	30844	17233	13611	3171	1634	1537	24319	14451	9868
Bengaluru East	Total	94584	44892	44892	11161	5691	5470	67530	38403	29127
Bengaluru East	Rural	94584	44892	4489	11161	5691	5470	67530	38403	29127
Bengaluru East	Urban	0	0	0	0	0	0	0	0	0
Anekal	Total	506579	277190	229389	53474	27235	26239	364431	213472	150959
Anekal	Rural	350371	191792	158579	36882	18732	18150	245137	144894	100243
Anekal	Urban	156208	85398	70810	16592	8503	8089	119294	68578	50716

As far as the economic status in the study area is concerned, economy is mainly based on agriculture, plantation and forestry.

INDUSTRIAL SCENARIO:

Bengaluru district is industrially the most advanced city in Karnataka. The city is endowed with almost all primary requirements such as accessibility to raw materials, machinery, power, technicians, labourers, transport and communication, climatic conditions, marketing opportunities and financial facilities for the growth and development of industries.

Of the old time industries of the district, production of textile goods is the most notable. Several large and medium industries in the mechanized sector came up after the 1980's in the district. These include the major public sector industries such as Government press, Bengaluru Mill, Bengaluru Printing and Publishing Company Ltd., Government Soap Factory, Hindustan Aircraft Ltd. etc.

The post-independence era in Bengaluru saw a flourishing industrial grown owing to the availability of power for industrial consumption, comparatively cheap labour and transport facilities. The industrial policy resolution enunciated by the Government of India in 1948 further accelerated the phase of industrial expansion. To name a few: Motor Industries Company, Hindustan Machine Tools Ltd., The New Government Electric Factory, Wheel and Axle Plant, BHEL, BEML, BEL etc..

An interesting development in electronic field is the concept of an "Electronic City", at Konnapana Agrahara, about 18 km from Bengaluru on Hosur road, as a specialized industrial estate for large, medium and small scale electronic units. The Karnataka State Electronics Development Corporation Ltd. (KEONICS) was incorporated in 1976 in Bengaluru, as a company with a view to plan, organize and promote electronic industries in Karnataka. With such an early initiative in the prospective field of electronics, Bengaluru has never looked back since then and is aptly named as Silicon Valley of India. The drastic boom in the Information Technology sector has transformed Bengaluru into a world class city in terms of economy and technical expertise. Garment manufacturing and Call center units are also doing well in the off-late years. The city mainly houses the IT industries, most of which are situated along Hosur Road and Electronics City. Some Garment units and other Small Scale Industries are also present in the industrial suburbs such as Begur, Veerasandra, Bommanahalli, Naganathapura etc.

BANKING, TRADE & COMMERCE:

Productive activities are mostly represented by agriculture and industry. Organized and unorganized banking and other credit agencies including the government agencies help production by assisting capital formation and its channelization for various productive activities. At the same time, commerce in general removes the hindrances of place, person and time. Being an industrially hyperactive region, the financial needs of the area is sufficiently served by the vibrant Banking institutes. Besides almost all of the nationalized banks and local co-operative banks, numerous multinational banks have also been rendering services over the region.

TRANSPORT SECTOR:

Being the capital city of the state, Bengaluru is well connected by Road, Rail & Air, with the other major cities in India. Totally 143 km of National Highways run through Bengaluru district originating from Bengaluru city connecting the cities like Chennai,

Hyderabad, Mumbai and Mangalore. The length of the state highway amounts to 194 km. Total length of surfaced roads by considering district as a whole sums up to 718 km.

The railway lines in five different directions terminate at Bengaluru city station viz.:

(a) Miraj Line in North Western Direction

(b) Guntakal Line towards North

(c) Salem Line passing from North West to South West

(d) Chennai Line towards East

(e) Mysore Line towards South East

There are direct trains running from Bengaluru city towards the other major metropolis – Delhi, Chennai, Calcutta & Mumbai. The total length of railway lines in the district as a whole is about 130 km with nearly 30 stations.

Bengaluru airport was built by Hindustan Aeronautics Ltd. for its use and the same is being used for Civil Aviation as civil airport. The airport comprise of both domestic and international terminals with daily flights to the major cities in India and around the world. Number of flights operating from Bengaluru is increasing owing to the proportionate demand from the well flourishing industrial sectors. Now the airline services have been being fulfilled by Kempe Gowda International Airport.

EDUCATION:

The study region is also known for its quality education and world's best institutions like IISc, IIM, IIIT etc. Apart from adequate schools & colleges providing basic education to the needy, there are also numerous professional institutions and other institutions offering specialized courses relevant to the present day job market.

PLACES OF TOURIST INTEREST:

Though the Bengaluru city dominates the scene in this small district, the mofussil areas too do not lag behind in their charm and importance from the point of their antiquity and their historical monuments, places of scenic beauty and religious sanctity.

Bengaluru with its modern buildings, parks, industries, temples dominates the scene. To name a few of the monuments of worth visiting – Vidhana Soudha, High Court Building, Bengaluru Palace etc. The city lives upto its fame as the 'Garden City' with its beautifully maintained parks and gardens.

3.8 SOLID WASTE

As per the Municipal solid waste Management rules 2000, BBMP is responsible for taking the waste management as per the situation.

- Door to Door collection of Municipal solid waste (MSW)
- Sweeping & drain cleaning twice daily of Main roads
- Collection of MSW from designated location and transportation to the transit segregation point or landfill site

3.8.1 SOLID AND HAZARDOUS WASTE GENERATED DURING CONSTRUCTION PHASE

- Quantity of solid waste generated from labors during construction stage is very less and same will be handed over to BBMP.
- Excavated earth material generated during construction phase is 1,47,748 cum and will be reused within the site for backfilling, landscaping, road formation.

3.8.2 SOLID AND HAZARDOUS WASTE GENERATED DURING OPERATION PHASE

- Total quantum of solid waste generated from the proposed project will be 6.0MT/day. Out of which, organic waste contributes to 20% i.e, 1.2MT/day and In-organic waste contributes to 80% i.e, 4.8MT/day
- Organic wastes will be segregated & collected at food area and will be processed in organic waste converter.
- The recyclable portion like paper, plastics, glass, metals etc. will be given to the waste collectors for recycling.
- Organic sludge from STP of about 43.5kg/day will be generated and same will be used as manure for gardening within the site.
- Waste oil generated from the DG sets will be collected in leak proof barrels and handed over to the authorized waste oil recyclers/processors.
- Household hazardous wastes (expired cosmetics, batteries, cleaning agents, paints, mosquito/cockroach spray containers, and insecticides) will collect and handed over to the authorized processors.
- Generated E-Wastes will be collected separately & handed over to the authorized & approved by KSPCB E-waste processors.

CHAPTER – 4

4.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 INTRODUCTION

Environmental impact is the term applied to the systematic examination of the likely impacts due to the proposed commercial building of ***"IBC WISDOM WORLD"*** project on the surrounding environment due to different project activities during construction and operation phase of the project.

This chapter deals with the Environmental Impacts due to project location, possible accidents, project design, project construction, regular operations, final decommissioning or rehabilitation of a completed project. The environmental impacts may be direct, indirect and cumulative impacts.

Environmental Impact study describes identification and appraisal of various impacts due to the proposed commercial project. Environmental Impact can be defined as any alteration of environmental conditions or creation of a new set of environmental conditions, adverse or beneficial, caused or induced by the action or set of actions under consideration. Environmental impact assessment is one of the tools available with the planners to understand the impacts that would emanate from the proposed project.

The impacts on environment have been predicted for the proposed project assuming that the pollution due to the existing activities have already been covered under baseline environmental monitoring. Impact prediction is a way of 'mapping' the environmental consequences of the significant aspects of the project and its alternatives. Environmental impact can never be predicted with absolute certainty and this is all the more reason to consider all possible factors and take all possible precautions for reducing the degree of uncertainty.

The objective of study of Environmental Impacts is to foresee and address the potential environmental problems at an early stage of planning and design of the project. This study covers up to 10 km radius around the project location.

Generally, the environmental impacts can be categorized as either primary or secondary. Primary impacts are those which are attributed directly by the project wherein secondary impacts are those which are indirectly induced and typically include the associated investment and changed patterns of social and economic activities by the proposed action. Some of these impacts would have long term and short term intuition on the surrounding environment.

4.2 IMPACT IDENTIFICATION MATRIX

From the table-4.1 significant environmental impacts are identified. They are further elaborated with characterization and assessment. Table-4.2 and Table-4.3 provide the characteristics of impacts from construction and operational activities of the project respectively.

TABLE-4.1: Impact identification matrix

Activities	Environmental attributes							
	Air	Noise	Surface water	Ground water	Land & Soil	Ecology	Socio-Economics	Aesthetics
Site Clearing	0	0	0	0	0	0	0	1
Transportation of Raw materials	-1	-1	0	0	0	0	1	0
Construction Activities on land	-1	-1	0	0	-2	0	1	-1
Laying of Roads	-1	-1	0	0	-1	0	1	-1
Labor camps	0	0	0	0	0	0	0	0
Operation of DGs	-1	-1	0	0	0	0	0	0
Solid waste disposal	-1	0	-1	-1	-1	0	-1	-1
Wastewater disposal	-1	0	-1	-1	-1	0	-1	-1
Buildings and Landscape	0	0	0	1	1	1	0	1
Transportation	-1	-1	0	0	0	0	1	0
Recreation Activities	0	0	0	0	0	0	1	0

Grading of Impacts:

2-Most Positive, 1-Positive, 0-No Impact, -1 –Negative, -2-Most Negative

TABLE-4.2: Environmental impacts due to construction activity

Activity	Environmental Attributes	Cause
Site clearing	Air quality (SPM and RPM)	Dislodging of particles from the ground.
	Noise levels	Noise generation arises usually from earth excavating equipment and transportation vehicles.
	Land & Soil	Removal of vegetation cover and reduced soil stability.
	Aesthetics	Removal of weeds.
Transportation of Construction materials	Air quality (PM, SO_2, NO_x, CO)	Transport of construction material in trucks; exhaust emission from vehicles.
	Noise levels	Noise generation from vehicles.
	Risk	Risk of accidents during transport, loading and unloading.
Construction activities / Laying of roads	Air quality (PM, SO_2, NO_x, CO)	Operation of construction machinery, welding activities and others.
	Noise levels	Noise generation from use of machinery.

	Land & Soil	Reduced Soil Stability.
	Aesthetics	All Construction activities.
Construction Labours	Water quality (BOD, TSS, Fecal Coli form)	Discharge of untreated sewage.
	Land and Soil	Generation of solid wastes from construction activity.
	Socio-economics	Employment opportunities to local people & skilled & semi skilled labours.

TABLE-4.3: Environmental impacts during operation phase

Activity	Environmental Attributes	Cause
Afforestation/ Landscaping	Ground Water	Ground Water Recharge
	Land & Soil	Abatement of Erosion
	Ecology	Afforestation
	Aesthetics	Scenic views
Vehicular traffic for conveyance of people	Air quality (SPM SO_2, NO_x, CO, HC)	Vehicle operation and fuel combustion
	Noise levels	Noise generation from vehicles
	Socio-Economic	Employment for local transport services
Solid-Waste Disposal	Air Quality	Odour Nuisance
	Water Quality	Surface runoff contamination and ground water contamination due to leachate
	Land & Soil	Soil contamination due to leachate
	Socio Economics	Objections from the local community
	Aesthetics	Scenic blights
Wastewater discharge	Water quality	Contamination of water resources due to untreated wastewater
DG set, operation	Air quality	Exhaust emissions
	Noise levels	Noise generation

The impacts on each environmental component due to the proposed project activities are separately identified and suitable mitigation measures are recommended for the same. The likely to be affected six basic environmental components due to the above project activities are as follows.

1. Air Environment
2. Water Environment
3. Noise Environment
4. Land Environment
5. Socio-economic Environment
6. Ecology

The Environmental impacts on above environmental parameters due to the proposed project activities are discussed in detail in the following sections. The potential significant

impacts due to proposed project activities on each environmental component are studied under mainly two phases, i.e. during

- Construction phase
- Operation phase.

4.3 ANTICIPATED IMPACT AND MITIGATION MEASURES DURING CONSTRUCTION PHASE

The impacts poses during construction phase will be temporary and restricted to small area for short duration. Depending upon the availability of the site details and impact characterization for the construction phase, it is identified that the construction phase impacts were low, short term and reversible. The impact on the environment arising during the construction phase are discussed in detail in the below sections.

4.3.1 IMPACT ON AIR ENVIRONMENT

The impact causing project activities on Air Environment during construction phase are leveling of site, demolition work if any, construction and erection of buildings etc., and associated equipments in operation. Apart from this, activities also include dismantling of unwanted existing structures, site clearance, storage and haulage of construction materials and disposal of surplus earth, debris and refuse.

Air pollution due to the proposed project activities will mainly include gaseous pollution (SO_2, NO_x and CO) and suspended particulate matter. The sources of air emissions during construction phase will include site clearing, emission from vehicles used for transportation of man and material to the site, emission from DG sets and from construction equipment. These emissions are expected to have temporary adverse impact on ambient air quality of surroundings of the construction site only on construction phase. Traffic at the site during construction will be more intensive and much heavier than normal operating conditions. In turn, it will subject roads to more stress. The prevailing soil surface particles within the proposed area shall have a tendency to become airborne by vehicular tyres once the area is disturbed by construction activities. This dust will lead to an increase in the background SPM concentration of the area. The building material carrying vehicles as well as the construction machinery generate emissions and pollute the environment. Dusts include brick and silica dusts, wood dust from joinery and other wood working and from earth moving and other vehicular movements within the site. Construction machinery poses a special threat to air quality. It is estimated that construction machinery emits toxic pollutants and are sources of fine particulate matter ($PM_{2.5}$)

which lodges deeply in the human lung. Detail baseline study has been conducted for the air environment parameters and the same are recorded in the **Chapter – 3**.

Mitigation Measures: To mitigate these impacts, regular sprinkling of water will be done at the construction site. Approach roads will be black carpeted/asphalted and this will help to reduce the fugitive emissions. The vehicles, which are involved in construction activity, will be kept in good condition to minimize automobile exhaust.

4.3.2 IMPACT ON LAND ENVIRONMENT

4.3.2.1 SOIL SUBSTRATA

The removal of soil cover will disturb the soil stability and texture. During construction, care will be taken to retain the present soil cover to the extent possible by proper construction management/planning. The stability of the soil will be re-established by proper preparation and better landscaping techniques. The substrata of this area are not rocky and as such no blasting is envisaged for either leveling or during foundation work.

Mitigation Measures: To conserve the soil substrata; soil disturbing activities will be restricted and will be minimum, preliminary landscape development will be done before construction and at the time of construction also. Top soil will be stored and reused for landscape development.

TABLE-4.4: Excavated earth and management details

Description	Quantity in Cum	%usage
Total Excavated earth	1,47,748	100
Management		
Backfilling in foundation	36,012	24.37
For landscaping	44,188	29.91
Roads & walkways	41,421	28.04
For compound wall stabilization	26,127	17.68

4.3.2.2 CONSTRUCTION WASTES

Construction wastes are the waste materials generated by the construction refurbishment of buildings and other structures. It mainly consists of earth, stones, concrete, bricks, lumber, roofing materials, plumbing materials, heating systems and electrical wires and parts of the general municipal waste stream.

Characteristics of Construction Wastes:

This category of waste is complex due to the different types of building materials being used but in general may comprise the following materials:

Major Components:

- Cement concrete
- Bricks
- Cement plaster
- Steel (RCC, door/window frames, roofing support, railings of staircase etc.)
- Rubble
- Stone (marble, granite, sand stone)
- Timber/wood (especially demolition of old buildings)

Minor Components:

- Conduits (iron, plastic)
- Pipes (GI, iron plastic,)
- Electrical fixtures (copper/ Aluminum wiring, wooden baton, Bakelite/ plastic switches, wire insulation)
- Panels (Wooden, laminated)
- Other (glazed tiles, glass panes)

Storage of Construction Waste:

These wastes are best stored at source, i.e., at the point of generation. All attempts will be made to stick to the following measures.

- All construction wastes will be stored within the site itself. A proper screen will be provided wherever necessary so that the waste does not get scattered and does not become an eyesore.
- Attempts will be made to keep the waste segregated into different heaps as far as possible so that their further gradation and reuse is facilitated.
- Material, which can be reused at the same site for the purpose of construction, leveling, making road/ pavement etc. shall also be kept in separate heaps from those, which will be sold or land filled.

