L&T Construction Equipment

L&T Construction Equipment Limited - Realty Division.
Bellary Road, Byatarayanapura
Bangalore - 560 092
Karnataka, INDIA

Date: 09/10/2017

To,

The Member Secretary
Expert Appraisal Committee (INFRA 2)
Ministry of Environment Forest and Climate Change,
Indira Paryavaran Bhavan,
Jorbagh Road,
New Delhi- 110 003

Respected Sir,

Sub: Prior Environmental Clearance for our Proposed Expansion of Building and Construction Project of mixed use development comprising of Residential, SEZs, Commercial & Retail units "L&T Raintree Boulevard" at Byatarayanapura Village, Bangalore North Taluk, Bengaluru, by M/s L&T Construction Equipment Limited-Realty Division.

Ref: Minutes of 22nd INFRA 2 Meeting held on 11th September 2017 (Agenda item number 22.3.6)

We are herewith submitting the reply to the additional details sought during the 22nd EAC meeting (INFRA2) held on 11th September 2017, with respect to our above said expansion project.

In this regard, we are submitting the point wise reply along with necessary annexure for your kind perusal.

Trust the above information is in order and requesting you to kindly do the further needful action to accord Environmental Clearance.

Thanking You,

Yours Faithfully,

For **L&T Construction Equipment Ltd. – (Realty Division)**

K. Chandrashekar
Authorized Signatory
Encl: a/a

Point-wise reply to the queries raised during 22th EAC meeting (INFRA 2) held on 11th September, 2017 w.r.t. Prior Environmental Clearance for our Proposed Expansion of Building and Construction Project of mixed use development comprising of Residential, SEZs, Commercial & Retail units "L&T Raintree Boulevard" at Byatarayanapura Village, Bangalore North Taluk, Bengaluru by M/s. L&T Construction Equipment Limited- Realty Division

Certified Compliance Report issued from Regional Office, Bengaluru on the existing environmental conditions stipulated in environmental clearance.

Reply: Certified Compliance Report from Regional Office is attached as **Annexure 1**.

Point 1: The Impact of dewatering for excavation of basements and plan for disposal of groundwater generated in dewatering.

Reply: During the excavation for basements, we did not encounter any ground water seepage and dewatering was not required. The ground water table of the area is below 20 m from general ground level. A geotechnical investigation was carried out prior to excavation and 5 numbers of exploratory boreholes were drilled to depths ranging from 15.5m to 20.0m below the existing ground level. The ground water was measured 24to 48hrs after completion of each borehole. The ground water table was not met with during the period of investigation, in all the boreholes drilled. The detailed report is attached as **Annexure 2**

Point 2: A certified report on the sources and availability of water from the local body supplying water along with the permission received by them for the same.

Reply: Water requirements for the project shall be met from Bangalore Water Supply and Sewerage Board (BWSSB). The NOC from BWSSB is attached as **Annexure 3**

Point 3: A detailed report on compliance to ECBC norms.

Reply: A report on ECBC Compliance is attached as **Annexure 4**

Point 4: Details energy conservation measures to be taken. All points mentioned in the proposal such as orientation to support reduced heat gain, use of ASHRAE 90.1, use of ECBC compliant envelope measures to be supported through drawings and details in the proposal.

Reply: Details regarding energy conservation, reduced heat gain and ECBC compliant envelope measures are attached as **Annexure 4**

Point 5: An assessment of the cumulative impact of all development and increased inhabitation being carried out or proposed to be carried out by the project or other agencies in the core area, shall be made for traffic densities and parking capabilities in a 05 kms radius from the site. A detailed traffic management and a traffic decongestion plan drawn up through an organization of repute and specializing in Transport Planning shall be submitted with the EIA. The Plan to be implemented to the satisfaction of the State Urban Development and Transport Departments shall also include the consent of all the concerned implementing agencies.

Reply: A detailed traffic management and a traffic decongestion plan have been prepared by Prof. M N Sreehari, M/s. Consortia of Infrastructure Engineers, Bangalore. The report is attached as **Annexure 5**

Point 6: The EIA should also give a compliance plan to conditions stipulated in Annexure XIV of the amended EIA Notification vide S.O. 3999 (E) dated 09.12.2016.

Reply: As per the EIA Notification vide S.O. 3999 (E) dated 09.12.2016, the compliance to the environmental conditions for Category 3 (50,000 to 1,50,000 sqm) is attached as **Annexure 6**

ANNEXURE 1

भारतसरकार
GOVERNMENT OF INDIA
पर्यावरण ,वनएवंजलवायुपरिवर्तनमंत्रालय
MINISTRY OF ENVIRONMENT, FORESTS & CLIMATE CHANGE
Regional Office (Southern Zone),
Kendriya Sadan, IVth Floor, E& F Wings, 17th Main Road,
IInd Block, Koramangala, Bangalore – 560 034,
Tel.No.080-25635901, E.Mail: rosz.bng-mef@nic.in

EP/12.1/SEIAA/2015-16/13/KAR 899
Dated: 24/10/2017.

To

Shri. K. Chandrashekar
Head – Business
M/s Larsen and Toubro Limited
#38, Cubbon Road
Bangalore Area Office
Bangalore 560001

Sub : Environmental clearance issued to Construction of Mixed use development (Residential & Commercial) Building called "L&T North Star" Project at Khatha. Nos. 239/240/275/88/1&240/276/89/1 Survey Nos. 88 to 104 of Byatarayaapura Village, Yelahanka Hobli, Bangalore North Taluk, Bangalore Dist by M/s. Larsen and Toubro Limited – SEIAA 190 CON 2014 dated 28.08.2015 – Request for certified compliance report – reg.

Ref : Your letter No. nil dt: 20/09/2017.

Sir,

This is in response to your letter referred above requesting to provide a certified compliance report. In this regard, I am directed to state that this office has visited your project site on 13/09/2017 and noted the status of compliance to the stipulations in the environmental clearance issued to your project by SEIAA-Karnataka. The monitoring report is enclosed herewith for necessary action at your end.

Yours faithfully.

24/10/17

(Dr Dola Bhattacharjee)
Research Officer (E)

Encl. : Monitoring Report.

Ministry of Environment & Forests
Southern Regional Office
BENGALURU
Monitoring Report
PART-I

DATA SHEET

1.	Project type		:	**Building construction**
2.	Name of the Project		:	**Construction of Mixed use development (Residential & Commercial) Building called "L&T North Star" Project at Khatha. Nos. 239/240/275/88/1&240/276/89/1 Survey Nos. 88 to 104 of Byatarayaapura Village, Yelahanka Hobli, Bangalore North Taluk, Bangalore Dist by M/s. Larsen and Toubro Limited.**
3.	Clearance/Approval letter(s) No. & date		:	**No. SEIAA: 190: CON: 2014 Dated 24.08.2015**
4.	Location			
	a.	District(s)	:	**Bangalore**
	b.	State(s)	:	Karnataka
	c.	Latitudes/Longitudes	:	**13°04'05.95"N & 77°35'29.80"E (Elev. 0 m)**
5.	Address of Correspondence			
	a.	Address of concerned Officer of Organization (with pin code and Telephone/telex/fax numbers) Mob. nos:	:	**Shri. S.N. Patil, Head-Projects** **M/s. Larsen and Toubro Limited** **#38, Cubbon Road,** **Bangalore area Office** **Bangalore – 560 001** **Mob: 9945932148** patil.sn@larsentoubro.com
	b.	Address of Head of project (with pin code and Telephone/telex/fax numbers) Mob. no:		**Shri. S.N. Patil, Head-Projects** **M/s. Larsen and Toubro Limited** **#38, Cubbon Road, Bangalore area Office** **Bangalore – 560 001** **Mob: 9945932148** patil.sn@larsentoubro.com
6.	Salient features			

	a.	Of the project	:	Covered in the project report.	
	b.	Of the environmental management plans	:	Submitted to the SEIAA, Karnataka during appraisal of the project.	
7.	Break up of the project areas (in ha)				
		Forest area	:	No	
		Non-forest area	:	Plot area – 2,65,117.47 Sqm, Total built up area – 10,87,032 Sqm	
		Total	:	Plot area – 2,65,117.47 Sqm, Total built up area – 10,87,032 Sqm	
8.	Break up of the project affected population		:	-	
9.	Financial Details				
	a.	Project cost as originally planned and subsequent revised estimates and the years of price reference	:	Rs. 2400 Cr	
	b.	Allocations made for environmental management plans, with item wise & year wise break up	:	~Rs. 540.24 L	
	c.	Benefit cost ratio/internal rate of return & the year of assessment	:		
	d.	Whether(c) includes the cost of environmental management as shown in (b) above	:		
	e.	Actual expenditure incurred on the environmental management plans so far	:	Project – Rs. 322 Cr	EMP~Rs. 135 L
10.	Status of construction				
	a.	Date of commencement (actual and/or planned)	:	August 2016	
	b.	Date of completion (actual and/or planned)	:	2026	
11.	Date of site visit a. On previous occasion, if any b. For this monitoring report c. Details of correspondence with project authorities		: : :	NIL 13.09.2017 As in the record	

Subject:

Construction of Mixed use development (Residential & Commercial) Building called "L&T North Star" Project at Khatha. Nos. 239/240/275/88/1&240/276/89/1 Survey Nos. 88 to 104 of Byatarayaapura Village, Yelahanka Hobli, Bangalore North Taluk, Bangalore Dist by M/s. Larsen and Toubro Limited.