Recycling and Reuse:

The use of these materials basically depends on their separation and condition of the separated material. A majority of these materials are durable and therefore, have a high potential of reuse. It would however, be desirable to have quality standards for the recycled materials. Construction waste can be used in the following manner:

Reuse (at site) of bricks, stone slabs, timber, conduits, piping railings etc. to the extent possible and depending upon their condition:

- Concrete and masonry waste can be recycled by sorting, crushing and sieving into recycled aggregate. This recycled aggregate can be used to make concrete for road construction and building material.
- Sale/auction of materials, which cannot be used at the site due to design constraint or change in design.
- Plastics, broken glass, scrap metal etc. can be used by recycling industries.
- Rubble, brick bats, broken plaster concrete pieces etc. can be used for building activity, such as, leveling under coat of lanes where the traffic does not constitute of heavy moving loads.

Disposal: Being predominantly inert in nature, construction waste does not create chemical or biochemical pollution. Hence maximum effort should be made to reuse and recycle them as indicated above and same will act as mitigation measure.

4.3.2.3 LAND USE

The construction of proposed commercial building would bring in certain immediate changes in the land use pattern of the area as well as in the vicinity. The construction activities would attract a sizable labour population and the influx of population (skilled and semiskilled labours) is likely to be associated within the site premises. This however, would be temporary, especially during construction phase.

4.3.2.4 NATURAL DRAINAGE SYSTEM

As per the site scenario project site slopes towards North West direction with a higher contour level of 99.0m in East and lower contour level of 97.0m in West direction of the site as indicated in the contour plan and there is an existing natural drain passing through the site in North direction. This will be retained as it is by making all necessary provisions like beautification of the drain & as per BDA norms, 50m buffer zone has been provided as 'no development zone' from the edge of the drain. This drain carries the upstream runoff and will not allow it to entering into the project site. The runoff within the site will be managed and used for ground water recharge.

4.3.3 IMPACT ON WATER ENVIRONMENT

The average water requirement for the construction work is estimated to be about 50 KLD for the duration of construction period. This water is mainly drawn from other project as STP treated water through tanker, hence there won't be any surface and ground water trapping for construction water requirement & there won't be any wastewater generation due to the construction activity.

The domestic water requirement during construction phase is estimated to be about 14 KLD and the source of water for this purpose is external tanker water supplier. The sewage generated from the labours is estimated to be about 11.2 KLD and the same will be collected in a collection tank and will be treated in mobile STP.

Wastewater generation due to construction activity is nil and generated domestic wastewater from construction labours will be managed properly, hence there won't be any adverse impact on ground and surface water during construction.

4.3.4 IMPACT ON NOISE ENVIRONMENT

The sources of noise during construction phase are as follows:

- Construction equipments
- Vehicular movements
- DG Sets for power back up

The major source of noise during construction phase are due to vehicular traffic and the operation of construction equipments like Dozers, Scrapers, Concrete Mixers, Pneumatic Tools, Vibrators, etc. The operation of these equipments will generate noise ranging from 85 to 95 dB (A) near source. The noise produced during the construction will have significant impact on the ambient noise levels. The construction equipment may have high noise levels, which can affect the personnel who are operating the machines. These noises will be generated within the existing site boundary and will be transient in nature.

Mitigation Measures

- Provision of insulating caps and enclosures at the exit of noise sources on the machinery
- Construction equipment generating minimum noise and vibration were chosen
- Internal speed limit for vehicles carrying construction materials are maintained with 15 kmph
- Trained security men deployed for guiding smooth entry/exit without traffic congestion which will help in reducing honking conditions

- Ear plugs provided to the workers exposed to high noise prone activities and it was enforced to be used by the workers
- DG sets with acoustic enclosures complying to Environment (protection) Rules provided
- 2 stage barricades are provided all long the site boundary to avoid noise nuisance on the surrounding population
- Use of proper personal protective equipment will mitigate any significant impact of the noise generated by such equipment.
- Also, the utility of the noisy equipments will be restricted only during the day time; hence the impact on the neighborhood due to the activity will be negligible.

4.3.5 IMPACT ON ECOLOGY

There is no interference of the project on Terrestrial Ecology. The initial construction works at the project site involves no significant land clearance, cutting of trees, filling and leveling. So the construction activity will not result in any major loss of vegetation. And also the site is an unused land therefore there won't be any loss/effect on potential agricultural productive land.

The species identified within the terrestrial study area are not endangered, rare or protected; in addition, they will not be affected by the project. The increased construction vehicular traffic coupled with higher noise level due to various construction activities will drive away the fauna form the project site to the neighboring area. Therefore the impact of construction activities on terrestrial ecology will be negligible and mean while the project site will be extensively landscaped with the development of green belt consisting of variety of plant species which would enrich the ecology of the area and add to the aesthetics.

The sewage generated from labors will be collected in collection tank and will be treated in mobile STP and domestic solid wastes generated will be handed over to outside vendors for further processing. Care will be taken that untreated wastes will not discharge on to the land. Hence no major impacts are envisaged on ecology.

The ecological and biodiversity assessment of study area around the proposed project has been carried out and is covered under baseline study.

4.3.6 IMPACT ON SOCIO-ECONOMIC ENVIRONMENT

There will be employment generation to the local people during the construction phase, as a significant proportion of the labour force is likely to be sourced from the local area. There will be employment opportunities for several skilled and unskilled workers in the

area. There will be migration of labour force from outside the study area during construction phase which may put some pressure on the local settlement and resources. However, this impact is envisaged to be marginal and a temporary phenomenon.

4.4 IMPACT MITIGATION MEASURES DURING CONSTRUCTION PHASE

Depending upon the availability of the site details and impact characterization for the construction phase it is identified that, the construction phase impacts will be low, short term and reversible. The construction activity will be restricted within the proposed plot premises only.

Some of the mitigation measures adopted during construction phase of the project are:

- During construction phase, operations such as leveling, transportation, construction works, etc will be planned for most optimum schedule to reduce the impacts.
- Stockpiles of the fine materials should be wetted or covered with tarp during windy conditions.
- The dispersal of dust beyond the construction site will be reduced by erecting barricades around the site.
- By reducing the speed of a vehicle can reduce emissions by a large extent.
- Proper upkeep and maintenance of vehicles used for the purpose of transportation of construction materials.
- Workers on the site should be issued with dust masks during dry and windy conditions.
- Use of covering sheet should be done for construction trucks to prevent dust dispersion from the trucks.
- Sprinkling of water on construction site in order to suppress the dust.
- Maintenance of DG sets should be such that emissions shall comply with the norms notified by MoEF.
- By retaining sufficient vegetation at the construction site, since plants are good absorbers of Sulphur dioxide.
- Use of cleaner fuel for the construction vehicles.
- The construction activities will be carried out only during daytime in order to control noise pollution during night time.
- Schedule construction to avoid breeding times for fauna, or important recreation times for people.
- PPE will be provided to workers at site and construction machinery will be maintained properly to check on noise and emission levels within prescribed limits.

- The domestic wastewater will be collected in collection tank and Sprinkling of water on construction site in order to suppress the dust.
- The construction and domestic solid waste will be segregated and will not be allowed to mix with the construction waste.
- The generated domestic solid waste from labours and workers will be collected and handed over to authorized vendors.
- The excavated earth will be made use for refilling and landscaping within the site premises.
- The domestic solid and liquid wastes generated during the construction phase shall be properly handled such that there will not be direct discharge of untreated effluent on the land or water.

4.5 ANTICIPATED IMPACTS AND MITIGATIVE MEASURES DURING OPERATION PHASE

As the impacts during operational phase are long-term in nature, the activities related to the operational phase are identified and the impacts due to the same have been assessed and quantified. The details on impact of the project activity on each of the environmental attributes are discussed in subsequent sections.

4.5.1 IMPACTS ON LAND ENVIRONMENT

IMPACTS ON LAND USE PATTERN: The total land requirement for the proposed project is about 20 Acres 21 Guntas. As per the Revised Master Plan of BDA-2015 of land use pattern planned for the planning district 3.16 (Map (a)) (Varthur), the project site is designated as Hi-tech zone with mutation corridor and a copy is enclosed as **Annexure-8** and also the land has been converted from agricultural to commercial purposes. Hence there won't be any adverse impact on land use pattern.

IMPACTS ON SOIL: The soil quality in and around the site is likely to be affected by the disposal of untreated sewage. However, as the sewage will be treated to the urban re-use standards stipulated by the KSPCB, no deterioration of soil quality is expected due to the utilization of the same for gardening. The generated solid waste will be collected separately as biodegradable and recyclables, stored in the storage yard. Biodegradable wastes will be processed in organic waste converter and the recyclables will be given to waste recyclers for further processing. Fuel for DG sets and waste oil from DG sets will be stored in leak proof containers on impervious floors. Hence, no significant impact on soil is envisaged during

operation phase. However, the project site will witness additional tree plantation in the form of green belt development during operation phase, such plantation will stabilize the soil and helps to recover from the adverse impacts of the construction phase.

MITIGATION MEASURES:

Impact on land use pattern from the proposed project is nil, following are the few mitigation measures will be adopted to prevent the impact on soil:

- Domestic solid wastes will be properly managed which comprises of organic and inorganic wastes. Since it is a residential project majority of the waste comprises of organic fraction which will be converted in to compost through organic waste converter and shall be used as manure.
- The inorganic wastes generated will be handed over to authorized recyclers for further processing.
- The container and bins used for collection of solid waste will be of closed type so that the waste is not exposed and thus the possibility of spreading of disease through flies and mosquitoes is minimized.
- By proper supervision of solid wastes collection system so that quick and regular removal of waste from the dustbin is practiced.
- Separate collection bins are provided at each block to collect the solid waste generated by employees.
- Hazardous wastes like waste oil from DG sets, used batteries etc shall be handed over to KSPCB authorized hazardous waste recyclers for further processing.
- E-waste like waste from CD, computers etc shall be handed over to authorized E-waste recyclers for further processing.
- The sludge from STP shall be used as manure for landscaping.
- The DG oil/ fuel, used oil/ fuel shall be stored at the designated place on the impervious floor in a closed container.

4.5.2 IMPACTS ON AIR ENVIRONMENT

The impact on air quality is assessed based on emissions of the proposed commercial building. During operation phase of the project, various daily activities may have impact on air environment and its parameters. Operation phase will involve emission from vehicular movement, from diesel generators and negligible emissions from sewage and solid waste handling and disposal.

The project is not significant from air pollution angle as there are no continuous air pollution sources. DG sets which are used purely as standby and shall be operated only in case of power outage/failure which are the only significant sources of air pollution during operational phase. As these DG sets are provided with adequate stack height as prescribed by CPCB, no impact of the same on air quality is envisaged. The emissions from the operation of DG sets will be in compliance with Environment (Protection) Second Amendment Rules, 2002. There will be 14×2000 KVA capacities of DG sets to be required as a power backup.

MITIGATION MEASURES: Following are the few mitigation measures, adopted to prevent the impact on Air Environment:

- Use of low-sulfur fuels to DG sets in order to reduce emissions. DG will be used as stand-by unit and usage will be restricted and will be used only in case of power failure.
- Emissions from DG sets shall comply with emission norms notified by CPCB.
- Regular monitoring and maintenance of ambient air quality parameters will be done, which shall be within the norms notified by CPCB (NAAQS), in order to check the surrounding air quality.
- Usage of speed limits will be adopted to reduce airborne fugitive dust caused by vehicular traffic from the project.
- Developments of greenbelt to a greater extent within the project site since plants are the good absorbers of SO_2.
- The vehicles used should have pollution under control certificate.

4.5.3 IMPACTS ON WATER ENVIRONMENT

The total water requirement for the proposed project is 1,082 KLD which will be met from BWSSB. The wastewater generated to the amount of 866 KLD from the project will be treated to the urban reuse standards stipulated by KSPCB. The wastewater from the proposed project involves wastewater from office, canteen etc which will be treated to the urban reuse standards and used for secondary purposes such as flushing, HVAC and for gardening purposes.

The total land available for greenbelt and Park development is about 27,518.41 Sqmt (i.e. 36.6% of the net site area). As per the observation of the soil, the category of the soil can be identified as sandy soil. With a minimum STP treated water application for landscape area including park and open space, for such soil types, it has been estimated that nearly 165 KLD of treated sewage can be applied on this soil.

The total treated sewage water discharge from the project is around 823 KLD. Out of this about 165 KLD can be used for gardening and about 481 KLD will be used for flushing, 177 KLD will be used for HVAC.

As the sewage will be treated to meet the urban reuse standards and the same would be reused, there is no adverse impact on ground and surface water is envisaged.

MITIGATION MEASURES: Following are the few mitigation measures will be adopted to prevent the impact on Water Environment.

- The sewage generated during operation phase will be collected through an internal network of sewerage system and discharge into the STP of capacity 300 & 570 KLD based on Sequential Batch Reactor (SBR) technology and the treated water quality shall be conformed to the standards laid by KSPCB. Treated water will be reused for toilet flushing, HVAC and for landscape development.
- Provision of dual piping system in order to utilize the treated sewage water for non potable purposes such as flushing, HVAC and for landscaping etc.
- Installation of flow meters at water inlet points in order to monitor the consumption of water as per Water Cess Act 1977.
- Use of water efficient fixture units which consume less amount of water compared to conventional type of units.
- Regular analysis of the STP treated water before using it for secondary purposes, which should comply with the KSPCB standards.
- By adopting rain water harvesting system with recharge pits and the reuse of roof top harvested rain water to the maximum extent to reduce the consumption of fresh water considerably after necessary treatment through softener.
- By the proper maintenance of sewer and storm water drainage system.
- Immediate attention towards the leaky plumbing fixtures.

TABLE-4.5: Quality of treated sewage for urban reuse

Sl.No.	Parameters	Standards
1	p^H	6-9
2	BOD_5 mg/l	≤ 10
3	Turbidity, NTU	≤ 2
4	E-Coli	None
5	Res. Cl_2, mg/l	≥ 1

Note: Urban reuse includes landscape irrigation, vehicle Washing, toilet flushing, use in fire protection

STORM WATER MANAGEMENT

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

RAINWATER HARVESTING FACILITIES:

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

I. Roof top collection sump capacities (Terrace, m^3)

Block-1:
Q= Runoff – 0.055 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 0.21 Ha
C= Co-efficient of runoff – 0.95
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 90%
(after first flush of water about 10%) = 44.58cum
This run-off is being diverted to roof top water collection sump of 50cum, which shall be used for domestic purposes after the necessary treatment

Block-2:
Q= Runoff – 0.083 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 0.32 Ha
C= Co-efficient of runoff – 0.95
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 90%
(after first flush of water about 10%) = 67.59cum

This run-off is being diverted to roof top water collection sump of 70cum, which shall be used for domestic purposes after the necessary treatment

Block-3:
Q= Runoff – 0.079 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 0.30 Ha
C= Co-efficient of runoff – 0.95
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 90%
(after first flush of water about 10%) = 64.17cum
This run-off is being diverted to roof top water collection sump of 70cum, which shall be used for domestic purposes after the necessary treatment

Block-4:
Q= Runoff – 0.107 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 0.40 Ha
C= Co-efficient of runoff – 0.95
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 90%
(after first flush of water about 10%) = 86.48cum
This run-off is being diverted to roof top water collection sump of 90cum, which shall be used for domestic purposes after the necessary treatment

Block-5:
Q= Runoff – 0.105 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 0.40 Ha
C= Co-efficient of runoff – 0.95
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 90%
(after first flush of water about 10%) = 85.12cum
This run-off is being diverted to roof top water collection sump of 90cum, which shall be used for domestic purposes after the necessary treatment

Block-6:
Q= Runoff – 0.112 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 0.42 Ha

C= Co-efficient of runoff – 0.95
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 90%
(after first flush of water about 10%) = 90.52cum
This run-off is being diverted to roof top water collection sump of 95cum, which shall be used for domestic purposes after the necessary treatment

Block-7:
Q= Runoff – 0.116 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 0.44 Ha
C= Co-efficient of runoff – 0.95
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 90%
(after first flush of water about 10%) = 94.35cum
This run-off is being diverted to roof top water collection sump of 100cum, which shall be used for domestic purposes after the necessary treatment

Block-8:
Q= Runoff – 0.104 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 0.39 Ha
C= Co-efficient of runoff – 0.95
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 90%
(after first flush of water about 10%) = 84.2 cum
This run-off is being diverted to roof top water collection sump of 90cum, which shall be used for domestic purposes after the necessary treatment

II. Runoff from podium Hardscape & driveway Area (Cum/Day)
Q= Runoff – 0.526 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 2.71 Ha
C= Co-efficient of runoff – 0.7
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 60%
(loss due to runoff, evaporation and evap-transpiration 40%) = **284.03cum**

III. Runoff from Landscape Area (Cum/Day)

Q= Runoff – 0.191 m^3/sec
I= Intensity of rainfall – 100mm/hr
A= Drainage area in hectares – 2.75 Ha
C= Co-efficient of runoff – 0.25
Data assumed:
Considering 15min of rainfall
Volume of Rainwater available for harvesting is 40%
(loss due to runoff, evaporation and evap-transpiration 60%) = **68.85cum**
Therefore total run-off from the site is = 352.88 cum

Recharge wells calculation:
Total depth of chamber - 3m BGL
Total depth of filter material in the chamber – 1.5m
Voids in the combination of filter material – 40%
Depth of effective open space in the chamber – 1.5m

Area of recharge chamber:
Surface area of well = Total run-off from site/effective depth of well = 168 Sqmt
Adding 10% for control unit, total area required is = 185 Sqmt
Requirement of Gravity head recharge well
It has been already discussed that the geo-hydrological situation of the ground water regime in the area is such that a gravity head recharge well of 150mm dia and strainer length of 50m will have a recharge efficiency of more than 20m^3/day
So the number of tube well requirement is = Total volume available/Recharge efficiency of bore well = 18 No's
Hence the area of each recharge well is = Total surface area of well/ no. of tube wells = 11 Sqmt

Roof rain water will be collected in roof rain water collection tank of capacities 1×50cum, 2×70cum, 3×90cum, 1×95cum, 1×100cum and same will be utilized after prior treatment. 18 no's of tube wells will be provided to recharge the ground water within the site and the plumbing plan is enclosed as **Annexure-9**. Hence excess runoff finds its way to storm water drain running near the project site.

4.5.4 IMPACTS ON NOISE ENVIRONMENT

The noise impacts are analyzed depending upon the people likely to be affected viz., people who are working near sources. People working near the source need damage risk threshold criteria for hearing, while the people who stay nearby need annoyance and psychological damage as the criteria for noise impact analysis. The noise levels in the work environment are compared with the standards prescribed by CPCB.

The major noise generating units in a proposed plant will be mainly from utility section such as DG. However, DG is proposed as standby arrangement. Besides, it will be located in closed and acoustically designed compartment (noise attenuating enclosure) hence no impact due to noise is envisaged.

MITIGATION MEASURES: Following are the few mitigation measures will be adopted to prevent the impact on Noise Environment

- D G sets will be provided with acoustic enclosure.
- Vehicles and machinery will be maintained properly.
- Regular monitoring of noise level will be carried out and corrective measures in concerned activity and machinery will be adopted accordingly.
- Sufficient green belt development will be done to help in reducing noise levels in the campus.

4.5.5 IMPACTS OF SOLID WASTE ASPECTS

Total quantum of solid waste generated from the proposed project will be 6.0MT/day. Out of which, organic waste contributes to 20% i.e, 1.2MT/day and In-organic waste contributes to 80% i.e, 4.8MT/day, if this quantum of waste is not scientifically handled and discarded improperly, leads to leachate formation under moisture conditions or when layers come in contact with water, affecting ground water through leachate percolation slowly into subsurface soil. Also, this leads to loosing the fertility of soil and intern odour nuisance / foul smell and attracts flies and helps in breeding of mosquitoes/flies/rats and may resulting in diseases causing serious health concern.

Improper maintenance of used oil from the operation of DG sets will have an impacts on the groundwater on long term through seepage into subsurface soil layers and indirectly aids in losing the fertility of the area. The waste oil when in contact with human skin leads to irritation to eyes/skin/nose causing health concern.

43.5 kg/day of STP sludge will be generated which needs to be properly disinfected, as this may pose health concern for operating staff and resident's exposure to these areas will feel uncomfortable and experience the odour nuisance/ foul smell.

Open burning of solid waste leads to emissions escaping into the atmosphere resulting air pollution and also affects the in-house & neighborhood residents. If these are not disposed properly, there will be chances of contamination of groundwater through percolation of toxic constituents into subsurface soil layers especially during monsoon period and when it contact

with human due to touch/inhalation/ingestion or by any means will seriously lead to health problems.

E-waste from the entire project will be generated includes used mobiles/batteries, expired CFLs, tube lights, electrical wires, used/old computers, CDs. E-wastes mainly contain heavy metals & toxic constituents and if unscientifically handled/managed, will leads to serious health concerns especially when they are burnt & discarded improperly.

MITIGATION MEASURES: Following are the few mitigation measures will be adopted to prevent the impact on Environment

- Implementation of Organic Waste Converter for treating organic solid wastes wherein the end product (manure) can be reused within the site premises for horticulture/ landscape development. Inorganic waste will be handed over to waste collector for recycling.
- Sludge generated from STP will be reused as manure for greenery development purposes.
- Waste oil generated from the DG sets will be collected in leak proof barrels and handed over to the authorized waste oil recyclers.
- Bio medical waste will be collected and stored in different colored bins as per the BMW rules, 1998 and dispose of the same to KSPCB authorized reprocessor.
- E-Wastes will be collected & stored in bins and disposed to the authorized & approved KSPCB E-waste processors.

COMPOSTING PROCESS USING "ORGANIC WASTE CONVERTER"

Process: The Organic Waste is converted into homogenized odour free output within 15 minutes through Bio Mechanical Process and is converted into COMPOST within two weeks which can be used in kitchen gardens and landscape applications.

Area Required: An area of 400 Sqmt earmarked housing the Organic waste converter. **Environment Friendly:** The system takes only 15 minutes to convert the Organic Waste into homogenized odour free output. Hence there is no foul smell. Consequently there is no fly menace or nuisance from rodents, dogs, insects Etc.

Treatment Process Description:

- The Organic Waste is collected from the building, and is segregated for removal of plastics, glass etc. The Organic waste is fed into a mechanical unit which converts this into homogenized, crushed odor free output with in fifteen minutes.
- This homogenized odour free output will go to the curing system for stabilization.

- The process is controlled aerobic microbial decomposition which includes initial low p^H levels then high p^H levels and stabilizes.

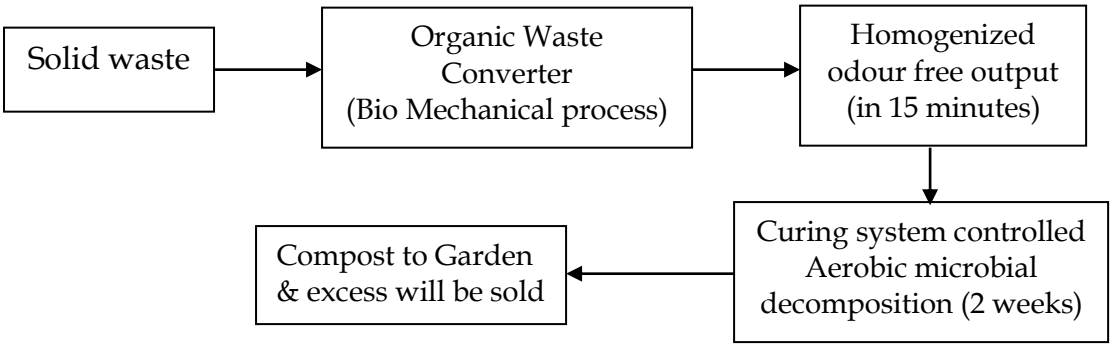
Special Advantage of the system:

- **Power Requirement: -** The Power required for operating this plant is lowest as the power is for 15 minutes for each batch. And the balance 14 days is natural aerobic microbial process.
- **Garbage Disposal: -** The storage, transportation and disposal of wet garbage is not required as it is safely treated at source and converted to high quality manure.

Advantages over other systems:-

- The manure is weed free and pathogen free as the process is aerobic.
- The surplus manure will be sold out for revenue generation.

Process of Organic Waste Converter:



4.5.6 IMPACTS ON ECOLOGY

The ambient air concentration of the pollutants released within the site viz. SO_2, SPM, RSPM, HC, & CO are well below the prescribed NAAQS and the sewage generated is also treated and recycled in compliance with the prescribed standards, no adverse impact of air pollutants and wastewater on the ecology is envisaged. On the other hand, extensive plantation and landscaping within the site will enhance its existing ecological value.

Proposed project is a commercial development and is presently surrounded with other similar project and expected the same in future, therefore there won't be any adverse impact on the ecology.

MITIGATION MEASURES:

Vegetation is the natural extension of the soil ecosystem on a site. It can provide summer shade, wind protection, and a low-maintenance landscape that is adapted to the local

environment. Unfortunately, the common practice is to remove the existing landscape cover and replace with a generic, water and maintenance-intensive lawn. Most of the trees present in the site will be retained for landscaping and the plan is enclosed as **Annexure-10**.

It is proposed to develop a minimum 36.6% of the total site area as greenbelt area which amounts to about 27,518.41Sqmt. Most trees proposed in the design are indigenous trees and native type of trees. Some trees such as the Temple tree, Neem & Champaka and palms have been added to the planting scheme for their aesthetic value. Annual budget of require amount shall be allocated for this purpose. The plantation schedule shall be completed within construction period of the project.

Following approach will be adopted for Vegetation and Ground Management.

- It is planned to include an ecologically knowledgeable landscape architect as an integral member of the design team.
- Preservation of existing vegetation, especially native plants. Avoid fencing off property where possible to make landscape available to community increasing project integration.
- Avoid replacing mature trees with young seedlings.
- Protect existing plants during construction. Delineate the "drip line" around trees and demark or fence off areas to avoid damage.
- Contain heavy equipment and stockpiling areas to predefined areas.
- Design new plantings as diverse communities of species well adapted to the site. Plant native species of varying ages. Select vegetation that attracts wildlife.

TABLE-4.6: List of species for the proposed project

Sl. No	TREE VARIETY		Approx. Nos./ Qty
	Common Name	**Botanical Name**	
1.	Neem Tree	*Azadirachta indica*	15
2.	Aarali Tree	*Ficus religiosa*	23
3.	Aala Tree	*Ficus benghalensis*	22
4.	Mango Tree	*Mangifera indica*	25
5.	Akasha mallige	*Millingtonia hortensis*	15
6.	Sampige Tree	*Michelia champaca*	35
7.	Singapore cherry	*Muntingia calabura*	32
8.	Nerale Tree	*Syzygium cumini*	30
9.	Honge Tree	*Pongamia pinnata*	20
10	Badami Tree	*Terminalia Catappa*	23
11	Silver Oak	*Grevillea Robusta*	22
12	Silver Trumpet Tree	*Tabebuia argentea*	20
13	African Tulip Tree	*Spathodia companulata*	25

14	Jacaranda Tree	*Jacaranda Mimosifolia*	24
15	Indian Laburnum	*Cassia Fistula*	24
16	Muttuga Tree (Flame of The Forest)	*Butea monosperma*	25
17	Queens Crape-Myrtle	*Lagerstromea speciosa*	30
18	Green bamboo	*Bambusoideae*	25
19	Yellow bamboo	*Bambusa vulgaris*	25
TOTAL			**450 Nos.**

Sl. No	**SHRUB VARIETY**		**Approx. Nos./ Qty**
	Common Name	**Botanical Name**	
1	Red Bird of Paradise	*Ceasalpinia pulcherrima*	40
2	Red Ginger	*Alpinia purpurata*	42
3	Crepe Jasmine	*Tabernaemontana divaricata*	35
4	Oleander/Dwarf Karabi	*Nerium oleander dwarf*	38
5	Great Bougainvillea	*Bougainvillea spectabillis*	32
6	Gold Shower	*Galphimia glauca*	38
7	Golden Dewdrop	*Duranta repens*	42
8	Chinese Rose	*Hibiscus rosa-sinensis*	45
9	Golden shrimp plant/ Lollypop plant	*Pachystachys lutea*	38
TOTAL			**350 Nos.**

Sl. No	**GROUND COVER VARIETY**		**Approx. Nos./ Qty**
	Common Name	**Botanical Name**	
1	Urn Plant	*Aechmea fasciata*	22
2	Barbados Lily	*Hippeastrum puniceum*	23
3	Gazania	*Gazania rigens*	25
4	Bush Lily	*Clivia miniata*	20
5	Lily Rose	*Zephyranthes rosea*	22
6	Foxtail Fern	*Asparagus Myers*	25
7	Bamboo Grass	*Bamboo grass*	24
8	Mexican Heather	*Cuphea hyssopifolia*	23
9	Begonia	*Begonia Semper Florens*	22
10	Texas Sage	*Salvia coccinea*	20
TOTAL			**226 Nos.**

4.5.7 IMPACTS ON SOCIO-ECONOMIC ASPECTS

The proposed development is in a favorable position to generate and sustain stable levels of employment, wage levels, continued improvements in living standards and the quality of life in the project surrounding area.

As the proposed project brings employment generation, both skilled and unskilled, it is obvious to assume that, all the economic activities in the project area would induce

considerable improvement in the socio-economic levels of people. The occupational phases of the project will have a potentially positive impact on local economy and society. Additionally, it has an affirmative impact and induces development of other sectors like school, colleges, health centers recreational centers etc. The impact of human settlement is expected to be positive, as rises the living standards of the people, literacy rate, and working class of people and also generates indirect employment.

4.5.8 IMPACTS OF NATURAL HAZARDS

There will be no impact of natural hazards on the proposed project, since the proposed project site comes under seismic zone – II, which is a low damage risk zone. Hence possibility of any natural hazard and risk would be nil. Due to the susceptibility of the project area to natural hazard such as cyclones/storm, flooding, earth quake, tsunami etc which would result on substantial damage and loss to the proposed project. Hence consideration must be given to these possibilities. Proper emergency response and action plan and disaster management plan should be followed in order to control any type of disaster from these natural hazards.

4.6 OTHER CUMULATIVE MITIGATION MEASURES

Following are the other cumulative mitigation measures adopted in the proposed project

- Renewable energy will be used throughout the building, wherever it is possible and practical to do so.
- Regular inspections of drainage systems will be performed to ensure that the drains remain clear of blockages to safeguard against flooding.
- Selection of plants for landscaping should consider the local habitat suitability, feeding trees, trees of national interest, flowering trees and shrubs.
- Preventing direct channeling of storm water to the existing lake.
- Public health and safety in the event of predictable events.
- Establish regulations and promote environmental awareness amongst the employees, visitors and staff e.g. using posters or signs.
- By establishing EMP cell.

CHAPTER 5

5.0 ANALYSIS OF ALTERNATIVES

M/s. Wisdom World Developers Pvt Ltd is having own land which is converted for the commercial usage therefore, no alternative for the site was considered. Moreover, the project site area is located adjacent to the outer ring road which is surrounded by the commercial building. Development of the commercial building at the selected area will cater the additional facilities to the commercial companies which will help to improve the socio economic status of the area as well as the country.

Rehabilitation and Resettlement is not applicable to this project site as the site is vacant land.

CHAPTER – 6

6.0 ENVIRONMENTAL MONITORING PROGRAM

6.1 INTRODUCTION

Environmental monitoring is important parameter to assess the status of environment during construction and operation phases of the project. Environmental monitoring program includes the technical aspects of monitoring and monitoring the effectiveness of mitigation measures (including measurement methodologies, frequency, location, and data analysis, reporting schedules, emergency procedures, detailed budget and procurement schedules). The details include summary matrix of environmental monitoring, location of monitoring stations, frequency of sampling, method of sampling analysis, parameters of monitoring and data evaluation during construction and operation stages; requirement of monitoring facilities; comparison with base line data and compliance to accepted norms & reporting system including plantation monitoring programme.

An impact assessment study comprises of two main phases, in relation to that, Environmental Monitoring Program will be carried out in the same two main phases and are:

- Assessment of the present environmental condition (Baseline)
- Prediction of the impact of future development.

Regular monitoring of environmental parameters is more importance to assess the status of the environment during operation of the project. Baseline conditions will serve as an indicator for any deterioration in environmental conditions due to operations of the project.

As the impact assessment study is carried out for a short period of time and the collected data cannot bring out all variations persuaded by the natural & human activities. Therefore, regular monitoring programme of the environmental parameters is essential to take into account the changes in the environmental quality. The objectives of monitoring are:

- To verify the results of the impact assessment study in particular with regards to new development.
- To follow the trend of parameters which have been identified as critical;
- To check or assess the efficiency of the controlling measures.
- To establish a data base for future Impact assessment studies for new projects.
- To ensure that new parameters, other than those identified in the impact assessment study, do not become critical through the commissioning of new development.

- To check assumption made with regard to the development and to detect deviations in order to initiate necessary measures; and
- To establish a data base for future Impact assessment studies for new projects.