Ref. : **No. SEIAA: 190: CON: 2014 Dated 24.08.2015**

Project monitored by : Dr. Dola Bhattacharjee, Research Officer (Env.)

Brief report:

The above mentioned project (now named as L&T Raintree Boulevard) was monitored on 13.09.2017 by this Regional Office. Shri. S.N. Patil [Head-Projects] and team were present during the inspection. The Project was granted Environmental Clearance on 24.08.2015 and activities started at site in August 2016. Number of residential units proposed to be constructed is 4554 units (in 8 Blocks with 77 no. of towers, 2 no. of club houses and 1 no. of commercial tower).

As observed, only 30% construction work is complete and the project is under construction phase. Total water consumption is 93 KLD at present. Total volume of wastewater that is being generated as a result of the activities undertaken at the site is not reported. However, there is an STP (140 KLD) in operation. Around 1300 labors (men only) are engaged for construction work. The project cost is Rs. 2400 Crores.

The Bangalore-Hyderabad highway (NH 7) is in the east to the project site. The Gandhi Krishi Vigyan Kendra (GKVK) is in the north, while Byatarayaapura Village is in the South and Kodigehalli Village is in the west to the project site.

In general, the status of compliance to the conditions stipulated in the environmental clearance is satisfactory. The detailed report is as follows.

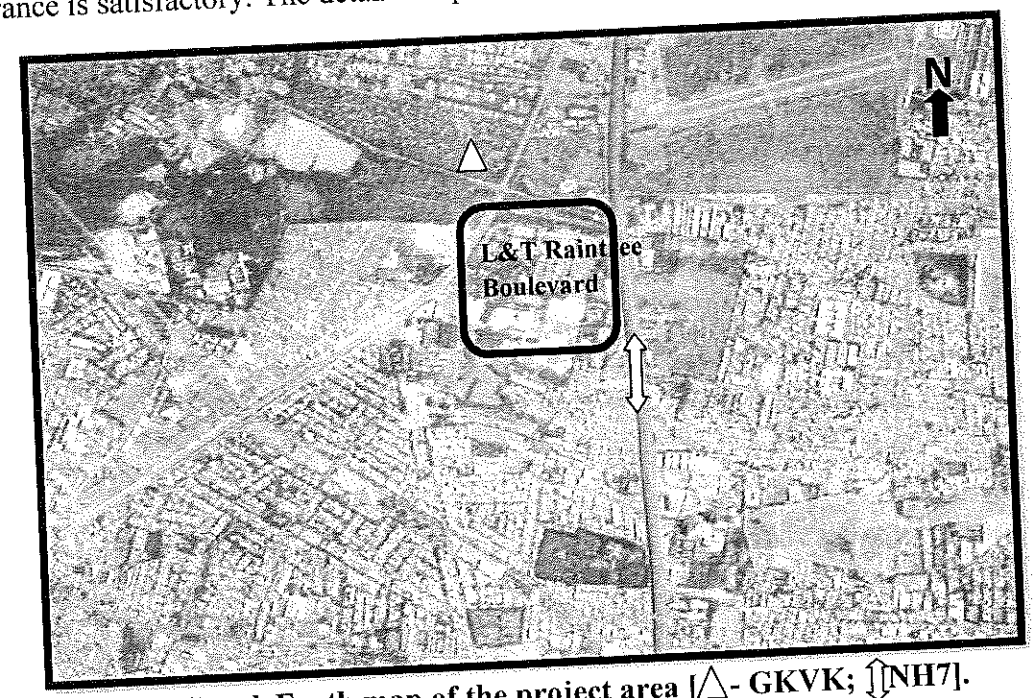

Fig. 1. **GoogleEarth map of the project area [△- GKVK; ⇕NH7].**

* * * * *

Part A – SPECIFIC CONDITIONS

I. Construction Phase

1. Set up an environment management cell and ensure that the cell manages/ maintains all the environmental aspects such as sewage treatment, solid waste disposal, maintenance of green belt areas, etc., and in case the commercial space is sold/ leased, then enter into an agreement with prospective buyers to ensure that they maintain the cell and take care of all environment concerns during the operation phase of the project. In addition, sufficient fees should be levied so as to raise a corpus fund to maintain the Environment cell.

   An environment management cell (4 member team) has been established for the purpose. As reported, the members meet every week to discuss the issues related to safety and environment. Minutes of such meetings were shown during the visit.
   The proponents have agreed to enter into agreement with the buyers (prospective) to ensure that they maintain the cell and take care of all environmental concerns during the operational phase of the project.

2. Appoint an Environmental and safety engineer during the construction phase to take care of environment and safety aspects.

   Environmental, Health and Safety Officer, Mr. Mallikarjuna B. (Mob. No. 8951700228) has been appointed for the purpose. Qualification and experience certificates of Mr. Mallikarjuna B. were shown during the visit.

3. The project proponent should ensure that during the construction phase utmost care is taken to ensure that there is no noise nuisance, on air and water pollution and no disturbance to the nearby inhabitants. In case of violation, the project construction activity may have to be directed to be stopped.

   Project authorities informed that locals in and around the site have never complained of any disturbance due to noise, air or water pollution. During the visit, they were asked to submit a statement from the local authority declaring the same. However, as observed in the records, environmental quality parameters are meeting the norms.

4. The project proponent should cover the project site from all sides by raising sufficiently tall barricades with sheets to ensure that pollutants do not spill to the surroundings.

   The site is covered from all side with tall barricades (height - 9m).

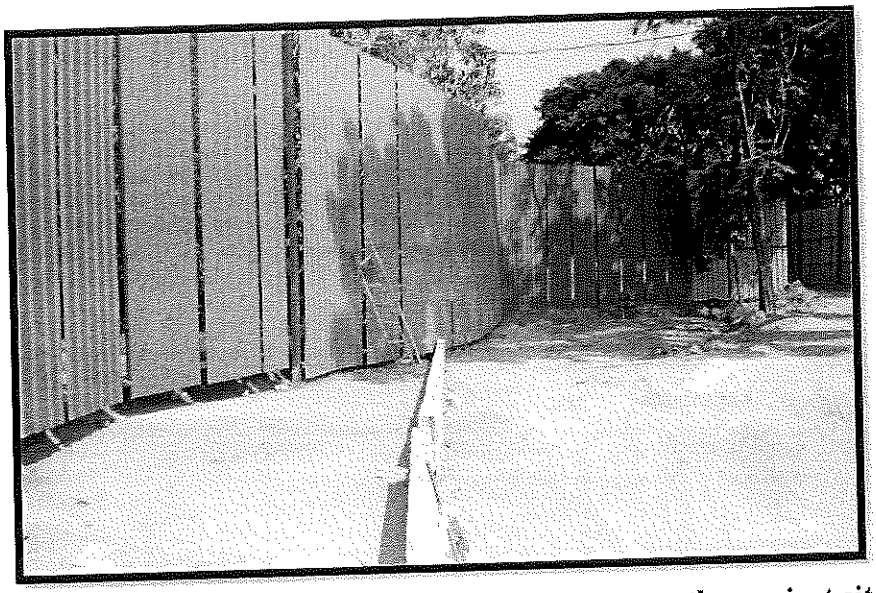

Fig. 2. Tall barricades erected all-around to cover the project site.

5. Provide at the main entrances bell gates, which are located at least 12′ inside the boundary of the project to enable smooth flow of traffic on the main road leading to entrance.
   The site opens on the Bangalore-Hyderabad highway (NH7) (in the east). Bell gates are in place.

6. All required sanitary and hygienic measures should be in place before starting construction activities and to be maintained throughout the construction phase. Sufficient number of toilets / bathrooms shall be provided with required mobile toilets, mobile STP for construction work force.
   Ten numbers of mobile toilets/ bathrooms are in place. The waste water generated is being treated in the STP.

7. A First Aid Room should be provided in the Project both during construction and operation of the project.
   A First Aid Room with basic facilities is in place.

8. Adequate drinking water and sanitary facilities should be provided for construction workers at the site. The safe deposal of wastewater and solid wastes generated during the construction phase should be ensured.
   Drinking water is being sourced from mobile tankers at the project site. An RO-Plant is in place to cater to the needs of labours at the labour-camp. Basic sanitary facilities have also been provided to the labours. Solid wastes are being sent to authorized agency for safe disposal. Agreement letters in this regard were shown during the visit. Treated water from the STP is being used for greenery development.

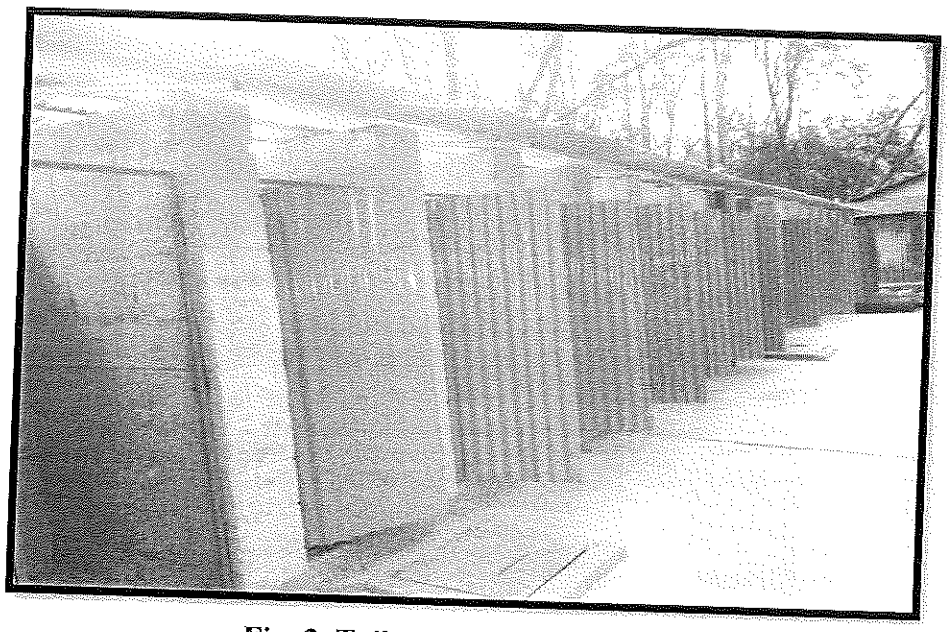

Fig. 3. Toilets in the labour camp.