The attributes, which merit regular monitoring, are specified underneath:

- Ambient air quality
- Ambient noise quality
- Water and wastewater quality
- Landscape development

The post project monitoring to be carried out at the project is discussed in the following sections.

6.2 MONITORING AND REPORTING PROCEDURE

Regular monitoring of important and crucial environmental parameters is of immense importance to assess the status of environment during operation of the project. With the knowledge of baseline conditions, the monitoring programme can serve as an indicator for any deterioration in environmental condition due to the construction of IT office and its operation and suitable mitigatory steps could be taken in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficiency of control measures can only be determined by monitoring.

The monitoring program would be a comprehensive monitoring programme as suggested underneath. Environmental attributes should be monitored as given below:

6.2.1 AMBIENT AIR QUALITY

CONSTRUCTION PHASE:

During baseline study, i.e. before construction of proposed building; air monitoring has been carried out at nine locations, including project site as well as another eight different stations within the study area of 10 km and the results are discussed in chapter-3.

The ambient air quality monitoring shall be carried out during the construction phase of the project. Once the construction activity starts, regular monitoring of the ambient air, once in three months will be carried out at project site.

The parameters to be monitored are Particulate Matter-2.5 $\mu g/m^3$, Particulate Matter-10 $\mu g/m^3$, Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Ozone, Lead, Carbon monoxide, Ammonia, Benzene, Benzo (a) Pyrene (BaP), Arsenic, and Nickel.

OPERATION PHASE:

Once the proposed office building would start operation, regular monitoring of the ambient air, once in six months will be carried out at the site.

The parameters to be monitored are Particulate Matter-2.5μg/m^3, Particulate Matter-10μg/m^3, Sulphur Dioxide (SO_2), and Nitrogen Dioxide (NO_2).

6.2.2 AMBIENT NOISE QUALITY

CONSTRUCTION PHASE:

During baseline study, i.e. before construction; noise monitoring has been carried out at nine locations, including project site as well as another eight different locations within the study area of 10 km and the results are discussed in chapter-3.

Noise emissions from vehicular movement, operation of various construction equipments shall be monitored during construction phase. The frequency of monitoring will be once in three months at two stations within in the premises of the project site.

OPERATION PHASE:

Ambient noise level within the project site will be monitored at two locations once in six months during the operation phase of the project in order to ensure that noise levels are within the permissible limits as prescribed by the Board.

6.2.3 WATER AND WASTEWATER QUALITY

CONSTRUCTION PHASE:

During baseline study, i.e. before construction; ground water quality analysis has been carried out at nine locations, including project site as well as another eight different locations within the study area of 10 km and the results are discussed in chapter-3.

Similarly, during baseline study; lake water quality analysis has also been carried out at surface water (lake) within the study area of 10 km and the results are discussed in chapter-3. Once the construction of the project starts, the groundwater quality analysis will be carried out once in three months within the project site. The parameters to be monitored are physical, chemical and biological characteristics.

OPERATION PHASE:

During operation phase of the project, water quality analysis will be carried out once in six months within the project site. Along with this, regular analysis (monthly once) of

sewage treatment plant (STP) treated water will be carried out for the following parameters, which will be maintained within the prescribed KSPCB limits.

And also water conservation methods used are to be done regularly which includes,

- Use of water meter conforming to ISO standards will be installed at the inlet point & at the discharge point to monitor the daily water consumption.
- Implementation of dual piping system.
- Awareness among the occupants regarding optimal usage of water & reuse.
- Rainwater harvesting facilities are proposed.
- Immediate attention towards the leaky plumbing fixtures.

TABLE 6.1: Quality of treated sewage for urban reuse

Sl. No.	Parameters	Standards
1	p^H	6-9
2	BOD_5 mg/l	≤ 10
3	Turbidity, NTU	≤ 2
4	E-Coli	None
5	Res. Cl_2, mg/l	≥ 1

Note: Urban reuse includes landscape irrigation, vehicle washing, toilet flushing, use in fire protection and commercial air conditioners.

6.2.4 LANDSCAPE DEVELOPMENT

CONSTRUCTION PHASE:

Initial landscape development will be started during construction phase itself, and landscape activities will be carried out on setback area, on walk ways etc.

OPERATION PHASE:

Once project starts operation, other landscape activities will be done and maintenance of the same will be carried out by maintenance staff.

Landscape maintenance activities include

- Fertilizer dosing
- Repotting
- Watering etc.

6.3 INFRASTRUCTURE FOR ENVIRONMENTAL PROTECTION

In the proposed IBC Wisdom IT office project the infrastructure facility for environmental protection will be established. This cell shall be head by project manager

supported by junior staff and maintenance staff; this cell will be framed to monitor the environmental status periodically in operation phase.

Following table depicts the list of equipments used; test method and monitoring schedule for environmental parameters.

TABLE: 6.2. List of equipments used and test method

Sl No	Attributes		Equipment Used	Test Method
1.	Ambient Air		High Volume air sampler	IS 5182
2.	Ambient Noise		Noise dosimeter/Sound level meter	Lab Method
3.	Stack Monitoring		Stack Monitoring kit	IS 5182
4.	Water (Ground & Surface)	Chemical	Manually - Standard Procedure	IS 3025
		Micro biological	Manually- Standard Procedure	IS 1622
5.	Waste Water		Manually- Standard Procedure	IS 3025
6.	Soil		Manually- Standard Procedure	Lab Method

TABLE: 6.3. Monitoring schedule for environmental parameters

Sl. no	Particulars	Monitoring frequency	Duration of sampling	Important monitoring parameters
1.	**Stack Monitoring**			
	DG stacks at project premises	Once in three months	As per the standard procedure	SO_2, NO_x, SPM, CO, Temperature, Flow Rate
2.	**Ambient air quality Monitoring**			
	Project premises	Once in three months	24 hours Continuous	PM_{10} & $PM_{2.5}$, NO_2, SO_2
3	**Ground/Drinking Water Quality Monitoring**			
	Ground water at project site	Once in three months	Grab sample	Parameters specified under As per IS -10500, 1993
4	**Sewage Quality Monitoring**			
I	Raw Sewage	Monthly once	Composite	p^H, BOD_5, Turbidity, E-Coli, Res.Cl_2
II	Treated sewage prior to discharge	Monthly once	Composite	p^H, BOD_5, Turbidity, E-Coli, Res.Cl_2
5	**Ambient noise levels**			
	Project premises in 2 locations	Once in a months	8hr continuous with 1hr interval	Ambient Noise Standards
6	**Greenbelt development**			
	Project premises	Continues	Continues	--

6.4 COST PROVISION FOR ENVIRONMENT MANAGEMENT

Total capital cost allocated towards environmental pollution control measures is about Rs. 49.5 Crores and the Recurring cost (operation and maintenance) will be about Rs. 142 Lakhs per Annum. The break – up of Environment Management cost for the project is given in the Table – 6.4.

TABLE: 6.4. Budgetary provision for environmental management plan

Sl. No.	Description	Capital Cost (Rs. In Crores)	Operating Cost (Rs. In lakhs/Annum)
1.	Sewage Treatment Plant	7.5	48.0
2.	Landscape Development	7.5	30.0
3.	Solid waste Management	5.0	6.0
4.	Rainwater harvesting facilities (Collection & Recharge pits)	6.0	24.0
5.	Solar water Heaters	10.0	5.0
6.	Fire safety & protection	30.0	5.0
7.	Storm water drain	10.5	24.0
Total Cost		**49.5**	**142.0**

TABLE: 6.5. Environmental monitoring plan & cost during operation phase

Sl. No.	Item	Parameter	Frequency	Location	Unit cost per sampling & Analysis (Rs)	Samples per year (No)	Cost per year (Rs)
1	Air quality	PM_{10} & $PM_{2.5}$, NO_2, SO_2	Quarterly	2 sites around periphery of site	5300	8	42,400
2	Noise Level	Equivalent noise level	Monthly	2 sites around periphery of site	600	24	14,400
3	Exhaust from DG set	SO_2, SPM	Quarterly	Stacks of DG sets	3000	32	96,000
4	Waste water analysis	p^H, BOD, COD, TSS, TDS	Monthly	STP	2500	36	90,000
Total Cost During Operation Per Year							**2,42,800**

CHAPTER – 7

7.0 ADDITIONAL STUDIES

7.1 ENVIRONMENTAL RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

RISK ASSESSMENT

Risk assessment refers to identifying and evaluating hazards identified within the system. Risk assessment is the determination of quantitative or qualitative value of risk related to an actual situation and a recognized threat (also called hazard). In all types of engineering of complex systems sophisticated risk assessments are often made within safety engineering and reliability engineering when it concerns threats to life, environment or machine functioning.

And it is also an orderly way of studying and analyzing the project, more than simply designing it and a clear understanding of the project objectives, all alternatives, and all issues that need to considered during the design and construction.

The purpose of risk assessment is:

- To ensure that potential safety problems are properly understood or not.
- To check whether existing control measures (including emergency plans) are adequate or not.
- To determine what is necessary to reduce risks to a reasonable level.
- To priorities unacceptable risks identified by the assessment and determine further action.

RISK MANAGEMENT

A risk management plan was developed to address the risk identified in the risk assessment process. Risk management is a structural approach to managing uncertainty related to threat, a sequence of human activities including: risk assessment, strategies development to manage it, and mitigation of risk using managerial resources.

The strategies include transferring the risk, avoiding the risk, reducing the negative effect of the risk.

STEPS IN THE RISK MANAGEMENT PROCESS

- Identification of risk in a selected domain of interest.
- Planning the remainder of the process.

- Mapping out the following
  - The social scope of risk management.
  - The identity and objectives of stake holders.
  - The basis upon which risks will be evaluated, constraints.
- Defining a frame work for the activity and an agenda for identification.
- Developing an analysis of risk involved in the process.
- Mitigation of risks using available technological, human and organizational resources.

The major risk identified due to the probable hazards in the project site during construction and operation phase of the project and precautionary measures as a part of emergency response plan is discussed in the below sections.

- Accident due to blasting (if any)
- Failure of machinery
- Working at heights
- Transport vehicles
- Loading and unloading
- Hazards pertaining to fires in buildings.
- Fire in diesel storage areas, garbage storage and disposal area.
- Earth quakes, Flooding
- LPG gas leak
- Electrical Accidents
- Spills
- Occupational Noise Exposure
- Housekeeping etc...

SAFETY ASPECTS PROPOSED DURING BOTH PHASES

DURING CONSTRUCTION:

The project authorities must recognize the causes of safety hazards in construction site and establish programs, rules, regulations, guidelines, whatever else might be necessary to reduce accidents.

1. Management:

- The management structure and responsibilities of the various members of the project team, whether based at site or elsewhere.

- Arrangements for the principal contractor to give directions and co- ordinate other contractors.

2. Standard setting: The health and safety standards to which the project will be carried out. These may be set in terms of statutory requirements or higher standards that the client may require in particular circumstances.
3. Information for contractors: Informing contractors about risks to their health and safety arising from the environmental in which the projects are to be carried out and the construction work itself.
4. Communications and co-operation: Communicating and passing information between the project team, the designers, the planning supervisor, the principal contractor, other contractors, workers on site and others whose health and safety may be affected.
5. Selection procedures: Machinery and other plant supplied for common use will be properly selected, used and maintained; and that operator training will be provided.
6. Information and training for people on site: Arrangements need to be made by which the principle contractor will check that people on site have been provided with:
   - Health and safety information
   - Health and safety training
   - Information about the project (e.g. relevant parts of the health & safety plan)

SAFETY MEASURES DURING CONSTRUCTION:

The safety procedures, norms and guidelines (as applicable) as outlined in the document Part 7 - Constructional practices and safety, 2005, National Building code of India, Bureau of Indian Standards shall be complied with.

- Provide clean drinking water to all workers.
- Provide adequate number of decentralized latrines and urinals to construction workers.
- Guarding all parts of dangerous machinery.
- Precautions for working on machinery.
- Maintaining hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition.
- Durable and reusable formwork systems to replace timber formwork and ensure that formwork where used is properly maintained.
- Ensuring that walking surfaces or boards at height are of sound construction and are provided with safety rails or belts.

- Provide Personal Protective Equipments (PPEs); helmets etc...
- Provide measures to prevent fires. Fire extinguishers and buckets of sand to be provided in the fire-prone area and elsewhere.
- Dangers, health hazards, and measures to protect workers from materials of construction, transportation, storage etc.
- Employment of Fire/Safety officer at project site

The following needs to be implemented:

1. **Fall Protection**

* The Contractor is required to provide fall protection to employees who are working at heights equal to or greater than 2m. Fall protection can be in the form of perimeter protection such as guardrails and toe rails, personal protective equipment (PPE), or a fall protection plan.
* Where scaffolds are not used, safety nets will be installed and maintained whenever the potential fall distance exceeds two storey's.
* The PPE standard should cover occupational foot, hand, head, hearing, and eye protection.
* To the greatest extent possible, working surfaces must be kept dry to prevent slips and falls and to reduce the chance of nuisance odors.
* All equipment and materials would be stored in designated storage areas that are labelled as such.

2. **Ladders and Stairs**

* Portable ladders used for access to an upper landing surface must extend a minimum of 1.5 m above the landing surface, or where not practical, be provided with grab rails and be secured against movement while in use.
* The Contractor is required to inspect and maintain all ladders and temporary/portable steps to ensure that they are in good working condition.
* All ladders must be used only on stable and level surfaces.
* All access points must be kept clear.

3. **Scaffolds**

* Access to Scaffolds - access to and between scaffold platforms more than 0.6m above or below the point of access will be made by portable/attachable ladders or ramps.

* Employees must never use makeshift devices, such as boxes and barrels, to increase the scaffold platform working level height.

4. Excavation

* The area around the excavation must be protected with barricading and kept clear of surface encumbrances.
* Water would not be allowed to accumulate in the excavation.
* Guardrails or some other means of protecting people from falling into the excavation would be present.

5. Electrical Safety

* If work has to be done near an overhead power line, the line must be de-energized and grounded before work is started.
* Fuses and circuit breakers would be used to protect motherboards, conductors and equipment
* Extension cords for equipment or as part of a temporary wiring system will not be damaged or compromised in any way and insulation must be of the highest grade.
* Temporary lights would not be suspended by their cords.
* All the necessary safety equipment and monitoring equipment to be provided
* Anytime electrical equipment is deactivated for repair, or circuits are shut off, the equipment will be locked out and tagged at the point where it can be energized.

6. Occupational Noise Exposure

* The Contractor would implement engineering controls to reduce noise levels.
* The Contractor would provide hearing protection to employees that are exposed to noise levels above the permissible limit.

7. Cranes

* A competent person has been designated to supervise activities that require the use of cranes.
* Cranes would not be operated near any power lines.
* All picks would be carefully planned to ensure that the crane adequately hoist the load.

8. Welding and Cutting

* The Contractor's employees would be trained in hot work procedures.
* There must be adequate ventilation to reduce the build-up of metal fume.
* The hot work operators would use proper personal protective equipment (i.e., welding helmet, burning goggles, face shield, welding gloves, and apron).
* There would be a fire extinguisher present at all welding and burning activities.

9. Sign Boards/ Caution Boards

* Signs and symbols would be visible during any construction activity that presents a hazard. Upon completion of such activity, the postings must be removed immediately.
* The Contractor would post specific DANGER signs when an immediate hazard exists and specific CAUTION signs when the potential for a hazard exists.
* Danger signs are posted at all immediate hazards (i.e. Danger: Open Hole).
* Caution signs are posted at all potential hazards (i.e. Caution: Construction Area, Caution: Buried Cable).
* Every floor, working place and passageway would be kept free from protruding nails, splinters, holes or loose boards.

10. Fire Fighting

* All new building construction will ensure compliance with applicable state, local, and national fire and life safety standards.
* Portable fire extinguishers will be installed
* Measures will be proposed to reduce the incidence of fires by eliminating opportunities for ignition of flammable materials
* Extinguishers must be noticeably located and readily accessible for immediate use in the event of fire.
* Extinguishers should be clearly visible. In locations where visual obstruction cannot be completely avoided, directional arrows will be provided to indicate the location of extinguishers and the arrows will be marked with the extinguisher classification.
* In the event of a fire emergency, a fire alarm would be provided for the building
* Inspection, maintenance, and testing of fire extinguishers will be ensured so that they are in proper working condition.

- Fire Hose would be provided at identified places and it should be free from ant obstructions.

11. First Aid

- First-aid supplies approved by the consulting physician would be easily accessible when required.
- The first-aid kit would consist of materials approved by the consulting physician in a weather proof container with individual sealed packages for each type of item. The contents of the first-aid kit would be checked periodically to ensure that the expended items are replaced.
- Provisions would be made for prompt medical attention in case of serious injury.
- Proper equipment for prompt transportation of the injured person to a physician or hospital, or a communication system for contacting necessary ambulance service, would be provided.
- All the Emergency telephone numbers of the first Aider, physicians, hospitals, or ambulances would be posted.

SAFETY MEASURES DURING OPERATION PHASE:

- Proper fire exit plan and well planned fire hydrant facilities will be provided.
- All floors will be provided with Fire Alarm systems.
- Fire detectors will be provided in each room, passages of all floors.
- Each floor will be provided with portable fire extinguisher.
- Emergency Exit plan with Emergency contact numbers will be displayed at various locations.
- Occupants will be given training for emergency situations.
- DG oil and DG waste oil will be stored in leak proof containers at designated locations.
- Well planned traffic movement and parking facilities will be provided to prevent the accidents.
- Proper maintenance of Sewage treatment plant and Solid waste management plan to prevent the health hazards.
- Fire/Safety officer will be employed at project site.
- Onsite maintenance engineer and maintenance team will be there during operation phase.

7.2 DISASTER MANAGEMENT PLAN (DMP)

As per Disaster Management Act, 2005 "Disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of property, or damage to, or degradation of environment and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected areas."

It is also an unexpected event due to sudden failure of the system, external threats, internal disturbances, earth quakes, landslides, floods, fire and accidents etc. Disaster management plan is nothing but the preparedness in case of emergency situations in order to limit the impact of disaster events.

Types of Disasters:-

Broadly there are two types of disasters namely:-

(i) Natural Disasters and

(ii) Man-Made Disasters

Types of Natural Disasters:

- Floods, Droughts, Cyclones, Tsunami
- Heat and Cold waves, Global warming, Sea Level Rise, Ozone Depletion
- Landslides, Snow avalanches
- Earthquakes, Volcanic eruptions

Types of Man-Made Disasters:

- Accidents: - Road, Rail, Air, River, Sea, Transport of hazardous material, Building Collapse.
- Fires: - Buildings, oil fires.
- Poisoning: - Food, Water,
- Civil Conflicts: - Arson, sabotage, terrorist and other criminal activities.

Emergency plan deals with the strategic organizational management processes used to protect life and critical assets of an organization from hazard risks thereby decrease the financial loss to the organization and to save lives as a result of the incident. Emergency and response plan prepared towards proposed project is enclosed as **Annexure-11.**

Bengaluru and surrounding regions are considered to be low damage zones as far as Earthquake (Risk Zone-II), Flooding, Landslides and Cyclone are concerned (Source:

BMTPC Risk Zone Maps). However, in case of any eventual disasters, it is proposed to draw guidelines for reporting procedures, communication system and emergency action committee as follows:

- Earthquake resistant structures as per the standards applicable for Risk Zone II.
- Emergency action committee: To ensure coordinated action, an Emergency Action Committee shall be constituted to interact with:
  - Police officer of the area.
  - Transport corporation representatives.
  - Home guard representative.
  - Department of information and publicity.
  - Nearest medical facilities.
- Safe route to be used, adequacy of transport for evacuation and traffic control.
- Fire protection: The building materials would be of appropriate fire resistance standard. The fire resistance period would be at least 4 hours. Usage of wood will be minimum and restricted to only for door panels and shall not be used for any purposes, excluding artificial wood products, which are flame – resistant.

The extent of damage would be reduced by proper emergency response by the inhabitants. Awareness programs shall be organized to educate the general residents and train the members of emergency response group.

PRECAUTIONS:

DURING CONSTRUCTION:

- Use of water sprinklers to prevent dust from being air borne
- Providing suitable personal protective equipments (PPE) like mouth mask with filters, nose mask, helmets etc
- Periodic health check-up camp for the labourers will be arranged.
- Provision of safety belts
- In case of injury, on site medical treatment and transport will be organized.
- Employing a safety engineer

DURING OPERATION:

- Once the likelihood of the disaster is suspected, preventive actions should be undertaken by the project in-charge.

- Conditional maintenance of equipments, materials and expertise for use during emergency.
- The electrical systems shall be provided with automatic circuit breakers activated by over current.
- Fire extinguishers are provided at pre-notified locations inside the apartments.
- Proper escape routes are planned and displayed in the public domain.
- Selected representatives are given proper training to guide other inhabitants during fire accidents.
- Periodic awareness programme will be conducted for the occupants on their roles during emergency situations.
- Important telephone numbers like police authorities, fire department and hospitals etc. of use during emergency situations are made available.
- First aid kit with primary medicines will always be available in the medical centre.

EMERGENCY DETAILS NEAR TO THE PROJECT SITE:

Nearest Bus stand	JP Morgan bus stop	0.25 km
Nearest Railway station	Bellandur Railway Station	1.08 km
	Karmelaram railway station	4.06 km
Nearest Fire station	Sarjapur fire station	4.05 km
Nearest Airport	Kempegowda International Airport	27.98 km
Nearest hospital	VIMS Hospital, Marathahalli	0.31 km

7.3 NATURAL RESOURCE CONSERVATION

Following are the few resource conservation measures will be adopted during construction as well as operation.

DURING CONSTRUCTION:

- Water requirement of construction will be minimized by using the ready mix concrete and other curing agents.
- Generated construction debris will be reused within the site for internal roads and walk way formation.
- Excavated topsoil will be conserved and reused for backfilling, landscaping and for road and driveway within the site.
- Storm water pollution prevention plan will be proposed, accordingly the storm water will be conserved through construction of catch pits and the same has been used for construction activities.

- Temporary seeding will be done like planting of fast growing grasses to hold down the soils in disturbed areas so that they are less apt to be carried offsite by storm water runoff or wind.
- Permanent seeding like use of permanent vegetation (grass, trees or shrubs) to stabilize the soil by holding soil particles in place.
- Building materials of low embodied energy and high strength are recommended as an alternative to the conventional building materials.
- Optimal transportation routes will be suggested for construction vehicles.
- Compensatory landscape will be done towards site clearance.

DURING OPERATION:

- Fresh water requirement of the project will be minimized by using the treated water for flushing and for landscaping.
- Generated STP sludge will be used as manure for landscaping.
- Usage of energy will be minimized by using energy efficient devices and controllers.
- Solar energy will be utilizes for Solar lighting.
- Generated organic waste will be processed in organic waste converter and manure will be used for landscaping.
- Utilization of DG sets will be restricted and will be used only during power failure, where it minimizes the fuel requirement.
- Roof rainwater collection will be done and the same will be used for domestic purposes after pre-treatment.
- Runoff from landscape and hardscape will routed to recharge pits for ground water recharge.
- Extensive landscape will be done within the project site.
- Construction debris will be reused/ recycled for backfilling/ sub base works for roads, pavements and drains within the project site.
- Earth work excavated is managed through backfilling between foundations on the backside of retaining walls and also reused for filling up the low lying areas at site. Top soil will be reused for landscaping purposes.

7.4 PUBLIC CONSULTATION

The proposed project is a development of IT Space; as per the EIA Notification 2006, the proposed project comes under item 8 i.e. building and construction project with a built up

area ≥1,50,000 Sqmt and excluded from public consultation, hence public consultation is not required for the proposed project.

7.5 RESETTLEMENT & REHABITATION (R&R) ACTION PLAN

Proposed project is a development of IT Space, as per the revised master plan – 2015 of BDA the project site is designated as Hi-tech zone and also land has been converted from agricultural to commercial purpose. Since the proposed project is development of IT/BT office building; hence the additional study does not involve resettlement and rehabitation (R&R) action plan for the proposed developmental project.

CHAPTER – 8

8.0 PROJECT BENEFITS

8.1 GENERAL

The proposed project will bring overall improvements in the locality, neighborhood and to the state by bringing industry, roads, water supply, drainage facility, power supply, employment for skilled, semi-skilled and unskilled labour, thereby uplifting the living standards of local communities and economic growth as well as it also stimulates the growth in small and medium scale industries like residential developments, hotels, shopping complexes, retail shops, health centers, educational institutes, recreational centers etc., may be further developed as a consequence.

Bengaluru is called as the "Silicon Valley" of India because of the large number of information technology companies located in the city. With the unparalleled increment of the IT sector in Karnataka capital, the demand has increased for both type of commercial and residential real estate in the destination of the city and its nearby area. This rise in demand will be considerably fulfilled by the proposed development and would be beneficial in reducing the demand of dwelling units in the city.

Bengaluru has an advantage due to the accessibility by all means of transportation systems. It has well connected via roads, rail and air. As the project accommodates residing population, there will not a positive change in the existing demographic pattern.

In operation phase, the proposed project would require significant workforce of skilled, semi-skilled and unskilled labours, improvement of personnel with better education and professional experience will result in increase of literacy in the locality and in surrounding villages.

8.2 IMPROVEMENT IN THE PHYSICAL INFRASTRUCTURE

Bengaluru is known as the Silicon Valley of India because of its position as the nation's leading IT exporter. A demographically diverse city, Bengaluru is a major economic hub and the second fastest growing major metropolis in India.

The beneficial impact of proposed project on the civic amenities will be substantial after the commencement of project activities. The basic requirement of the community needs will be strengthened by extending healthcare, educational facilities to the community, building/strengthening of existing roads in the area, providing water with drainage system, power supply, transportation facility etc,. IT building will initiate the above amenities either

by providing or by improving the existing facilities in the area, which will help in uplifting the living standards of local communities.

Physical infrastructure includes the necessary infrastructural & technological facilities available in the locality for project operation. IT building project which includes modernized technologies and infrastructural facilities like transportation, power connections, communication facilities, water supply and drainage facilities, internal drive way cum parking facility, landscape, rain water harvesting, solid waste management, and usage of solar energy etc. which will enhance the existing infrastructure and stimulates similar developments in the locality.

The construction of new roads/strengthening of existing roads in the project area and in surroundings will enhance the transportation facilities. Roads will be laid to facilitate the movement of materials and equipment during construction and operation of the units. However, permanent roads would be built on the basis of plant layout. With improved transportation facilities there is always a scope for development.

TRANSPORTATION:

The major mass transportation in Bengaluru is through buses; Buses are operated by Bengaluru Metropolitan Transport Corporation (BMTC) and are an important means of public transport available in the city and are highly reliable. As the road connectivity improves passenger will use transport vehicles like maxi cabs, cars and Auto Rickshaws and the numbers will also increases simultaneously. This is the healthy trend of a growing city. Railways and airlines are also located near the project area which will help the easy conveyance to the public.

The proposed project will create the demand on the existing transportation infrastructure and stimulates for new developments and also generate economic benefits to these sectors.

WATER SUPPLY & DRAINAGE SYSTEM:

Water supply to the Bengaluru city is majorly sourced from BWS&SB. Water requirement for the proposed project will also be sourced from BWSSB, water supply line and drainage facilities provided from BWSSB, which will helps for the proposed project as well as for other upcoming projects. With this, the proposed project will enhance the requirement and maintenance of water supply and drainage system.

The study area is well connected with natural drainage system; and well planned storm water management is proposed. i.e., all along the boundary of the site storm water drains will be provided. They would be adequately sized to prevent over flooding of the site. The storm water collection system will be designed in such a manner so that clean storm water from garden, parking areas, roadways and lawns will be used for recharging of ground water through recharge pits. The excess run off will be discharged in to the nearest storm water drain.

POWER SUPPLY:

The main power supply for the Bengaluru city is sourced from BESCOM. Electricity is supplied from BESCOM for various needs such as domestic utilities, industrial establishments and agricultural requirements etc. The study area is well connected with electricity supply network.

The required Electricity for our proposed project will be sourced from BESCOM and it will enhance the demand for requirement and maintenance of the same.

MISCELLANEOUS: Almost all the basic civic amenities like Phone lines, post offices, electric poles, sewer lines etc. are provided in project surroundings.

INDUSTRIAL SCENARIO:

Bengaluru is home to many well-recognized colleges and research institutions in India. Numerous public sector heavy industries, software companies, aerospace, telecommunications, defense organizations and are located in the city. Bengaluru is a hub for biotechnology related industry and IT sector in India.

Major information technology companies such as Infosys, Cognizant, Wipro, I Gate, Tata Consultancy Services, Accenture, Nokia Siemens Network, US based companies like Texas Instruments, Google, IBM, Hewlett-Packard, Honeywell, Yahoo, Oracle, Cisco, Microsoft, Intuit and Intel have their research and development centers along with their corporate offices in Bengaluru. The proposed project will create the demand on the existing structure and stimulates economic benefits to these sectors.

8.3 IMPROVEMENT IN THE SOCIAL INFRASTRUCTURE

Due to proposed project activity; social infrastructure will improve by means of Civilization, standard of living, education, Vocational Training, and Basic Amenities.

Additional benefits will be arrived from the proposed project like: healthcare, educational facilities to the community, community hall, sports centers, recreational centers, industrial developments, shopping malls, public services in the surrounding area.

Better education facilities, proper health care, road infrastructure and drinking water facilities are basic social amenities for better living standard of human being. Proposed project will further increase the above amenities directly/indirectly either by providing or by improving the existing facilities in the area, which will help in uplifting the living standards of local communities. Due to this project development adaptation of new technologies and other infrastructural facilities will improve which will indirectly boost the civilization of the surrounding people.

EDUCATIONAL INSTITUTE:

Education is an essential element of human development. It plays a major role in improving economic opportunities for people and enhancing their quality of life by building capabilities, enhancing skill levels and providing more productive employment. The study region is well placed which is having adequate infrastructure facilities for education. Number of pre-primary, primary, middle, secondary and senior secondary schools exists in the area. There are also numerous professional institutions and other institutions offering specialized courses relevant to the present day job market. With the increase in demand, more growth in educational infrastructure will likely to come up in the project area.

The proposed project will create the demand on the educational institutes which enhances skill power, quality of life & standard of living.

HEALTH CENTRES:

The project area is in advantageous position in terms of healthcare infrastructure. There exist many general / intermediate hospitals, polyclinics, nursing homes, in the area. Many more government and private healthcare facilities are being developed in the project area due to this proposed project.

BANKING:

Productive activities are mostly represented by agriculture and industry. Organized and unorganized banking and other credit agencies including the government agencies help production by assisting capital formation and its channelization for various productive activities.

Being an industrially hyperactive region, the financial needs in the project area is sufficiently served by the vibrant Banking institutes. Besides almost all of the nationalized banks and local co-operative banks, numerous multinational banks have also been rendering services over the region, hence it provides,

- Foreign exchange earning to the destination country.
- It will be helpful in raising the GDP (Gross Domestic Product) of the country.
- Increases revenue to the country by way of royalty, taxes and duties.

Additional benefits will be arrived from the proposed project are as mentioned below:

- Increase the demand for all other sectors like commercial and retails.
- Further development of small and medium scale industries may be developed as consequence.
- Increased revenue to the state by way of royalty, taxes and duties.
- Attracts more number of people for plenty of job opportunities.
- Infrastructure development.
- It raises the living conditions of the citizens of the country.
- Cultural exchange is also possible through the project.
- Self-employment gives a new boost to the country.

8.4 EMPLOYMENT POTENTIAL

As the proposed project bring employment generation for skilled, semi-skilled and unskilled, it is obvious to assume that, all the economic activities in the project area would induce considerable improvement in the socio-economic levels of people. The impact of human settlement is expected to be positive, as apart from some people being directly employed; many others will get indirect employed.

The employment of local people in primary and secondary sectors of project shall upgrade the prosperity of the region. This in turn will improve the socioeconomic conditions of the area.

DURING CONSTRUCTION PHASE:

This project will provide temporary employment to many unskilled and semi-skilled laborers in nearby villages; project will also help in generation of indirect employment to those people who render their services for the personal directly working in the project.

The proposed project duration is approximately five years. Project may require around 200 numbers of coolies and others are around 100 members during the construction phase. The project will fulfill the job requirements for all kinds of people in various sectors, which increase the employment opportunity and improve the living standards.

DURING OPERATION PHASE:

The impact of the project on the economic aspects can be clearly observed. The proposed project activities will provide employment to persons of different skills and trades. The local population will be given preference to employment. The employment potential will ameliorate economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service oriented activities.

During operational phase, considerable number of people will be benefited by provision of services to the residents; some people may retain as permanent employee after the construction phase.

8.5 OTHER TANGIBLE BENEFITS

Infrastructure development plays a very important role in the process of regional inversion. It provides a platform upon which the phenomena supporting regional inversion depend. The sponsor of the project is the best person to identify the benefits.