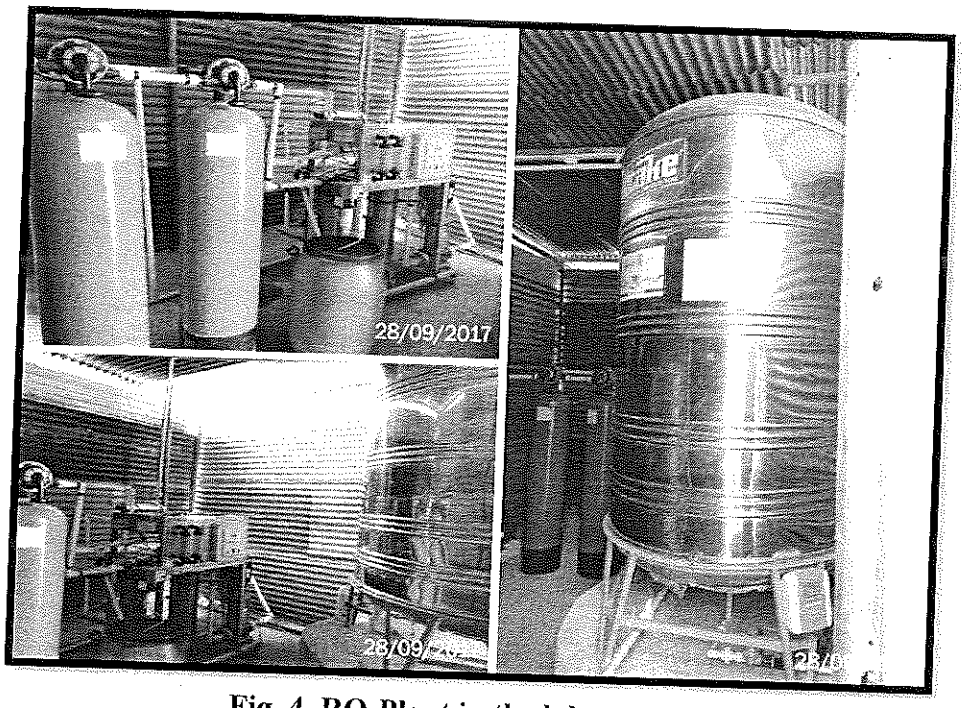

Fig. 4. RO-Plant in the labour camp.

9. Provision shall be made for the housing of construction labourers within the site with all necessary infrastructures. The housing may be in the form of temporary structures to be removed after the completion of the project. The facilities shall include the crèche.
   Provisions are made for housing of labors with all necessary infrastructures.

10. Provision should be made for the supply of fuel (kerosene or cooking gas); utensils such as pressure cookers etc. to the laborers during construction phase.
    The proponent has stated to have made provisions for fuel (LPG) to the labours.

11. All the labourers to be engaged for construction should be screened for health and adequately treated before engaging them to work at the site and detailed report submitted to SEIAA. Safety standards as per National Building Code (NBC) should be ensured.
As reported, the very exercise to screen the labors for their health has been done by the proponent and reports maintained. The project proponents stated to have complied with the NBC standards and an undertaking was submitted in this regard affirming that they will follow the safety standards in the future (Encl. A).

12. For dis-infection of wastewater which is not meant for recycling for toilet flushing, use ultra violet radiation and not chlorination. For traded wastewater meant for reuse for toilet flushing disinfect by using chlorination.
Project proponents are complying with the condition.

13. All the topsoil excavated during construction activities should be stored for use in horticulture / landscape development within the project site.
The top soil is under storage for use in landscaping.

14. Disposal of muck, construction debris during construction phase should not create any adverse effect on the neighboring communities and be disposed taking the necessary precautions for general safety and health aspects of people, only in approved sites with the approval of competent authority.
The muck and construction debris are disposed through authorized agency. Copy of the agreement was shown during the site visit.

15. Soil and ground water samples should be tested at the project site during the construction phases to ascertain that there is no threat to ground water quality by latching of heavy metals and or other toxic contaminates and report submitted to SEIAA.
Soil and ground water quality monitoring is being done by the project proponents and records maintained. The reports were also found meeting the prescribed standards.

16. Construction spoils, including bituminous material and other hazardous materials, must not be allowed to contaminate watercourse and the dumpsites for such material must be secured so that they should not leach into ground water.
Construction debris and hazardous waste (used oil) are disposed through authorized agency. Copies of agreements were shown during the site visit.

17. The diesel generator sets to be used during construction phase should be of low sulphur diesel type and should conform to E (P) Rules prescribed for air and noise emission standards.

As reported, two DG sets (capacities – 2 X 250 KVA) are in use as backup to power supply. The DG sets are well maintained meeting the requirements as prescribed in the E(P) Rules. Noise level exceeded the standards (Encl. B).

18. Vehicles hired for bringing construction material to the site should be in good condition and should conform to the applicable air and noise emission standards and should be operated only during non-peak hours.
Vehicles are checked at the entrance for their condition and PUC certificate, and records maintained. On the day of this site visit, no vehicles were seen bringing in materials to the site and therefore it could not be affirmed that the goods carrying vehicles to the site are conforming to the applicable air and noise emission standards. However, it was gathered during the site visit that these vehicles are operating during non-peak hours.

19. Ambient noise levels should conform to the residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures to reduce air and noise pollution during construction keeping in mind CPCB norms on noise limits.
As observed in the records, noise level exceeded the standards. Ambient air quality parameters, as reported, found meeting the norms.

20. Fly ash should be used as building material in the construction as per the provisions of Fly Ash Notification of September 1999 and amended as on August 2003.
Project authorities are using fly ash for concreting.

21. Ready mixed concrete must be used in building construction.
Ready mixed concrete is in use.

22. Storm water control and its re-use as per CGWB and BIS standards for various applications.
Storm water is being collected through a network of drainage system into a tank (213 m^3) for re-use in greenery development.

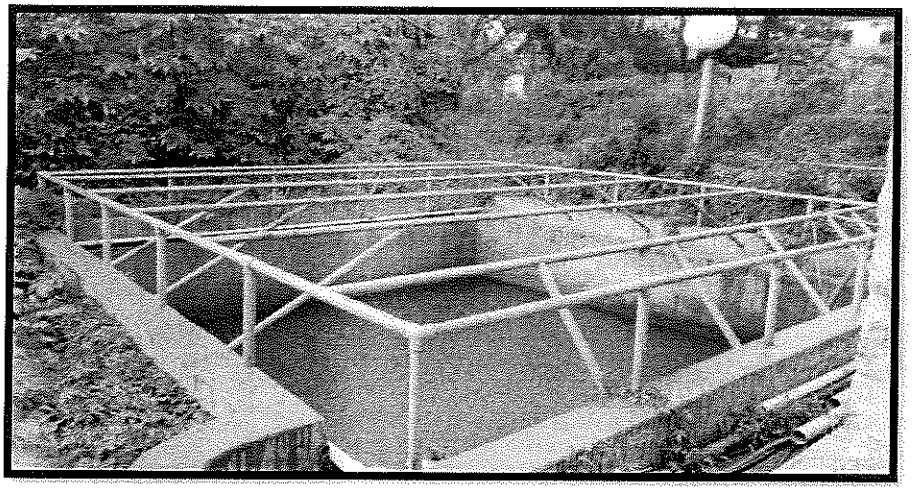

Fig. 4. Storm water storage tank.

23. Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best practices and only tertiary treated water shall be used for construction as per G. O. No. FEE 188 ENV 2003 dated 14.08.2003.
Ready mixed concrete is in use.

24. No ground water is to be drawn without permission from the Central Ground water Authority.
There is a bore-well in the premises and it was reported that groundwater is being lifted for domestic usage. It was also informed that the proponent had submitted application to the Karnataka Groundwater Authority on 23rd September 2016 for permitting the former to dig bore-well at their premises.

25. Separation of grey and black water should be done by the use of dual plumbing line for separation of grey and black water.
Dual plumbing lines are in the plan.

26. Treatment of 100% grey water by decentralized treatment should be done.
The grey water is being treated in the STP and the treated water is being used for greenery development.

27. Fixtures for showers, toilet flushing and drinking should be of low flow either by use of aerators or pressure reducing devices or sensor base control.
Flow restrictors are planned to be installed for the purpose.

28. Use of glass shall not exceed 40% of exposed area to reduce the electricity consumption and load on air conditioning. If necessary, use high quality double glass with special reflective coating in windows.
Project authorities have agreed to comply with the condition.