CORPORATE SOCIAL RESPONSIBILITY (CSR):

M/s. Wisdom World Developers Private Limited is a Bengaluru based Private Limited Company with a primary objective of constructing and developing multi storied Residential Apartment and commercial spheres. The promoters of this company are engaged in the business of property development in and around Bengaluru.

In a short period, it has emerged as one of the leading developers in South India with its excellent projects of outstanding quality, reliability, affordability and efficient after-sales service. It has its own team of construction with huge and latest equipment including imported shuttering materials for speedy construction and equipments like cranes, batching plants, trucks etc

Some of the social responsibilities in concern with the proposed development:

With respect to Wisdom World property in a variety of activities that help man co-exist with nature, such as employing local talent, help to conserve the environment and

ecology thereby minimizing the adverse effects of the project activity on the locality, its surroundings and an Environment.

- **Employment**
  - There is an estimated employment opportunities for laborers during construction phase and permanent staff for various jobs like Manager, supervisor, housekeeping, Gardeners, STP maintenance, security during operational phase of the project.
  - To encourage local talent, will increase local employment opportunities and thus will improve the local economy. Secondary employment opportunities anticipated in the vicinities in the form of tea/coffee shops, provision stores, hyper market, fruits/vegetable/flowers selling vendors, stationary shops, medical shops, etc., which will improve the standard of living conditions of the local region.

- **Recycling process**
  - Wastewater from the proposed project as well as from other projects would be treated and reused for flushing, car washing
  - STP sludge will be reused as manure for landscaping.

- **Rain water harvesting**

  All the Wisdom World property projects have rain water harvesting systems in place to provide supplemental water for their requirements, to increase soil moisture levels, and improve ground water table levels.

- **Landscape Development**

  All the Wisdom World property projects will have a well-planned Landscape, which will enhance the beauty of the aesthetics and were committed to delivering environmental-friendly quality buildings with state-of-the-art technology; which enhance the beauty of the area. Improve the avi-faunal population of the area and also helps in reducing the heat island effect.

- **Use of Renewable Resources**

  All the Wisdom World properties projects will make use of renewable source of energy like solar street lights, solar heater etc, which will conserve the energy and reduces the load on the project.

- **Road & Drainage**

  All the Wisdom World properties will have well planned internal road and drive way facilities as well as internal drainage systems, which will improve the better management and maintenance.

- **Sewage treatment plant**

  All the Wisdom World properties will have well planned STP facilities of adopting efficient cum advanced technologies, which improve the sanitation facilities and reduces the load on fresh water requirement.

- **Education**

  Wisdom World has been setting up Creche and imparting education to the workers' children at every worksite, encourages workers to send their children to school. While helping them carve a better future for themselves, they also ensure to provide mid-day meals to the children.

Along with the above, Wisdom World have always been on the lookout of conducting CSR activities which directly make a benefit on society. Some of such initiative that took up is thoroughly explained in chapter-12.

CHAPTER – 9

9.0 ENVIRONMENTAL MANAGEMENT PLAN

9.1 INTRODUCTION

The Environmental Management Plan (EMP) is aimed at mitigating the possible adverse impact of a project and ensuring the existing environmental quality. The EMP converse all aspects of planning, construction and operation of the project relevant to environment. It is essential to implement the EMP right from the planning stage continuing throughout the construction and operation stage. Therefore the main purpose of the Environmental Management Plan (EMP) is to identify the project specific activities that would have to be considered for the significant adverse impacts and the mitigation measures required.

The identification and characterization of impacts has been presented in chapter-4 which dealt with Impact Assessment. It has been evaluated that, the project area will not be affected significantly with proposed project. Mitigation measures at the source level and an overall management plan at the site level are elicited so as to improve the surrounding environment. The Environmental Management Plan (EMP) is the road map for implementing mitigation measures to prevent the impacts arising from a particular project.

The construction phase impacts are mostly short term, restricted to the plot area and not envisaged on the larger scale. In the operational phase the environmental impacts are due to continuous operation of the project, hence, the emphasis in the Environment Management plan (EMP) is to minimize such impacts. The following mitigation measures are recommended in order to synchronize the economic development of the project area with the environmental protection of the region.

The emphasis on the EMP development is on the followings,

- Incorporating Green Building concept from the design to execution stage.
- Mitigation measures for each of the activities causing the environmental impact.
- Monitoring plans for checking activities and environmental parameters and monitoring responsibilities.
- Role responsibilities and resource allocation for monitoring; and
- Implementation of the scheduled plan.

Environmental management plan has been discussed in the following sections separately for construction phase and operational phase.

9.2 EMP DURING CONSTRUCTION PHASE

The Construction Environmental Management Plan is one of the most important documents for managing and monitoring the environmental impact of a construction site.

The EMP describes the proposed measures to be implemented to help, achieve and maintain acceptable levels of environmental impact. Proponents having the responsibility and will ensure the relevant employees are fully cognizant of and abide by the Environmental Management Plan. In order to measure the performance of our environment management system the following environmental goals have been stated for the project implementation.

- Training of all employees in environmentally relevant activities of the environmental management system.
- Reduction of the noise at the construction sites.
- Reduction of lost-time accidents at the construction sites.
- Prevention of environmental incidents at the construction sites.
- Implementation of project procedure for environmental requirements.

9.2.1. OBJECTIVES

The primary objective of environmental management plan is to initially limit the amount of generated construction wastes on this project by requiring all subcontractors and material suppliers to limit the quantities of materials and to supply only required materials those necessary for the project. The secondary objective is to divert 50 to 75% of the total wastes on this jobsite from area landfills at no cost premium to the project.

Every effort will be made to limit, separate, sort, collect and properly dispose of all construction waste materials generated on this project site during construction phase. EMP includes the following management programs for the construction activities, which need to be monitored and managed during its construction phase.

9.2.2. ENVIRONMENTAL AWARENESS TRAINING PRIOR TO COMMENCING WORK

The proponent shall ensure that all construction personnel, including senior site staff, sub-contractors and suppliers, etc attend an environmental awareness information session prior to commencing work on site. Additional staff, sub-contractors and suppliers coming onto the site must be made aware of the requirements of the EMP.

9.2.3. DEMARCATION OF THE SITE

The 'site' here refers to all areas required for construction purposes. The proponent shall demarcate the boundaries of inner limits of the site. Netting should be provided preventing building material from falling. The proponent shall maintain the demarcation line and ensure that materials used for construction site do not blow on or move outside the site and environs, or pose a threat to flora/fauna of that area.

9.2.4. LEVELING AND SITE CLEARANCE

Vegetation clearing to allow for site establishment as well as construction purposes will sometimes be required. Vegetation can be cleared mechanically with a bulldozer, but should be cleared by hand on other areas. All alien vegetation shall be eradicated from site during the site preparation. Indigenous vegetation that does not pose any risks to the operation of the project upon completion of the contract should be retained for esthetical purposes. Such vegetation shall be identified during design and clearly indicated on the site plans. Protected or endangered species of plants shall be retained where possible.

As the present project is involved under fresh proposal, hence there is no clearance of existing land. Excavation will be done for basement preparation and it will be restricted to minimize the excavation.

TABLE 9.1: Environmental management during levelling and site clearance

Environmental Impacts	Mitigation	Remarks
Noise generation: Caused due to Excavators and Bulldozers	• Most optimum no. of operation by the heavy equipment. • Selection of equipment with less noise generation to be used. • The earth moving equipment shall be periodically checked and maintained for noise levels. • The workers shall be provided with adequate PPE such as ear plugs to reduce impact of high noise levels.	To reduce noise level; equipment provided with noise control devices is only used.
Dust generation: Leveling operations results in the emission of the dust.	• The site cleared shall be periodically watered to reduce emission of dust particles • Barricades like metal sheets should be provided all round the premises to avoid fugitive dust emission in to the neighbouring area apart from water sprinkling.	The construction water requirement will be sourced from external tanker water suppliers.

	• The workers shall be provided with PPE such as nose masks and goggles to reduce impact on health.	

9.2.5. TRANSPORTATION OF CONSTRUCTION MATERIALS

During the transportation of construction materials, minimum no. of vehicles will be used. Most optimum route is planned to reduce the impact of transportation activity on the environment. The proponent shall ensure that all suppliers and their delivery drivers are aware of procedures and restrictions in terms of this EMP.

TABLE 9.2: Environmental management during transportation

Environmental Impacts	Mitigation
Noise generation	• Quality fuel is used. • Periodic maintenance of vehicles is required.
Dust generation	• Quality packaging of the construction materials. • Construction materials shall be covered with tarpaulin sheets to prevent the material from being air borne. • Material shall be appropriately secured to ensure safe passage between destinations during transportation. • The vehicle speed shall be regulated. • The workers transporting materials shall be provided with PPE such as nose masks to reduce impact of air borne dust on their health.
Vehicular emissions	• Periodic emission check for vehicles is required. • Clean fuel shall be used for vehicles.

9.2.6. CONSTRUCTION ACTIVITIES

<u>CEMENT AND CONCRETE MIXING</u>

- Unused cement bags shall be stored out of the rain where runoff won't affect it.
- Used (empty) cement bags shall be collected and stored in weatherproof containers to prevent windblown cement dust and water contamination.
- Concrete mixing directly on the ground shall not be allowed and shall take place on impermeable surfaces.
- All excess concrete shall be removed from site on completion of concrete works and disposed off at an appropriate disposal site.
- Wastewater from the concrete mixer after washing should be properly disposed to drainage.

During the construction work, the following impacts are identified to monitor and mitigate the level of impact.

TABLE 9.3: Environmental management during construction

Environmental impacts	Mitigation	Remarks
Noise generation	• Selection of Less noise generating equipments. • Personnel Protective Equipment (PPE) such as ear plugs and helmets shall be provided for construction workers • The working hours shall be imposed on construction workers.	Implementation responsibility: Contractor – Civil Works
Dust generation	• PPE in the form of nose masks shall be provided for construction workers. • Use of water sprays to prevent the dust from being air borne. • Barricades like metal sheets should be provided all around the premises to avoid fugitive dust emission in to the neighbouring area apart from water sprinkling.	Implementation responsibility: Contractor
Water Discharge from construction works	• Sewage generated from the construction labours will be collected in collection tank & will be treated in mobile STP	Implementation responsibility: Contractor
Air Emissions from construction machinery	• Periodic check and regular maintenance of construction machinery for emissions. • Clean fuel shall be used in equipments.	Implementation responsibility: Contractor

9.2.7. NOISE POLLUTION & CONTROL

Noise will be generated by construction activities such as vehicular movement, hammering, drilling, cement concrete mixing, welding etc. The proponent shall take all reasonable measures to minimize noise disturbance as a result of construction activities. These measures must comply with rules and regulations of the concerned Board and shall be limited to daylight hours.

Following are the control measures for noise pollution,

- Selection of less noise generating construction equipment.
- Quality fuel is used for vehicles.
- Personnel Protective Equipment (PPE) such as ear plugs shall be provided for construction workers.
- Periodic maintenance of vehicles is required.

- DG sets with acoustic enclosures complying to Environment (Protection) Rules is provided.
- Barricades are erected all along the site boundary to avoid noise nuisance on the surrounding population.
- Trained security men are deployed for smooth guiding entry/exist without traffic congestion which helps in reducing honking conditions.

9.2.8. DUST POLLUTION & CONTROL

Dust will be generated by construction activities such as excavation, filling, mixing, hammering, drilling, cutting, vehicular movement etc; the proponent shall take all reasonable measures to minimize the generation of dust as a result of construction activities.

Following control measures shall be used for dust suppression,

- Covering of material loads during transportation.
- Sprinkling of water on the material during transportation particularly in dry and wind season.
- Construction vehicles shall comply with speed limits.
- Haul distances shall be minimized.

9.2.9. SOIL EROSION & SEDIMENTATION AND ITS CONTROL

Construction activities such as earthmoving operations that disturb land areas depending on construction area affect the surrounding air and generate noise and vibration. During construction phase, a range of activities on construction sites has the potential to pollute surface water, these include earthworks, and construction works etc, that result in erosion and sedimentation. This erosion may result in a significant increase in sediment loads to receiving waters. Sediment, which results from the excessive erosion of disturbed soils, is the main sources of pollutants.

Following control measures shall be used for soil erosion and sedimentation.

- Before construction, care should be taken to keep vegetation clearing at a minimum.
- Re-vegetation of construction sites during and after construction is the most effective way to permanently control erosion.
- Mulching is used primarily to reduce the impact of rainfall on bare soil, to retain soil moisture, to reduce runoff, and often to protect seeded slopes.
- During construction, the proponent shall protect all areas susceptible to erosion by installing necessary temporary and permanent drainage works and by taking any other

measures necessary to prevent storm water from concentrating in streams and scouring slopes.

9.2.10. MATERIALS HANDLING AND STORAGE

FUEL STORAGE

During construction, fuels required for use shall be stored in a central depot at the construction camp at a location agreed upon by the concerned authority. The proponent shall take all the necessary precautions to prevent fires or spills at the fuel stores.

Following precautions will be taken during fuel storage:

- Tanks containing fuels shall have lid and shall remain firmly shut.
- Gas and liquid fuel shall not be stored in the same storage area.
- No smoking shall be allowed inside the stores and within 3m of the boundary.
- The proponent shall ensure that there is adequate fire-fighting equipment at the fuel stores.

LUBRICANT STORAGE

Lubricants will be stored in drums or tins that are either sealed or have tightly fitting caps. Decanting of lubricants must be carried out in a specific area that has been previously identified and suitably protected. Lubricants shall be stored under cover in a no smoking area. All lubricant impregnate cotton waste and rags shall be promptly disposed off and handled as hazardous waste.

9.2.11. WASTE MANAGEMENT

9.2.11.1 WASTEWATER FROM CONSTRUCTION ACTIVITIES

Construction water refers to all water affected by construction activities. The proponent shall construct and operate the necessary collection facilities to prevent pollution. The proponent shall adopt below mentioned measures in order to manage the construction wastewater.

- The proponent may discharge "clean" slit laden water overland and allow this water to filter into the ground.
- Proponent shall not cause erosion as a result of any overland discharge.
- All washing of plant/equipment/concreting equipment etc. shall take place within the construction camp.
- All washing operations shall take place off-site at a location where wastewater can be disposed of in an acceptable manner.

To prevent the contamination of water by materials used during construction:

- Materials are prepared and stored away from watercourses.
- Implement measures to prevent seepage of liquid materials into ground where it could contaminate groundwater.
- Ensure prompt cleaning up of accidental spillages.
- The machinery/equipment is maintained in a good operating condition.

9.2.11.2 WASTE WATER FROM CONSTRUCTION LABOURERS

The sewage generated from the labours during the construction is estimated to be about 11.2 KLD. This will be collected in collection tank and will be treated in mobile STP.

9.2.11.3 SOLID WASTE MANAGEMENT

Solid waste here refers to all construction debris and domestic waste. The organic wastes collected and shall be handed over to the local body for further processing and recyclable wastes such as bricks, stone, metal, plastic, etc., will be handed over to the authorized waste recyclers. Hazardous wastes like waste oil from DG sets, used batteries, paint waste etc; will be handed over to the authorized hazardous waste recyclers.

The solid waste management includes the following mitigation measures.

- The proponent shall not dispose of any waste or construction debris by burning or by burying.
- On completion of construction, all leftover construction materials are to be removed from the working area.
- The proponent shall supply waste bins/skips throughout the site at locations where construction personnel are working.
- The bins shall be provided with lids and an external closing mechanism to prevent their contents blowing out.
- Bins shall be emptied on a daily basis. The bins shall not be used for any purposes other than waste collection.
- Collection system should be properly supervised so that quick and regular removal of waste from the dustbin is practice.

9.2.11.4 DISPOSAL OF EXCAVATED EARTH AND DEMOLISED MATERIAL

During site clearance, the demolished material generated such as bricks, stone, concrete will be used for site leveling and for back filling.

The excavated earth which is generated during construction will be used for back filling, for development of landscape and for road formation and therefore there will not be any solid waste problem from the generation of excavated earth.

9.2.12. PERSONNEL SAFETY SYSTEM

It is planned to adopt the safe working practices which shall govern all construction works undertaken throughout the project.