29. The provision of Energy Conservation Building Code, 2007 shall be fully complied with.
Project authorities have agreed to comply.

30. Roof should meet prescriptive requirement as per Energy conservation building code, 2007 by using appropriate thermal insulation material.
Project authorities have agreed to comply.

31. Opaque wall should meet prescriptive requirement as per Energy Conservation Building Code, 2007 which proposed to be mandatory for all air conditioned spaces while it is optional for non-air conditioned spaces by use of appropriate thermal material to fulfill requirement.
Project authorities have agreed to comply.

32. Facilities such as ramps and separate parking shall be provided for the benefit of physically challenged.

Project proponents have plans to construct ramps to benefit physically challenged.

33. The project shall be made operational only after necessary infrastructure / connection for water supply and sewerage line is provided and commission by the competent Authorities.

Proponents have obtained NOC from the Bangalore Water Supply and Sewerage Board (BWSSB) vide letter No.BWSSB/EIC/CE(M)/ACE(M)-I/DCE(M)-II/TA(M)-I/5284/2015-16 dated 20.08.2015.

34. The project authority shall maintain and operate the common infrastructure facilities created including STP and solid waste management facility for a period of at least 5 years after commissioning the project.

Project proponents have agreed to comply with the condition.

35. The project authority shall incorporate a suitable condition in the Sale Agreement / Deed to be made with the buyers that the occupier / buyer holds the responsibilities jointly with other users to maintain common infrastructure facilities created including STP and solid waste management facility.

Project authorities have agreed to comply.

36. The proponent shall obtain the construction material such as stones and jelly etc. only form the approved quarries and other construction material shall also be procured from the authorized agencies / traders.

Project proponents stated to have procured construction materials from authorized traders only and agreed to comply with the condition in future as well. An undertaking in this regard has been submitted to this office.

37. The proponent shall obtain approval from the authorities for structural safety of the building due to earthquake adequacy of firefighting equipment etc. as per the National Building Code (NBC) including protection measures for lightening etc.

Copy of the structural stability certificate - submitted.

38. The project authorities shall ensure that no water bodies are polluted be followed and ensured.

Nearest water bodies to the project site are – (i) Jakkur Lake (756 Km in the east), and (ii) Hebbal Lake (2.5 Km in the south). Project authorities have agreed to take necessary measures to ensure that these lakes are not been polluted because of the project activities. The proponent was asked to submit a certificate from the local authorities stating that the latter has not received any complaint in this regard.

39. Safety standards as per National Building Code (NBC), 2005 should be followed and ensured.

Safety standards, as stated by the proponent, are being followed at the site. An undertaking in this regard has been submitted to this office (Encl. A).

40. The project Authorities shall ensure that the National Building Code, 2005 is fully complied with and adhered to.
Project authorities have agreed to comply. An undertaking in this regard has been submitted to this office.

41. The project authorities shall be not use Kharab land if any for any purpose and keep available to the general public duly displaying a board as public property. No structure of any kind be put up in the Kharab land and shall be afforested and maintained as green belt only.
As reported, there is no Kharab land present in the site. The proponent has submitted a declaration in this respect (Encl. C).

42. The project authority shall obtain NOC before commencement of the construction activity and clearance after the completion of the construction from the Fire and Emergency Services Department.
Project proponents have obtained necessary permits.

43. The project Authorities shall ensure the time specification prescribed by the Honorable High Court to Karnataka in WP. No. 1958/2011 (LB-RES-PIL) on 04.12.2012 for different activities involved in construction work.
Project authorities have agreed to comply and submitted an undertaking that they will comply with the time specification prescribed by the Honorable High Court to Karnataka in WP. No. 1958/2011 (LB-RES-PIL) on 04.12.2012 (Encl. D).

44. The proponent shall take up the construction activity only after obtaining NOC from BWS &S B or clearance from the competent authority for assumed supply of water as the case may be.
Project authorities have obtained the NOC.

45. The project authorities shall ensure that the construction activity is undertaken strictly in accordance with approved site Plan / Layout drawing annexed to this Environmental Clearance Letter However, it is subject to compliance to the provisions of local authorities regarding setbacks, FAR etc. Shall be adhered to.
Project authorities have agreed to comply.

46. The existing water body, canals and rejakaluve and other drainage and water bound structures shall be retained unaltered with due buffer zone of 15 meter around maintained under tree cover, If applicable.
As noticed during the visit, canal/rajakaluve does not exist within the project premises. However, a storm water storage tank (213 m^3) was seen at the site.

47. The project authorities shall leave 30 mtrs buffer form the boundary of lake and 15 meters on either side of the channel / nala and other water bodies as per the BDA norms and this shall be free from any permanent structure. The buffer so maintained shall be planted with indigenous tree species such as Neem, Akash Mallige, Mahagoni, Honge, Kadamba Ficus, etc. and maintained as green belt, if applicable.
As noticed during the visit, canal/nala does not exist within the project premises.

48. The natural sloping pattern of the project site shall remain unaltered and the natural hydrology of the area be maintained as it is to ensure natural flow storm water.
The proponents have given an undertaking that they will ensure that natural sloping pattern of the project site shall remain unaltered and the natural hydrology of the area be maintained as it is.

49. Lakes and other water bodies within and / or at the vicinity of the project area shall be protected and conserved.
Proponents have agreed to comply.

50. The proponent shall donate Rs. 5 Lakhs to Bangalore Hospice Trust- Karunashraya, Marathahalli, Rs. 2.5 Lakhs to Cheshire Homes India, Bangalore and Rs. 2 Lakhs each to deaf aid society Bangalore and Huskur Devasthagala Jeernodhara Samthi (R) Bangalore respectively towards the Corporate Social Commitment made Vide Letter dated 24th August 2015 and report be submitted to Authority.
Proponents had extended ambulance service to the locals; constructed hostels for economically backward classes at KR Market, Bangalore; constructed toilets at Government School premises etc. and submitted a plan to spend Rs 11.5 Lakhs toward specific social commitment plan including the ones in the condition above (Encl. E)

PART – B. GENERAL CONDITIONS:

1 The Environmental safeguards contained in the application should be implemented in letter and spirit.
Proponents have agreed to comply.

2 All commitments made by the proponents in their application, and subsequent letter addressed to the SEAC/SEIAA should be accomplished before the construction work of the project is completed.
Proponents have agreed to comply.

3 Half yearly monitoring reports should be submitted to the SEIAA and the APCCF, Regional Office, MoEF Bangalore.
Proponents have agreed to comply.

4 Officials from the Department of Environment and Ecology, Bangalore / APCCF, Regional Office of MoEF, Bangalore who would be monitoring the implementation

of Environmental safeguards should be given full cooperation, facilities and document / data by the project proponents during their inspection, a complete set of all the documents submitted of MoEF/SEIAA should be forwarded to the APCCF, Regional Office of MoEF, Bangalore / Department of Environmental and Ecology, Bangalore.

Full cooperation extended during the visit.

5 In the case of any change (s) in the scope of project, the project would require a fresh appraisal by this Authority.

Proponents are aware of the condition.

6 Concealing factual data or submission of the false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provision of Environmental (Protection) Act, 1986.

Proponents are aware of the condition.

7 The Authority reserves the right to add additional safeguard measures subsequently, if found necessary, and to take action including revoking of the environmental clearance under the provisions of the Environmental (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measure in a time bound and satisfactory manner.

Proponents are aware of the condition.

8 All other statutory clearance such as the approvals for storage of diesel from Chief Controller of Explosives, fire Department, Civil Aviation Department, Forests Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the competent authorities.

Necessary permits were taken.

9 The project proponent should advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental clearance and copies letter are avail be with the Karnataka State Pollution Control Board and may also be seen on the website of the SEIAA Karnataka at http://www.seiaa.kar.nic.in. or http://seiaa.karnataja.gov.in The advertisement should be made within 7days from the day of issue of the clearance letter and copy if the same should be forwarded to the APCCF, Regional office of the MOEF at Bangalore / Department of Environment and Ecology, Bangalore.

Proponents stated to have complied with the condition.

10 The project proponent should display the conditions prominently at the entrance of the project on suitable size board for the information of the public.

Proponents have complied with the condition.

11 Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under section 16 of the National Green Tribunal Act, 2010.

Proponents are aware of the condition.

12 These stipulations would be enforced among other under the provisions of Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification, 2006.

Proponents are aware of the condition.

13 Under the provisions of Environment (Protection) Act, 1986, legal action shall be initiated against the project proponent if it is found that construction of the project has been started without obtaining environmental clearance.

Proponents are aware of the condition. As reported, activities at site initiated only after getting environmental clearance from the SEIAA, Karnataka.

14 The issuance of Environmental Clearance doesn't confer any right to the project proponent to operate / run the project without obtaining statutory clearances/ sanctions from all other concerned authorities.

Proponents are aware of the condition.

(Dr. Dola Bhattacharjee)
Research Officer (E)

Encl. A

Annexure 12

L&T Construction Equipment Limited – Realty Division
Bellary Road, Next to GKVK, Byatarayanapura, Bangalore - 560092, INDIA. Tel. +91 80 22178900: www.LnTrealty.com

To

The Regional Director
Ministry of Environment and Forests
Government of India
Regional Office (South Zone)
Kendriya Sadan, IV Floor
E&F Wing.17th Main Road, 2nd Block,
Koramangala, Bangalore-560034.

UNDERTAKING

(read specific condition no. 39 of EC no. SEIAA 190 CON 2014 dt.24-08-2015 issued by SEIAA Karnataka)

I, K. Chandrasekhar, Head - Business at L&T Construction Equipment Limited - Realty Division, hereby affirm and undertake myself including my successors on behalf of L&T Construction Equipment Limited - Realty Division and its legal heirs that Safety standards as per National Building Code (NBC), 2005 shall be followed during the construction of "L&T North Star" at survey Nos.88/1 to 104/4, Khata No. : 239/240/275/88/1 & 240/276/89/1, Ward No. 07 of Byatarayanapura Village, Bengaluru North Taluk, Bengaluru, Karnataka State.

Place: Bengalùru
Date : 12/10/2017

Signature
Name & Designation
(Authorised signatory)

L&T Construction Equipment Limited Realty Division * Bangalore *

Encl. B

METAMORPHOSIS[SM]
LABORATORY PRIVATE LIMITED
thought . process . reality!!
An ISO 9001:2008
OHSAS 18001:2007
Recognized by MoEF & CC and Accredited by NABL

TEST REPORT

MLPL/N/17/10/137

AMBIENT NOISE MEASUREMENT

1. **Name of the Project** : Proposed Expansion of Building and construction Project of Mixed use development comprising of residential, SEZs, commercial & Retail Units
2. **Name of the Project Proponent** : M/s L&T Construction Equipment Limited, Survey Nos. 88/1 to 104/4 of Byatarayanapura Village, Bengaluru North Taluk, Bengaluru.
3. **Date of Measurement** : 26/09/2017

Name of the Location	Location Code	Protocol	Result (dB (A))		
			Day		
			L_{Min}	L_{Max}	Leq
Near DG Set - 250KVA steeling Yard (while in operation)	LTB/CZ/N1	IS:9989-1981	85.3	89.0	87.8

Limits in dB (A) Leq			
Area Code	Category of Area / Zone	Day (6 a.m. to 10 p.m.)	Night (10 p.m. to 6 a.m.)
(A)	Industrial Area	75	70
(B)	Commercial Area	65	55
(C)	Residential Area	55	45
(D)	Salience zone	50	40

INFERENCE	**As per CPCB Standards Report Status**: Noise Level is found to be higher than the permissible limits. Employees exposed / working at those locations advised to wear PPE's.
Sample Collected By	M/s. METAMORPHOSIS Laboratory Private Limited, Bengaluru

** End of Report **

Analysed By

Chemist
Mr. Ramesh. S

Authorised Signatory

Laboratory Head
Dr. Shanth A. Thimmaiah

"PRAKRUTHI BHAVAN", #200, 1st & 2nd Floor, 40th Main, 1st Cross, 6TM Layout II Stage, Behind Central Silk Board, Bengaluru - 560068, Karnataka, India. Telefax: +91.80.26783006 Email: mail@metamorphosis-india.com

Encl. C

Annexure 13

L&T Construction Equipment Limited – Realty Division
Bellary Road, Next to GKVK, Byatarayanapura, Bangalore - 560092, INDIA. Tel. +91 80 22173900: www.LnTrealty.com

To

The Regional Director
Ministry of Environment and Forests
Government of India
Regional Office (South Zone)
Kendriya Sadan, IV Floor
E&F Wing.17th Main Road, 2nd Block,
Koramangala, Bangalore-560034

DECLARATION

(read specific condition no. 41 of EC no. SEIAA 190 CON 2014 dt.24-08-2015 issued by SEIAA Karnataka)

I, K. Chandrasekhar, Head - Business at L&T Construction Equipment Limited - Realty Division, hereby solemnly affirm and declare that there is no Kharab land present at the site measuring 2,65,117.47 Sqm and no structure of any kind to be put up in the Kharab land, if any, outside the project area of "L&T North Star" at survey Nos.88/1 to 104/4, Khata No. : 239/240/275/88/1 & 240/276/89/1, Ward No. 07 of Byatarayanapura Village, Bengaluru North Taluk, Bengaluru, Karnataka State.

Place: Bengaluru
Date : 12/10/2017

Signature
Name & Designation

(Authorised signatory)

L&T Construction Equipment Limited - Realty Division * Bangalore *

Encl. D

Annexure 14

L&T Construction Equipment Limited – Realty Division
Bellary Road, Next to GKVK, Byatarayanapura, Bangalore - 560092, INDIA. Tel. +91 80 22173900: www.LnTrealty.com

To

The Regional Director
Ministry of Environment and Forests
Government of India
Regional Office (South Zone)
Kendriya Sadan, IV Floor
E&F Wing.17th Main Road, 2nd Block
Koramangala, Bangalore-560034.

UNDERTAKING

(read specific condition no. 43 of EC no. SEIAA 190 CON 2014 dt.24-08-2015 issued by SEIAA Karnataka)

I, K. Chandrasekhar, Head - Business at L&T Construction Equipment Limited - Realty Division(herein after referred as 'the company'), hereby affirm and undertake myself including my successors on behalf of L&T Construction Equipment Limited - Realty Division and its legal heirs that the company shall ensure the time specification prescribed by the Honourable High Court of Karnataka in W.P. No. 1958/2011(LB-RES-PIL) dated 04/12/2012 for different activities involved in construction work of "L&T North Star" at survey Nos.88/1 to 104/4, Khata No. : 239/240/275/88/1 & 240/276/89/1, Ward No. 07 of Byatarayanapura Village, Bengaluru North Taluk, Bengaluru, Karnataka State.

Place: Bengaluru
Date : 12/10/2017

Signature
Name & Designation
(Authorised signatory)

Encl. E

LARSEN & TOUBRO

To,

The Member Secretary,
SEIAA
Department of Ecology & Environment
Room No. 709, 7th Floor, 4th Gate
M.S. Building, Bangalore – 560 001

Date: 24/08/2015

Respected Sir,

Subject: Submission of additional information for our mixed use project "**L & T North Star**" (SEIAA 190 CON 2015).

Ref: Proceedings of the 102nd SEIAA meeting held on 14th Aug 2015

We are hereby submitting the following additional information in regards to our Mixed use Construction Project "L & T North Star" at Khata Nos. 239/240/275/88/1 & 240/276/89/1, Sy. Nos. 88 to 104, Byatarayanapura, Bengaluru North, Karnataka.

Sl.No	Additional Information Sought by SEIAA	Compliance
1	Appropriate treatment facility for ground water as it is having higher Fluoride and Nitrate concentrations.	We have proposed to use water from BWSSB supply for drinking purpose however, suitable treatment will be adopted if required in case we use bore well water.
2	Proposal to shift parking provided close to the gas tank.	From the conceptual plan submitted, parking provided is about 15m-20m away from the proposed gas tank.
3	Noise barriers along the railway line	To control the effect of noise due to movement of trains to the residents, effective green belt all along the railway line is proposed and will be implemented.
4.	Specific social commitment with budget activity and time frame.	Specific social commitment plan is enclosed as **Annexure 1**.

Trust the above information is in order and request you to kindly process our application and issue us Environmental Clearance.

Yours faithfully
for L & T Realty-LARSEN & TOUBRO LIMITED.

LARSEN & TOUBRO LIMITED
No. 38, CUBBON ROAD, BANGALORE 560 001

NISHIKANT SHIMPI
(in capacity of constituted attorney of L & T Construction Equipment Limited)

24/8/2015

Encl: as above
Encl: a/a

Larsen & Toubro Limited
Area Office, No.38, Cubbon Road, Bangalore - 560 001. INDIA
Tel : 91- 80 25020100 / 25583613 Fax : 91- 80 25596397 / 25585214 www.Larsentoubro.com
CIN: L99999MH1946PLC004768

Registered Office:
L&T House, N. M. Marg
Ballard Estate
Mumbai - 400 001, INDIA

(RTO)

LARSEN & TOUBRO

ANNEXURE 1

SPECIFIC SOCIAL COMMITMENT PLAN

Sr. No.	Commitment to	In INR.
1.	Bangalore Hospice Trust-Karunasharaya, Marathalli, Bengaluru, Karnataka	5,00,000.00 (Rupees Five Lakhs Only)
2.	Cheshire Homes India, HAL, Old Airport Road, Bengaluru	2,50,000.00 (Rupees Two Lakhs fifty Thousand Only)
3.	Deaf Aid Society, Bengalruru.	2,00,000.00 (Rupees Two Lakhs Only)
4.	Huskur Devasthanagala Jeernodhara Samithi (R), Bengaluru.	2,00,000.00 (Rupees Two Lakhs Only)

L&T LIMITED

Larsen & Toubro Limited
Area Office, No.38, Cubbon Road, Bangalore - 560 001. INDIA
Tel : 91- 80 25020100 / 25583613 Fax : 91- 80 25596397 / 25585214 www.Larsentoubro.com
CIN: L99999MH1946PLC004768

Registered Office:
L&T House, N. M. Marg
Ballard Estate
Mumbai - 400 001. INDIA

REPORT ON GEOTECHNICAL INVESTIGATION FOR THE PROPOSED "RAINTREE BOULEVARD" AT BYATARAYANAPURA, BANGALORE

Prepared For

L&T Realty

Prepared By

Sarathy Geotech & Engineering Services Pvt. Ltd.
(ISO 9001:2008 & OHSAS 18001:2007 Certified)

Registered office & Correspondence address:
671, 6th 'C' Main, 11th Cross, 3rd Phase, J P Nagar, Bangalore – 560078, INDIA

Operations Office & Laboratory:
38, 2nd Floor, Attar Syed Hussain Building, KH Circle, Hosur Road, Bangalore-560027
Tele fax: +91 80 42850202, **Mob:** +91 9844875200
E-mail: info@sarathygeotech.com **Website:** www.sarathygeotech.com

Document Version Control

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Customer Approval			
Version Number	**Date Submitted**	**Approval Status**	**Remarks**
Version 1	30th December 2015	IFA	

30th December 2015 Report No: SGES/2015-16/S-864/Ver1

To

M/s Larsen & Toubro Limited
Gate 5, L&T Business Park,
Tower-A, Ground Floor,
Saki Vihar Road,
Powai, Mumbai- 400 072

Dear Sir/Madam,

Report on Geotechnical Investigation for the Proposed "Raintree Boulevard" at Byatarayanapura, Bangalore

We are pleased to submit this report on Geotechnical Investigation carried out for the Proposed "Raintree Boulevard" project at Byatarayanapura, Bangalore

We thank you for providing an opportunity to work with you.