Following Safety Aids to all labourers will be provided:

- Safety Helmets
- Safety Belts/ Harness
- Safety Shoes
- Hand gloves
- Gumboots while concreting
- Safety Goggles while welding/ Stone dressing etc.
- Face masks and full body kit while Pest control

Implementation of Safety procedures such as:

- Using proper lifting techniques
- Using Safe Scaffold
- Hot work permits for Fabrication and Welding
- Height work permit

9.2.13. HUMAN HEALTH AND SAFETY MANAGEMENT PLAN

The objective is to ensure that the health and safety of on-site personnel is proactively managed during the construction stage of the project. Below are given the proposed project related human health and safety environmental concerns and its management

- The primary concern on potential health risks for the construction workers and employees on site during construction are associated with drinking water quality.
- Construction site will be provided with readily available first aid kids including adequate supply of sterilized dressing materials and appliances. An ambulance-on-call shall be provided to take injured or sick person to the nearest hospital.

- Each construction worker will be provided with safety gadgets and compulsorily made to wear them during the construction work. This will include protective footwear, helmets & gloves to all workers employed for the work on mixing, cement, lime mortars, concrete etc.; the welders protective eye-shields to workers who are engaged in welding works; ear plugs to workers exposed to loud noise; safety belts to the labours working at higher platforms; and masks to avoid dust.
- The project will strictly follow the statutory child labour act.
- The project will also ensure that no paint containing lead or lead products is used. The project will comply with all regulations & follow good construction & safety practices for scaffolding, ladders, working platforms, gangway, stairwells, excavations, etc.
- The project will take adequate precautions to prevent danger from electrical equipments. No material will be so stacked or placed as to cause danger or inconvenience to any person or the public.
- Regular health check-ups for the labourers will be conducted at site and also at the labour camp for free of cost. Mock-up fire drills and first aid training will be conducted at site at regular intervals.
- Work permit will only be given to labourers who are fit/capable to work at heights, handle heavy machineries, etc.
- All necessary fencing and lights will be provided to protect the public. All machines to be used in the construction will conform to the relevant Indian standard codes, will be free from patent defect, will be kept in good working order, will be regularly inspected & properly maintained as per IS provision.

9.2.14. EMERGENCY PROCEDURES

The proponent shall comply with the Occupational Health and Safety Act, National Building Regulations and other national, regional or local regulations with regard to safety on site. The proponent shall ensure that contact details of the local medical services are available to the relevant construction personnel prior to commencing work.

The Emergency plans should include the following procedures:

- Identification of key escape routes, how people can gain access to them and escape from them to a place of total safety.
- Arrangements for the safe evacuation of people identified as being especially at risk, such as those with disabilities, lone workers and young persons.

- Any machines/appliances/processes/power supplies that need to be stopped or isolated if there is a fire.
- Specific arrangements, if necessary, for high-fire-risk areas.
- Contingency plans for when life safety systems such as evacuation lifts, fire-detection and warning systems, sprinklers or smoke control systems are out of order.
- How the fire and rescue service and any other necessary services will be called and who will be responsible for doing this.
- Procedures for meeting the fire and rescue service on their arrival and notifying them of any special risks, e.g. the location of highly flammable materials.
- Plans to deal with people once they have left the premises.

9.3 EMP DURING OPERATION PHASE

In the operational phase the environmental impacts are due to continuous operation of the project; hence, the emphasis in the Environment Management Plan (EMP) is to minimize such impacts. Following are the identified operational phase activities in the impact assessment, which may have impact on the environment.

1. Air quality management
2. Water quality management
3. Noise quality management
4. Solid waste management
5. Storm water management
6. Transport management
7. Landscape development

9.3.1. AIR QUALITY MANAGEMENT

The air pollutants likely to be emanated from the proposed project are PM, SO_2, NO_2, HC and CO mainly due to burning of liquid fuel in DG. Exhaust from DG set will be emitted from stack of adequate height for dispersion of gaseous pollutants. The green belt development is also proposed covering about 36.6% of the plot area will reduce PM levels. Following table presents the EMP for air quality management during operation phase.

TABLE 9.4: Air quality management during operation phase

Environmental Impacts	Mitigation
DG set	• Equipment selected will ensure the exhaust emission standard as

	prescribed as per the latest amendments from the CPCB. • DG will be used as stand-by unit. • Periodic check and maintenance. • Use of ultra-low sulphur diesel. • Use of clean fuel by the DG sets will reduce the emission of pollutants.
Ambient air quality	• Ambient air quality monitoring as per the guidelines at regular intervals.

9.3.2. WATER QUALITY MANAGEMENT

Operational phase water requirement of project will be met by BWSSB, as mentioned earlier. Water balance is presented in the earlier section. Following are some of the water quality management measures that would be adopted during the operation phase of the project.

- Ground water should not be abstracted without prior permission of the competent authority.
- Use of water meter conforming to ISO standards should be installed at the inlet point of water uptake to monitor the daily water consumption.
- Use of water efficient devices/fixtures and appliances should be promoted.
- Installation of dual flushing system should be considered to conserve water.
- Rainwater harvesting will be put into practice on regular basis.
- Practice of surface runoff harvest through recharge pits on regular basis.
- Sewage Treatment Plants should be monitored on a regular basis.

The sewage generated from the proposed project will be about 866 KLD which will be treated in the Sewage treatment plant capacity of 300 & 570 KLD using Sequencing Batch Reactor (SBR) technology. The treatment scheme for domestic effluents generated from the building has also been discussed in Chapter-2. Treated water will be reused for flushing, car & floor washing, gardening. Following Table 9.5 presents the EMP for water quality.

TABLE 9.5: Water quality management during operation phase

Environmental impacts	Mitigation
Effluent from domestic water consumption	• Treated with existing sewage treatment plant to produce tertiary treated water which is ultimately reused for domestic purposes such as flushing, landscaping and HVAC. • Following water conservation measures will be encouraged ⮝ Awareness among the residents regarding optimal usage of

	water and reuse. ⅄ Implementation of dual piping system: Use of treated sewage for domestic purposes like flushing, gardening after prior treatment. ⅄ Rainwater harvesting facilities are proposed. ♦ Roof top rain water will be harvested and it will be treated and reused after prior treatment. ♦ Surface runoff will be harvested and it will be used for ground water recharge through recharge pits within the site

TABLE 9.6: Wastewater disposal

Total quantity of treated sewage to be managed	823 KLD
Treated sewage water used for landscaping	165 KLD
Treated sewage water used for flushing	481 KLD
Treated water used for HVAC	177 KLD

9.3.3. NOISE QUALITY MANAGEMENT

High noise generating units such as DG set will be provided with integral acoustic enclosure. Noise barriers will be provided to the DG sets at appropriate locations so as to ensure that the noise levels do not exceed the prescribed standards.

Green belt on the project boundary will further act as noise barrier and helps in attenuation of noise. Following table presents the EMP for noise levels.

TABLE 9.7: Noise management during operation phase

Environmental Impacts	Mitigation
Noise from DG set operation & vehicular traffic	▪ Acoustic enclosures will be provided to DG set. ▪ DG set will be installed in an area (utility section) where the access will be restricted. ▪ The use of PPE (ear plugs) will be mandatory in this area. ▪ Selection of equipment to ensure that the residual noise level of < 55 dB (A). ▪ Noise levels will be checked periodically using a noise pressure level meter. ▪ Landscape development within the proposed site will act as a noise attenuator & will be implemented gradually in parallel with the construction.

9.3.4. SOLID WASTE MANAGEMENT

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

- Municipal Solid Wastes
- Hazardous wastes
- E- Wastes

Municipal Solid Wastes:

The municipal solid wastes include food leftovers, vegetable peels, plastic, house sweepings, paper, cardboard clothes, ash etc. The municipal solid wastes generated in the premises are estimated to be about 6.0 MT/day. Out of which, 1.2MT/day is Organic waste & 4.8MT/day is recyclable wastes.

- Further this organic biodegradable waste will be segregated and will be processed in organic waste converter.
- The recyclable wastes such as plastic materials, glass & metal wastes are handed over to the authorized waste recyclers for further processing.
- The Sludge from the STP will be used as manure for gardening purpose.

Hazardous Wastes:

Hazardous wastes like waste oil generated from the DG sets will be stored in barrels and handed over to the authorized waste oil recyclers/processors & the generated used batteries, battery cells etc., will be handed over to the authorized hazardous waste recyclers.

E- Wastes:

E- Wastes like electrical wastes such as wires, bulbs, tube lights and electronic wastes such as used PC, calculators, CD's, Xerox machine components etc., will be collected separately & handed over to the authorized & approved by KSPCB E-waste processors.

The various mitigation measures to be adopted for the solid waste management during operation phase are as follows:

- Different colored bins will be provided for different categories of waste and ensure complete segregation of biodegradable and non-biodegradable wastes. The biodegradable wastes will be processed in organic waste converter and recyclable wastes such as plastic materials, glass & metal wastes are handed over to the waste recyclers.
- Separate compartments shall be provided for each type of recyclables.
- Collection and storage of hazardous wastes during pre-construction and post-construction activity should be planned properly.

- The expected hazardous wastes should be disposed off separately as per the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008.
- Separate bins shall be provided in each building to collect the solid wastes.
- Collection system should be properly supervised so that quick and regular removal of waste from the dustbin is practice.
- It is preferable that the container and bins used for collection of waste should be of closed type so that the waste is not exposed and thus the possibility of spreading of disease through flies and mosquitoes is minimized.

9.3.5. STORM WATER MANAGEMENT

As the project location is blessed with fairly good rainfall, it is planned to collect the storm water at different gradients of the location. There will be rainfall runoff from building roof-tops, roads and pavements and greenbelt area. Necessary provision will be made to collect the quantity of rainfall runoff during the most rainy day of season.

- Necessary rain harvesting pit/ recharge pit at regular intervals around the periphery of the site have been envisaged.
- Storm drains with RCC precast perforated cover will be provided around the periphery of property.
- The details of the rain water harvesting facilities are interpreted in the early section and it is depicted in the enclosed layout plan.

9.3.6. TRANSPORT MANAGEMENT

- Use of public mode of transportation should be encouraged.
- Use of the least polluting type of transportation should be promoted.
- Adequate parking space should be provided as per norms.
- Use of pathways covered or shadowed by tree canopy as far as practicable.

9.3.7. GREENBELT DEVELOPMENT

Vegetation is the natural extension of the soil ecosystem on a site. It can provide summer shade, wind protection, and a low-maintenance landscape that is adapted to the local environment. Unfortunately, the common practice is to remove the existing landscape cover and replace with a generic, water and maintenance-intensive lawn.

The greenbelt development in the project site area not only functions as landscape features resulting in harmonizing and amalgamating the physical structures of proposed buildings with surrounding environment but also acts as pollution sink / noise barrier. In addition to augmenting present vegetation, it will also check soil erosion, make the ecosystem more diversified and functionally more stable, make the climate more conducive and restore balance.

It is planned to include an ecologically knowledgeable landscape architect as an integral member of the design team. Preservation of existing vegetation, especially native plants, will possibly be incorporated. Avoid fencing off property where possible to make landscape available to community increasing project integration. Besides this, the visual aesthetic of the proposed site will be enhanced by developing lawn with local ornamental plants in open spaces.

9.3.8. FIRE PROTECTION

The firefighting requirements depend on occupancy classification and height of the proposed building. The proponent shall comply with the Occupational Health and Safety Act and regional or local regulations with regard to safety on site. Depending upon the occupancy heights, buildings should be protected by wet riser, automatic sprinkler system, and fire water tanks as applicable.

The Project has been designed based on all the relevant fire safety as per NBC norms.

- Fire extinguishers systems are deployed throughout the residential building.
  - ✓ ABC powder Extinguisher - 5 kg should be provided in transformer yard electrical room and same should provide for every 8 car parks.
  - ✓ ABC powder extinguisher - 2 kg should be provided in kitchen area and lift area
  - ✓ Fire buckets filled with clean water and sand kept in a common stand provided at each stair case landing.
- Fire hydrants around the building.
  - ✓ Internal system - Wet riser cum down comer
  - ✓ External system – yard hydrants.
- Fire hose cabinets provided at every floor.

Precautions & safety Measures proposed are:

- Sufficient capacity of Fire water tank will be provided for immediate action to arrest the fire accident.
- Nearby Fire Station contact numbers will be displayed
- Sprinkler System, Automatic fire detection & Alarm system will be provided.
- Smoking should be strictly prohibited.
- Provision of helipad for the proposed building in case of emergency.

9.3.9 HEALTH, RISK AND DISASTER MANAGEMENT

PUBLIC HEALTH AND SAFETY

Since all the construction related activities shall be confined to the project site, minimal health related impacts are envisaged within the project influenced area during the construction stage.

The persons engaged at project site will face direct exposure to dust and noise generated from the construction activity. This is likely to cause health related affects such as asthma, bronchitis etc. and hearing impairments respectively.

To minimize these anticipated impacts, suitable actions like

- Use of water sprinklers to prevent dust from being air borne.
- Providing suitable personal protective equipments (PPE) like mouth mask with filters, nose mask, helmets etc.
- Periodic health check up camp for the labourers will be arranged.
- Provision of safety belts.
- In case of injury, on-site medical treatment and transport will be organized.
- Employing a safety engineer.

Due to operation of the proposed project, there will be enhancement in public health and safety.

- Regular visit of employees medical officer to take care of the first aid and primary medication in case of emergency for occupants and labourers.
- First aid kit with primary medicines will always be available in the medical centre.
- Display of action plan and preparedness measures during emergency situations.

RISK AND DISASTER MANAGEMENT PLAN

Disaster is an unexpected event due sudden failure of the system, external threats, internal disturbances, earth quakes, fire and accidents. Thus an appropriate management plan shall be incorporated.

PRECAUTIONS

- Once the likelihood of the disaster is suspected, preventive actions should be undertaken by the project in-charge.
- Conditional maintenance of equipments, materials, and expertise for use during emergency.
- The electrical systems shall be provided with automatic circuit breakers activated by over current.
- Fire extinguishers are provided at pre-notified locations inside the buildings.
- Proper escape routes are planned and displayed in the public domain.
- Selected representatives are given proper training to guide other inhabitants during fire accidents.
- Periodic awareness program is conducted for the occupants on their roles during emergency situations.

Important telephone numbers like police stations, fire department and hospitals etc. of use during emergency situations are made available.

9.4 EMP IMPLEMENTATION SCHEDULE

Phased according to the priority, the implementation schedule is presented in below table.

TABLE 9.8: Implementation schedule for EMP

S. No	Recommendations	Requirement
1.	Air pollution control measures	Before commissioning of respective building
2.	Water pollution control measures	Before commissioning of the project
3.	Noise control measures	Along with the commissioning of the project
4.	Solid waste management	During commissioning of the project
5.	Green belt development	Stage-wise implementation

The responsibility of EMP implementation lies with the project promoter for a period of 5 year (approximate Construction Period). Once project is established, the EMP responsibility will be properly handed over with clearly defined procedures and guidelines.

9.5 ENVIRONMENTAL LEGISLATIONS

There are many Environmental Acts & Rules which are formulated by Ministry of Environment and Forests (MoEF) for the prevention of Environmental squalor and are to be compiled by the Industry. All the regulations are not applicable to all. The Act and Rules which are to be constantly perused and followed by the Industry are enumerated in the following section.

TABLE 9.9: Particulars of environmental legislations

YEAR OF ENACTMENT	LEGISLATION
1974	The Water (Prevention and Control of pollution) Act.
1975	The Water (Prevention and Control of pollution) Rules.
1977	The Water (Prevention and Control of pollution) Cess Act.
1978	The Water (Prevention and Control pollution).
1988	The Water (Prevention and Control of pollution) as amended.
1981	The Air (Prevention and Control of pollution) Act.
1987	The Air (Prevention and Control of pollution) and as amended.
1986	The Environment (Protection) Rules.
1991	The Environment (Protection) Rules (Amended).

9.6 ENVIRONMENT PROTECTION ACT & RULES

Among the various notifications coming under the Environment (Protection) Act, following are the notifications applicable to this project:

TABLE 9.10: Notifications under environmental protection act & rules

YEAR OF NOTIFICATION	RULES
1989	The Hazardous Waste (Management & Handling) Rules
2000 & 2003	The Hazardous Waste (Management & Handling) Rules (amended)
1992/1993	Environmental Statement
2002	DG Rules
2000	Noise Pollution (Regulation & Control) Rules and Amendment Rule 2006
2000	Municipal Solid Wastes (Management & Handling) Rules

2001	Batteries (Management & Handling) Rule, 2001 and Amendment Rule, 2010
2008	The Hazardous Wastes (Management, Handling & Transboundary Movement) Rules
2011	The Plastic Waste (Management & Handling) Rules
2011	The e-Waste (Management & Handling) Rules implementation from 1-5-2012.