Sincerely

For Sarathy Geotech & Engineering Services Pvt Ltd.

Dr. C.R.Parthasarathy
Managing Director

TABLE OF CONTENTS

1.0 INTRODUCTION

M/S L&T Realty **(LnT)** approached M/s. Sarathy Geotech & Engineering Services Pvt. Ltd. **(SGES)** to carry out the confirmatory Geotechnical Investigation for the proposed "RAINTREE BOULEVARD" at Byatarayanapura Bangalore.

This report presents the results of a geotechnical investigation for the proposed construction of RAINTREE BOULEVARD project, which includes (2 Basement + Ground + 16 Upper Floors) located at Byatarayanapura, Bangalore. Previously, 10 Nos of exploratory boreholes was carried out by Geomarine consultant's pvt ltd., Chennai, the results of which is also used in the estimation of allowable bearing pressure in this report.

2.0 PURPOSE AND SCOPE OF WORK

The purpose of this geotechnical investigation is to determine the stratification of ground, geotechnical properties of substratum, to recommend the allowable bearing pressure for the proposed construction.

The following scope of work was performed in order accomplish the foregoing purposes

- The subsurface condition were explored by advancing, sampling and logging a five (5) Nos of exploratory boreholes to depths ranging from 15.5m to 20.0m below the existing ground level.
- Conducting Standard Penetration Test (SPT) at every 1.5 m interval in soil.
- Collecting undisturbed soil samples wherever possible.
- When met with refusal /rock strata collecting core samples using core barrels.
- Conducting laboratory tests on both soil and rock samples
- Final Report including the acquired field information, laboratory test results and engineering recommendations based on the results and analysis.

3.0 SITE CONDITION

The site is located at Byatarayanapura, Bangalore extending to about 11 acres. The borehole location for the Geotechnical investigation is presented in **Plate 1**.

4.0 FIELD INVESTIGATION AND LABORATORY TESTING PROGRAM

A field investigation was performed during the period of November 20, 2015 to December 11, 2015. The investigation consisted of sinking 5 nos. exploratory boreholes (Viz., BH-12, BH-13, BH-14, BH-15 & BH-16) using drilling rig. In all the boreholes, Standard Penetration Test (SPT) was conducted at every 1.5m interval and undisturbed samples (UDS) were collected at every change in the strata or wherever possible.

The boreholes were drilled up to a depth of 19.0m in BH-12, 20.0m in BH-13 & BH-16, 19.3m in BH-14 and 15.5m in BH-15 from existing ground level. The boreholes were terminated upon approval from client's engineer. The field and laboratory tests procedures as outlined in relevant Bureau of Indian Standard (BIS) were followed for this geotechnical investigation campaign.

4.1 FIELD EXPLORATION

4.1.1 Drilling (IS 1892)

This consisted of sinking 5 nos. exploratory boreholes using drilling rig. The boreholes were drilled up to a depth ranging from 15.5m to 20.0m.

4.1.2 Standard Penetration Test (IS 2131)

Standard Penetration Test (SPT) was conducted at every 1.5m interval. The Standard Penetration Test (SPT) utilizes a 50 mm OD and 600 mm long thick- walled split sampler tube driven into undisturbed soil under the impact of 63.5 kg weight hammer having a free fall of 750 mm. The penetration resistance of 'N' value is recorded as the number of hammer blows required to achieve a penetration of 300 mm after the initial penetration of 150 mm as a seating drive (to allow for any disturbed materials at the bottom of borehole). In very dense/disintegrated formations, the penetration for 50 blows were recorded and the N-values extrapolated. After completion of test the sampler tube is removed & disassembled to provide a disturbed but representative sample.

In all the boreholes the SPT was conducted up to the stratum where core is less than 10% . The total number of SPT conducted were 11 Nos in BH-12, 13 Nos in BH-13, 9nos in BH-14, 8 Nos in BH-15 and 10 Nos in BH-16

4.1.3 Undisturbed samples (IS 2132)

Undisturbed soil samples were collected wherever possible in the boreholes by driving 100 mm OD thin walled sampler with a 63.5 kg weight. After removing the sampler tube from the borehole, outside is cleaned and both the ends of the tube are coated with non-shrinking wax to ensure airtight seal and to retain moisture.

Total Six (6) Nos of undisturbed samples were collected in the borehole. One each in BH-12 (@ 8.5m), BH-13 (@ 5.5m), BH-14 (@11.5m) and BH-16 (@ 10.0m), while 2 Nos in BH-15 (at 5.5m and 12.0m).

4.1.4 Core Recovery (CR %)

The core recovery is the ratio of the total length of the rock cores recovered to the drilled core run expressed as percentage. Core samples were collected in each boreholes up to termination depth after refusal strata. Core recovery at each depth is presented in bore logs.

4.1.5 Rock Quality Designation (RQD %)

The Rock Quality Designation (RQD) is the ratio of the sum of cumulative lengths of all the cores larger than 10cm to the drilled core run expressed as percentage. Core lengths are measured along the central line of the cores. A relationship between the RQD and the quality of core is tabulated in **Table 1**

Table 1 Classification of Core Quality based on RQD

RQD (%)	Core Quality
0-25	Very Poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

Based on the above table, RQD at boreholes appears to be "Very Poor to Fair"

Soil and Rock samples obtained from the boreholes were inspected in the field immediately upon retrieval for type, texture and color. All samples were sealed in plastic bags and arranged in core boxes, which was later transported to SGES laboratory.

4.2 LABORATORY TESTING

After the completion of fieldwork, the samples were transported to SGES lab for further visual-tactile examination, and to select appropriate samples for laboratory analysis.

Table 2 shows the list of laboratory tests performed on Soil samples

Table 2: Laboratory Tests on Soil Samples

Laboratory Tests	Codes
Natural Moisture Content and Unit Weight	IS 2720 Part 2
Specific Gravity	IS 2720 Part 3
Grain Size Distribution	IS 2720 Part 4
Atterberg Limit	IS 2727 Part 5
Direct Shear	IS 2720 Part 13

Table 3 shows the list of laboratory tests performed on Rock samples

Table 3: Laboratory Tests on Rock Samples

Laboratory Tests	Codes
Physical Properties	IS 13030
Point Load Index	IS 8764
Unconfined Compression Test	IS 9143

The results of all the test are presented in the Summary of Test Results (SOTR) given in **Plate 3** and also incorporated in borehole logs presented in **Plate 2**.

5.0 SUBSTRATUM

The stratigraphy at the proposed site location is shown in below tables

Table 4A: Stratigraphy of BH-12	
Depth	**Description/Stratigraphy**
0.0m-4.5m	Very Loose Reddish Brown Clayey SAND with traces of Gravels
4.5m-9.0m	Medium Dense to Dense Yellowish Brown Silty SAND
9.0m-15,0m	Dense to Very Dense Yellowish Brown Silty SAND
15.0m-16.5m	Dense Pale Yellowish Green Sandy SILT with mica
16.5m-18.5m	Very Dense Greyish Brown Silty SAND/Disintegrated Rock
18.5m-19.0m	Weathered Quartzite

Table 4B: Stratigraphy of BH-13	
Depth	**Description/Stratigraphy**
0.0m-4.5m	Loose to medium dense Reddish Brown Clayey SAND with Gravels
4.5m-7.0m	Medium Dense Yellowish Brown Silty SAND
7.0m-20.0m	Very Dense Yellowish Brown Silty SAND/Disintegrated Rock

Table 4C: Stratigraphy of BH-14	
Depth	**Description/Stratigraphy**
0.0m-4.5m	Dense Reddish Brown Clayey SAND with Gravels
4.5m-16.5m	Dense to very Dense Yellowish Brown Silty SAND
16.5m-19.3m	light Grey Granite

Table 4D: Stratigraphy of BH-15	
Depth	**Description/Stratigraphy**
0.0m-3.0m	Medium Dense Reddish Brown Sandy CLAY with Gravels
3.0m-7.5m	Medium Dense Yellowish Brown Silty SAND
7.5m-13.6m	Very Dense Greyish Brown Silty SAND/Disintegrated Rock
13.6m-15.5m	Light Grey Granite

Table 4E: Stratigraphy of BH-16	
Depth	**Description/Stratigraphy**
0.0m-4.5m	Medium Dense Reddish Brown Clayey SAND
4.5m-13.5m	Very Stiff Reddish Yellow Clayey SILT
13.6m-20.0m	Very Dense Greyish Brown Silty SAND

For detailed stratigraphy of the borehole location, refer the bore log presented in **Plate 2A to 2E.**

6.0 GROUND WATER TABLE

The ground water was measured 24to 48hrs after completion of each borehole. **The ground water table was not met with during the period of investigation, in all the boreholes drilled by SGES**

7.0 CONCLUSIONS AND RECOMMENDATION

- The proposed RAINTREE BOUVALARD has been planned to accommodate two excavated basement with the founding depth of about 10m below the natural ground level.
- We recommend Raft foundation be adopted with an allowable Bearing pressure of **70T/m^2** at **10.0m** below the existing ground level for a total permissible settlement of 40mm, except in the region of **BH-16.**
- For the design of raft foundation, a modulus of subgrade reaction of **20,000 KN/m^3** shall be adopted. It is recommended to conduct a plate load test after the excavation to reconfirm the subgrade modulus.
- **As a thick SILT layer is encountered in BH-16, we recommend additional 2 boreholes to be drilled for the proposed tower in the vicinity for BH-16.**

- The following parameter shall be adopted for the design of side retaining wall/excavation support system.