HAZARDOUS AND OTHER WASTES (MANAGEMENT, HANDLING & TRANSBOUNDARY MOVEMENT) RULES, 2016

The DG Sets, waste/used oil is included in the schedule-1 of list of Hazardous Waste under Serial No.5 which states as under:

- Used/spent oil (category No.5.1) generated from industrial operations.
- Using mineral/synthetic oil as lubricant in hydraulic systems or other applications.

Used oil defined under Rule 3 (34) means any oil derived from crude oil or mixtures containing synthetic oil including used engine oil, gear oil, hydraulic oil, turbine oil, compressor oil, industrial gear oil, heat transfer oil, transformer oil, spent oil and their tank bottom sludge and suitable for re-refining, if it meets the specifications laid down in Schedule 5, but should not include waste oil.

Responsibility of the occupier and operator of a facility for handling of the wastes is delineated as under:

1. The Occupier and the operator of a facility shall be responsible for proper collection, reception, treatment, storage and disposal of hazardous wastes listed in schedule –1, 2 and 3 { Rule 4(1)}.
2. It shall be the responsibility of the occupier and the operator of a facility, to take all steps to ensure that the wastes listed in schedule 1, 2 and 3 are properly handled and disposed of without any adverse effects to the environment {Rule 4(3)}.
3. Hazardous wastes shall be collected, treated, stored and disposed of only in such facilities as may be authorized for this purpose {Rule 5(1)}.
4. Every occupier handling, or a recycler recycling, hazardous wastes shall make application in Form-1 to the Member Secretary, State Pollution Control Board or committee, as the case may be or any Officer designated by the State Pollution Control

Board of committee for the grant of authorization for any of the said activities{ Rule 5(2)}.

5. The Occupier or operator of a facility shall ensure that the hazardous wastes are packaged, based on the composition in the manner suitable for handling, storage, and transport and the labeling and packaging shall be easily visible and be able to withstand physical conditions and climatic factors { Rule 7(1)}
6. Packaging, labeling and transport of hazardous wastes shall be in accordance with provisions of the rules made by the Central Government under the Motor Vehicles Act 1988 and other guidelines issued from time to time { Rule 7(2)}.
7. The occupier or an operator of a facility shall send annual reports to the State Pollution Control Board or committee in Form-4 {Rule 9(2)}.
8. All Hazardous waste containers shall be provided with a general label as given in Form-8 of Hazardous Waste (Management Handling) Rules 1989 as amended there after { Rule 7(3)}
9. The Occupier shall prepare six copies of the manifest in Form 9 comprising of colour code indicated below (all six copies to be signed by transporter) {Rule 7(4)}:
10. The Occupier generating hazardous waste and operator of a facility for collection, reception, treatment, transport, storage and disposal of hazardous waste shall maintain records of such operations in Form-3 {Rule 9(1)}.
11. Where an accident occurs at the facility or on a hazardous waste site or during transportation of hazardous waste the occupier or Operator of a facility shall report immediately to the State Pollution Control Board or committee about the accident in Form-5 {Rule 10}.
12. No owner or occupier generating non-ferrous metal waste specified in schedule 4 or generating used oil or waste oil of ten tons or more per annum shall sell or auction such non-ferrous metal wastes, used oil or waste oil to a registered re-refiner or recycler, as the case may be, who undertakes to re-refine or recycle the waste within the period of validity of his certificate of registration (Rule 20(1)).

TABLE 9.11: Colour code for the manifest copies

Copy Number With Colour Code	Purpose
Copy 1 (White)	To be forwarded by the occupier to the State Pollution Control Board or committee.

Copy 2 (Yellow)	To be retained by the occupier after taking signature on it from the transporter and rest of the four copies to be carried by the transporter.
Copy 3 (Pink)	To be retained by the operator of the facility after Signature.
Copy 4 (Orange)	To be returned to the transporter by the operator of Facility after accepting waste.
Copy 5 (Green)	To be returned by the operator of the facility to State Pollution Control Board/Committee after treatment and disposal of wastes.
Copy 6 (blue)	To be returned by the operator of the facility to the occupier after treatment and disposal of wastes.

9.7 ENVIRONMENTAL STATEMENT

Under rule 14 of the Environmental protection Rules 1986, every person carrying on an industry, operation or process requiring consent under Section 25 of Water (Prevention and control of Pollution) Act, 1974 (6 of 1974) or under Section 21 of the Air (Prevention and control of Pollution) Act, 1981 (14 of 1981 or both or authorization under the hazardous Waste (Management & Handling) Rules 1989 issued under the Environment (Protection) Act, 1986 (29 of 1986) shall submit an Environmental Statement report for the financial year ending the 31st March in Form-V to the concerned State Pollution Control Board on or before 15th Day of September every year.

9.8 COST PROVISION FOR ENVIRONMENTAL MEASURES

Total capital cost allocated towards environmental pollution control measures is Rs. 7650 lakhs and the Recurring cost (operation and maintenance) will be about Rs.137 lakhs per annum

TABLE 9.12: Cost provision for environmental measures

S. No.	Description	Amount in lakhs	Amount in lakhs
		Investment cost	**Maintenance cost**
1.	WTP and Sewage treatment Plant	750	48
2.	Rainwater Harvesting system	600	24
3.	Green Belt Development	750	30
4.	Storm water drains and fire management	4050	24
5.	Solar water heaters	1000	5
6.	Solid waste management	500	6
	TOTAL	7650	137

CHAPTER – 10

10.0 SUMMARY & CONCLUSION

10.1 INTRODUCTION

Introduction chapter explains purpose of the project, identification of the project, brief description of the project with nature, size, location & its importance to the country and its region and it also explains the scope of the study and applicable regulations on the proposed project.

M/s. Wisdom World Developers Pvt Ltd is proposed development of commercial building by name ***"IBC Wisdom World"*** to set up world class office space at Bellandur Amanikere Village, Varthur Hobli, on ORR, Bengaluru East Taluk, Bengaluru. The proposed project is having total extent of area 83,061.04 Sqmt (20Acres 21 Guntas) with a total built up area of 4,37,473.09 Sqmt, with sufficient area earmarked for landscape, internal drive way and other services. The master plan for the development comprises of components such as residential units, Civic amenities.

With the summary, the EIA study of the proposed Office building Project ***"IBC WISDOM WORLD"*** has not been identified with any major negative impacts on the site and on to the local environment. As it involves the construction activity, there might be a chance of minor risks, for which all required precautions and preventive management plans are proposed.

And while in operation, the proposed development does not involve any processing/manufacturing activities and it is nil, whatever the impacts like generation of domestic wastewater, solid waste, waste oil etc., for that proper well planned Environmental Management Plan has been proposed along with this, for operation phase; other permanent Environmental Management Plans like well-planned storm water management, internal transportation management, sufficient parking provision, sewage treatment plant, organic waste converter, green belt development plan has been proposed and the same will be effectively implemented on the proposed project and for the implementation of the same and its management EMP cell will be framed, along with this environmental monitoring routine plans are also proposed with estimated budgetary allocations.

However, development of this proposed commercial building project has certain beneficial impacts/effects during the course of its construction and as well as in operational phase of the project.

Some of the beneficial impacts/effects are:-

- It will result in considerable benefits on physical infrastructures like transportation system, water supply & drainage system, power supply and social infrastructures like health centers, banking, education as well as small and medium scale industries like residential developments, hotels, shopping complexes, retail shops etc,.
- Improvement to the general aesthetics of the surrounding area.
- It will also bring employment generation to skilled, semiskilled and unskilled; it is obvious to assume that, all the economic activities in the project area would induce considerable improvement in the socio-economic levels of people. The impact of human settlement is expected to be positive, as apart from some people being directly employed, many others will get indirect employment.
- The impacts are identified and evaluated to reduce their negative impacts and maximize the positive effects on the surrounding environment.
- It raises the living conditions of the citizens of the country.
- During construction, erection of barricades around the periphery, traffic management, scientific management of solid waste, hazardous waste, bio medical waste and e-waste measures were undertaken towards better implementation of the project.
- During operation phase, use of ecofriendly methods such as sewage treatment plant, organic waste converter, energy conservation features, rain water harvesting & recharging, scientific disposal of hazardous waste, bio medical waste and e-waste, green belt development and corporate social activities around the project site will benefit the environment.
- Overall, the proposed project will have positive impact on the Environment if, the recommended Environmental Monitoring, Health & Safety and Environmental Management aspects are fully implemented by the project proponents.

As it is a construction project, Impacts from the proposed project will not reach behind 1 km, to prevent that proper mitigation measures has been adopted. Thus implementing this project will not have any appreciable negative impacts. Thus, the proposed project is a welcome development and request to accord Environmental clearance.

CHAPTER – 11

11.0 DISCLOSURE OF CONSULTANT ENGAGED

AM Enviro Engineers is a prominent provider of environmental consulting to wide range of clients. Our comprehensive range of diversified services includes obtaining environmental clearance from SEIAA/MoEF, CRZ clearance from MoEF, preparation of EIA/EMP and approval/authorization from KSPCB.

TABLE-11.1: Project team

SL NO	CONSULTANCY SERVICES	NAME & ADDRESS OF THE CONSULTANTS
1.	**Environmental Consultants**	**M/s. AM ENVIRO ENGINEERS** **Environmental consultancy** #14/1, 2nd Floor, Harikrupa patalamma temple street, Basavanagudi, Bangalore-560 004 e-mail: amee.operations@gmail.com Covered by stay order WP. No. 15026-15038 of 2016, dated 26.03.2016 of Honorable High Court of Karnataka at Bangalore from being covered by the accreditation OM issued by MoEF
2.	**Architects Consultants**	**M/s. Architect Hafeez Contactor** No. 29, Bank Street, Mumbai – 400023 Tel Phone: (+91 22) 22661920
3.	**Structural Consultants**	**M/s. Sterling** **Engineering Consultancy Services Private Limited** 1307, Brigade Towers, 135, Brigade Road, Bengaluru-560025. Tel Phone: (91)80 22244810 e-mail: nagendra@sterlinggblr.com
4.	**PHE & Fire Consultants & Electrical Consultants**	**M/s. Design Tree Service Consultants Pvt Ltd** #7, Lakshmi Narasimha complex, 15th cross, 100 Feet Road, 4th Phase, JP Nagar, Bengaluru-560078 Tel Phone: (91)80 41225481/ 40919417
5.	**Traffic Impact Studies & Management Measures Consultants**	**M/s. Consortia of Infrastructure Engineers-CIE,** # 004, 37/ 2-1, Ramky Samruddhi, 2nd main road, Thimmenahalli road, Vijaynagar, Bengaluru-560040 Tel Phone: (91) 80 - 23403232, mob:+919845049505 e-mail: consortia.infra@gmail.com
6.	**Landscape consultant**	**M/s. Lakshya Associates**

		Bengaluru
7.	**Lab Analysis Services**	**M/s. Robust Materials Technology Pvt Ltd** (ISO 9001 : 2008, OHSAS 18001:2007 certified Laboratory) NABL Accredited Laboratory No. 94, 2nd floor, Thirumala complex, Nagarabhavi Main Road, NGEF Layout, Nagarbhavi, Bengaluru - 560 072 Tel Phone: (91) 80 - 23186230, Fax:+91 80-23186230 e-mail: info@robustmaterials.com

CHAPTER – 12

12.0 CORPORATE ENVIRONMENTAL RESPONSIBILITY

Environment and natural resources are the prime source of all material inputs to economic activities. The environment also acts as a receiver and sink of the various kinds of waste generated through human activity. A proper balance between the developmental needs and environmental concerns is necessary in order to pursue the path of sustainable development.

Sustainable development involves an enduring and balanced approach to economic growth, social protection and justice, and environmental conservation.

The proposed project is a development of IT office building with a total built up area of 4,37,473.09 Sqmt. As per EIA notification dated 14th September 2006 and amended in 2016 proposed project comes under item 8(b) category of the said notification under Township & Area Development projects and apprised as category 'B1' (since BUA ≥ 1,50,000 Sqmt).

As the proposed project attracts an EIA study, pre-construction baseline environmental study has been carried out, in accordance with that EIA has been prepared. In EIA, monitoring schedules for environmental attributes will be scheduled for construction phase as well as for operation phase to assess the quality of environment.

Environmental cell will be framed to manage/maintain Environmental and safety aspects such as labour health & safety, sanitation and other safety measures along with the environmental status during construction phase of the project.

Environmental cell will be framed to manage/maintain all environmental aspects, such as sewage treatment plant, solid waste management, maintenance of landscape and environmental monitoring of the project premises during the operation phase of the project. In addition, sufficient fund will be fixed for maintenance of EMP cell.

The provided details & documents towards the project are inline as per the final execution of the project. If any change in plan; prior intimation will be given to the concerned authority & required statutory clearance/approval will be obtained before starting up of any activity.

Once after obtaining the Environmental Clearance, Environmental Compliance study with respect to EC conditions will be carried out during the construction phase twice in a year by considering the study periods from April to September and October to March and the report of the same will be submitted to the SEIAA and the regional office of MoEF, Bengaluru.

Similarly compliance study will be carried out by the maintenance team during operation phase. All other required statutory clearances will be obtained from the concerned department; therefore there won't be any violation/noncompliance in the proposed project.

Technical Clearance:

(i) No Objection Certificate from BWSSB

(ii) No Objection Certificate from BESCOM

(iii) No Objection Certificate from Fire Authority

(iv) Consent for Establishment (CFE) has to be applied for Karnataka State Pollution Control Board (KSPCB)

ENVIRONMENT SUSTAINABILITY AND CSR RELATED ISSUES:

A company's sense of responsibility towards the community and environment (both ecological and social) in which it operates.

Corporate Social Responsibility is a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. CSR is generally understood as being the way through which a company achieves a balance of economic, environmental and social imperatives the roots of CSR lie in philanthropic activities (such as donations, charity, relief work, etc.) of corporations

- ✓ The CSR approach is holistic and integrated with the core business strategy for addressing social and environmental impacts of businesses.
- ✓ CSR needs to address the well-being of all stakeholders and not just the company's shareholders.
- ✓ Philanthropic activities are only a part of CSR.

THE COMPANIES ACT, 2013:

The concept of CSR is governed by clause 135 of the Companies Act, 2013, which was passed by both Houses of the Parliament. The CSR provisions within the Act is applicable to companies with an annual turnover of 1,000 Crores INR and more, or a net worth of 500 Crores INR and more, or a net profit of five Crores INR and more.

The Act encourages companies to spend at least 2% of their average net profit in the previous three years on CSR activities. The Act lists out a set of activities eligible under CSR. Companies may implement these activities taking into account the local conditions. The indicative activities which can be undertaken by a company under CSR as specified under Schedule VII of the Act are

Activities relating to:—

1) Eradicating extreme hunger and poverty;
2) Promotion of education;
3) Promoting gender equality and empowering women;
4) Reducing child mortality and improving maternal health;
5) Combating human immunodeficiency virus, acquired immune deficiency syndrome, malaria and other diseases;
6) Ensuring environmental sustainability;
7) Employment enhancing vocational skills;
8) Social business projects;
9) Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government or the State Governments for socio-economic development and relief and funds for the welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women;

BENEFITS OF A ROBUST CSR PROGRAMME:

As the business environment gets increasingly complex and stakeholders become vocal about their expectations, good CSR practices can only bring in greater benefits, some of which are as follows:

- Attracting and retaining employees: Several human resource studies have linked a company's ability to attract, retain and motivate employees with their CSR commitments. Interventions that encourage and enable employees to participate are shown to increase employee morale and a sense of belonging to the company.
- Communities as suppliers: There are certain innovative CSR initiatives emerging, wherein companies have invested in enhancing community livelihood by incorporating them into their supply chain. This has benefitted communities and increased their income levels, while providing these companies with an additional and secure supply chain.
- Enhancing corporate reputation: The traditional benefit of generating goodwill, creating a positive image and branding benefits continue to exist for companies that operate effective CSR program. This allows companies to position themselves as responsible corporate citizens.

Process of Corporate Social Responsibility can be implemented in following steps;

1. Developing a CSR strategy and policy
2. Formation of implementing committee
3. Due diligence of the implementation partner
4. Project development
5. Project approval
6. Finalizing the arrangement with the implementing agency
7. Progress monitoring and reporting
8. Impact measurement
9. Report consolidation and communication

The total cost of the proposed project is 1250 Crores.

In the view of the Office memorandum issued by the Ministry of Environment Forest and Climate Change dated 1st May 2018 regarding the Corporate Environmental responsibility (CER) 0.5% of the total project cost which will be 6.25 Crores will be enmarked for the development of the surrounding area in terms of providing basic infrastructure facilities, avenue plantation and development of educational institutions and old ager homes.