Depth from EGL, M	Cohesion (kPa)	Angle of Internal Friction (Deg)	Density (kN/m^3)
0.0-4.5m	15	28	18
4.5-7.5m	10	30	19
7.5-12.0m	10	33	20

- In order to resists the lateral earth pressure of retained soil, following methods can be adopted
  1. Combination of micro pile, waler beam, with or without grouted nails.
  2. Touch piles with anchors.
  3. Diaphragm wall construction.
  4. If enough space available within the boundary, open excavation with appropriate slope, design of retaining wall and backfilling also may be adopted.
- After excavation for basement is completed, if any, marked deviation are observed at the basement level than what is reported herein, the same shall be reported to the consultant.
- The bottom of excavation shall be inspected for loose pockets/filled up-unconsolidated soil and if found any, the same shall be replaced with lean concrete.

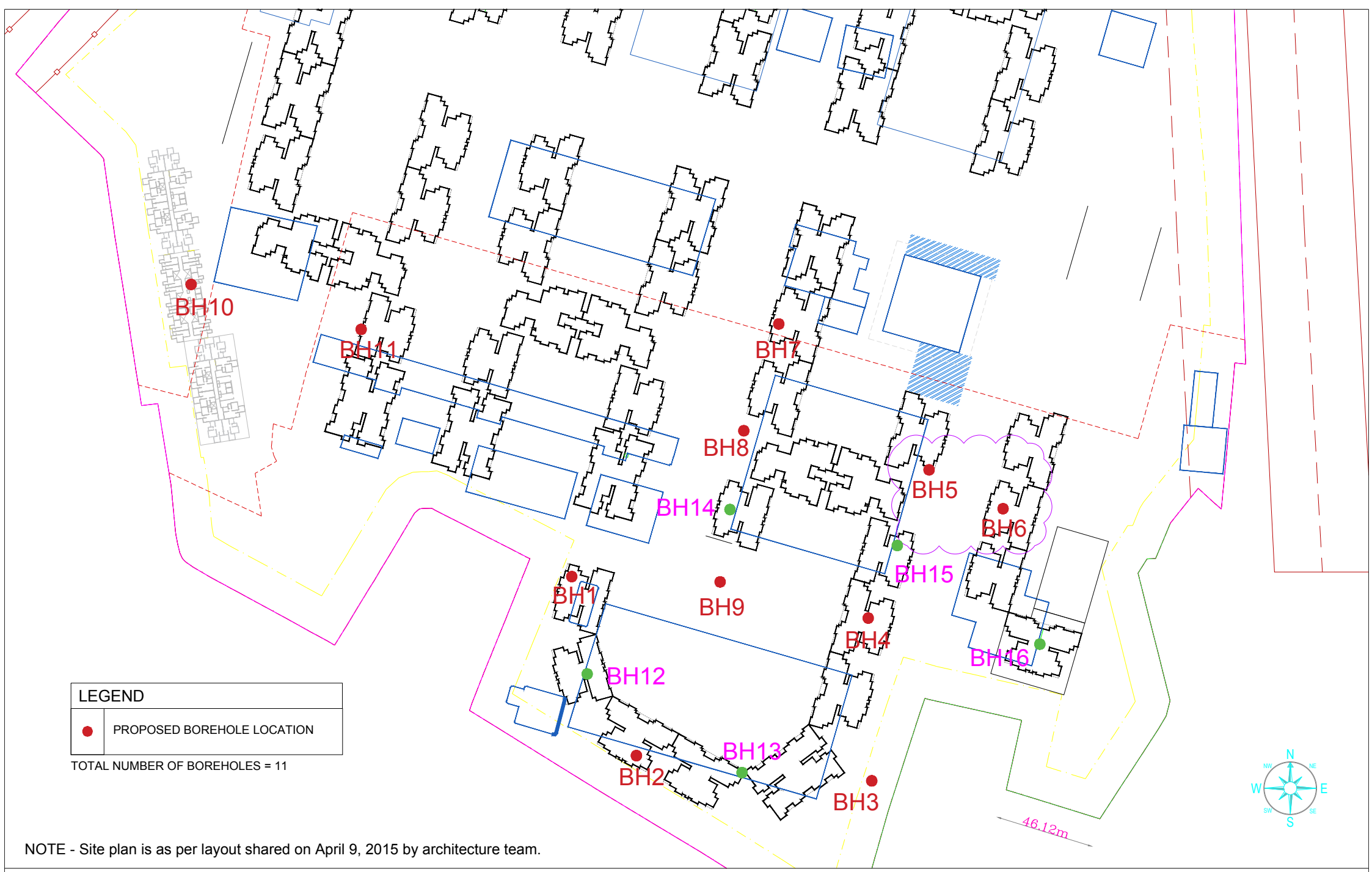
8.0 REFERENCES

1) IS 1892-1979: Code of Practice for subsurface Investigation for foundation.
2) IS 2131-1981: Method of Standard Penetration Test for soil.
3) IS 1498-1970: Classification and identification of soils for general engineering purposes.
4) IS 2720: Method of test for soils (relevant Parts).
5) IS 13030 and IS 9143: Method of test for Rock.
6) IS 6403-1971: Code of practice for determination of bearing capacity of shallow foundation.
7) Report on proposed construction of residential building (2 basement + ground + 16 upper floors) at Byatarayanapura, Bangalore, Karnataka, By M/s. Geomarine consultants Pvt Ltd, Chennai

9.0 DISCLAIMER

Sarathy Geotech & Engineering Services Pvt. Ltd., (SGES) personnel / scientists have prepared this report based on the available data and to the best of our knowledge and belief which stems from the state-of-art awareness and best practices being adopted by us and the industry. The analysis, findings and conclusions are based on the assumptions made and the tested parameters. Any differences regarding this study/ analysis results shall be resolved within 30days or at the time of project whichever is earlier. Beyond the scope of our conclusion in this report, we do not claim responsibility of any action or other conclusions derived from this report. SGES's Liability is limited only to the scope of work.

ILLUSTRATION



LEGEND	
●	PROPOSED BOREHOLE LOCATION

TOTAL NUMBER OF BOREHOLES = 11

NOTE - Site plan is as per layout shared on April 9, 2015 by architecture team.

L&T Realty Limited

NORTH STAR, BANGLORE
PROPOSED BOREHOLE LAYOUT (PHASE-1A)

PLATE 1

FINAL BORELOG

Depth (m)	Soil Profile	Sample Type	Soil / Rock Description	Density kN/m³ (○ Dry Density, ● Bulk Density)	Atterbergs limits WC % (PL, W, LL)	SPT Number of Blows (cm)	N-Value	Strength Parameters (UCC for Rock (MPa); UCC for Rock derived from Point Load (MPa))	Run (m) from	Run (m) to	Core Recovery (%)	RQD (%)	Remarks
1			Very Loose Reddish brown [5YR 5/4] Clayey SAND with gravel										
2		SPT-1				5 2 2	4						
3													
4													
5		SPT-2	Medium Dense Yellowish brown [10YR 5/4] Silty SAND			5 7 8	15						
6		SPT-3				16 17 21	38						
7													
8		SPT-4				11 12 15	27						
9		UDS-1						Cohesion(kPa)=2 Angle of internal friction(Deg)=46					
10		SPT-5	Dense to Very Dense Yellowish brown [10YR 5/4] Silty SAND			16 20 26	46						
11		SPT-6				12 19 20	39						
12		SPT-7				16 18 18	36						
13													
14		SPT-8	-color changes from Yellowish Brown to Greyish Brown			16 34 28	62						
15		SPT-9	Dense Pale yellowish green [10GY 7/2] Sandy SILT with mica			12 16 26	42						
16													
17		SPT-10	Very Dense Grayish brown [10YR 5/2] Silty SAND/Disintegrated rock			47 50/5cm R	R						
18		SPT-11				50/7cm R R	R						
19		RC-1	Weathered Quartzite						18.5	19	10	NIL	
20			Borehole terminated at 19.0m										

Originator: KSV Date: 17/12/2015 Checked by: TV Date: 17/12/2015

Client : M/s L & T REALTY
Project : Raintree Boulevard
Location : Byatarayanapura
Report No. : S-864

Date of Boring : 10/12/2015 to 11/12/2015
Borehole : BH-12
Water Table(m) : Not met
Status : FINAL

⊕Percent passing 75 micron sieve (%)

R- Refusal

□ Point Load Index, (MPa)

Coordinates:

SGES

Plate 2A

FINAL BORELOG

Depth (m)	Soil Profile	Sample Type	Soil / Rock Description	Density kN/m³ (○ Dry Density, ● Bulk Density)	Atterbergs limits WC % (PL, W, LL)	SPT Number of Blows (cm)	N-Value	Strength Parameters (UCC for Rock (MPa); UCC for Rock derived from Point Load (MPa))	Run (m) from	Run (m) to	Core Recovery (%)	RQD (%)	Remarks
1			Loose to Medium Reddish brown [5YR 5/4] Clayey SAND with gravel										
2		SPT-1				4 5 5	10						
3		SPT-2				6 6 7	13						
4													
5		SPT-3	Medium Dense Yellowish brown [10YR 5/4] Silty SAND			7 9 13	22						
6		UDS-1						Cohesion(kPa)=5 Angle of internal friction(Deg)=43					
		SPT-4				8 10 15	25						
7			Very Dense Pale yellow [5Y 8/2] Silty SAND/Disintegrated rock										
8		SPT-5				28 38 50/10cm	R						
9		SPT-6				36 50/10cm	R	R					
10													
11		SPT-7				50/13cm R	R	R					
12		SPT-8				36 50/10cm	R	R					
13													
14		SPT-9				39 50/8cm	R	R					
15		SPT-10				50/7cm R	R	R					
16													
17		SPT-11				41 50/9cm	R	R					
18		SPT-12				44 50/8cm	R	R					
19													
20		SPT-13				35 50/13cm	R	R					
21			Borehole Terminated at 19.95m										

Density kN/m³: ○ Dry Density, ● Bulk Density (0 0 0 0)

Atterbergs limits WC %: PL — W — LL (20 40 60 80)

SPT Number of Blows (cm): 15 30

Strength Parameters: ✳ UCC for Rock (MPa); ✳ UCC for Rock derived from Point Load (MPa) (40 80 120 160)

Run (m): from / to

Originator: KSV Date: 07/12/2015 Checked by: TV Date: 07/12/2015

Client	: **M/s L & T REALTY**	**Date of Boring**	: **20/11/2015 to 21/11/2015**
Project	: **Raintree Boulevard**	**Borehole**	: **BH-13**
Location	: **Byatarayanapura**	**Water Table(m)**	: **Not met**
Report No.	: **S-864**	**Status**	: **FINAL**

20 40 60 80 ⊕Percent passing 75 micron sieve (%)

R- Refusal

2 4 6 8 □ Point Load Index, (MPa)

Coordinates:

SGES

Plate 2B

FINAL BORELOG

Depth (m)	Soil Profile	Sample Type	Soil / Rock Description	Density kN/m³ (○ Dry Density, ● Bulk Density)	Atterbergs limits WC % (PL, W, LL)	SPT Number of Blows (cm)	N-Value	Strength Parameters (✳ UCC for Rock (MPa), ✳ UCC for Rock derived from Point Load (MPa))	Run (m) from	Run (m) to	Core Recovery (%)	RQD (%)	Remarks
1			Dense to Very Dense Reddish brown [5YR 5/4] Clayey SAND with gravel										
2		SPT-1				19 21 21	42						
3		SPT-2				11 15 37	52						
4													
5		SPT-3	Dense to Very Dense Yellowish brown [10YR 5/4] Silty SAND			7 12 18	30						
6		SPT-4				9 15 16	31						
7													
8		SPT-5	-color changes from yellowish Brown to Greyish Brown			12 14 18	32						
9		SPT-6	-color changes from Greyish Brown to Light Grey			21 26 42	68						
10													
11		SPT-7				24 43 50/10cm	R	Cohesion(kPa)=20 Angle of internal friction(Deg)=48					
12		UDS-1 SPT-8	-color changes from Light Grey to Greyish Brown			50/9cm R R	R						
13													
14		SPT-9 RC-1				48 50/10cm R	R		13.5	15	80	NIL	
15									15	16.5	73	NIL	
16		RC-2											
17		RC-3	Light gray [10R 7/1] Granite					✳ □	16.5	18	47	8	
18		RC-4						✳	18	19.5	67	34	
19													
20			Borehole terminated at 19.3m										

Density kN/m³: ○ Dry Density, ● Bulk Density (0 0 0 0)

Atterbergs limits WC %: PL — W — LL (20 40 60 80)

SPT Number of Blows (cm): 15 30

Strength Parameters: ✳ UCC for Rock (MPa); ✳ UCC for Rock derived from Point Load (MPa) (40 80 120 160)

Run (m): from / to

Originator: KSV Date: 17/12/2015 Checked by: TV Date: 17/12/2015

Client : M/s L & T REALTY
Project : Raintree Boulevard
Location : Byatarayanapura
Report No. : S-864

Date of Boring : 1/12/2015 to 4/12/2015
Borehole : BH-14
Water Table(m) : Not met
Status : FINAL

20 40 60 80 ⊕Percent passing 75 micron sieve (%)

R- Refusal

2 4 6 8 □ Point Load Index, (MPa)

Coordinates:

SGES

Plate 2C

FINAL BORELOG

Depth (m)	Soil Profile	Sample Type	Soil / Rock Description	Density kN/m³ (○ Dry Density, ● Bulk Density)	Atterbergs limits WC % (PL, W, LL)	SPT Number of Blows (cm)	N-Value	Strength Parameters (✳ UCC for Rock (MPa), ✳ UCC for Rock derived from Point Load (MPa))	Run (m) from	Run (m) to	Core Recovery (%)	RQD (%)	Remarks
1			Medium Dense Reddish brown [5YR 5/4] Sandy CLAY with Gravel										
2		SPT-1				12 13 13	26						
3		SPT-2	Medium Dense Yellowish brown [10YR 5/4] Silty SAND			43 46 45	91						
4													
5		SPT-3				9 11 11	22						
		UDS-1						Cohesion(kPa)=10 Angle of internal friction(Deg)=38					
6		SPT-4				11 14 17	31						
7													
8		SPT-5	Very Dense Grayish brown [10YR 5/2] Silty SAND/Disintegrated rock			17 23 40	63						
9		SPT-6				22 47 50/13cm	R						
10													
11		SPT-7	-Presence of mica @ 11.0m			16 15 19	34						
12		UDS-2						Cohesion(kPa)=10 Angle of internal friction(Deg)=47					
13		SPT-8 RC-1				50/5cm R R	R		13	13.65	Nil	Nil	
14		RC-2	Light gray [10YR 7/1] Granite					✳	13.65 14	14 15.5	94 100	69 60	
15		RC-3						✳					
16			Borehole Terminated at 15.5m										
17													

Originator: KSV Date: 07/12/2015 Checked by: TV Date: 07/12/2015

Client : M/s L & T REALTY
Project : Raintree Boulevard
Location : Byatarayanapura
Report No. : S-864

Date of Boring : 24/11/2015 to 26/11/2015
Borehole : BH-15
Water Table(m) : Not met
Status : FINAL

⊕ Percent passing 75 micron sieve (%)

R- Refusal

□ Point Load Index, (MPa)

Coordinates:

SGES

Plate 2D

FINAL BORELOG

Depth (m)	Soil Profile	Sample Type	Soil / Rock Description	Density kN/m³ (○ Dry Density, ● Bulk Density)	Atterbergs limits WC % (PL, W, LL)	SPT Number of Blows (cm)	N-Value	Strength Parameters (✳ UCC for Rock (MPa), ✳ UCC for Rock derived from Point Load (MPa))	Run (m) from	Run (m) to	Core Recovery (%)	RQD (%)	Remarks
1			Medium Dense Reddish brown [5YR 5/4] Clayey SAND										
2		SPT-1				10 6 5	11						
3		SPT-2				2 5 8	13						
4													
5		SPT-3	Very Stiff Reddish yellow [5YR 7/6] Clayey SILT			9 10 12	22						
6		SPT-4				18 13 12	25						
7													
8		SPT-5				7 10 15	25						
9		SPT-6				7 11 15	26						
10		UDS-1						Cohesion(kPa)=28 Angle of internal friction(Deg)=32					
11		SPT-7				6 9 11	20						
12		SPT-8				6 8 12	20						
13													
14		SPT-9	Very Dense Pinkish white [10R 8/2] Silty SAND/Disintegrated rock			12 49 50/5cm	R						Due to collapsing of side walls not able to retrieve the samples
15		SPT-10				30 27 29	56						
16													
17													
18													
19													
20			Borehole terminated at 20.0m										
21													

Originator: KSV Date: 17/12/2015 Checked by: TV Date: 17/12/2015

Client : M/s L & T REALTY
Project : Raintree Boulevard
Location : Byatarayanapura
Report No. : S-864

Date of Boring : 6/12/2015 to 8/12/2015
Borehole : BH-16
Water Table(m) : Not met
Status : FINAL

⊕Percent passing 75 micron sieve (%) (20 40 60 80)

R- Refusal

□ Point Load Index, (MPa) (2 4 6 8)

Coordinates:

Plate 2E

L&T Realty

SUMMARY OF TEST RESULT OF GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF "RAINTREE BOULEVARD"AT BYATARAYANAPURA, BANGALORE

SGES

Borehole No.	Depth, m	Sample Type	SOIL PARAMETERS											ROCK PARAMETERS					
			CLASSIFICATION & INDEX									SHEAR PARAMETER		PHYSICAL PROPERTIES					
						Grain Size Distribution			Atterberg Limit										
			Water Content %	Unit Weight (kN/m^3)	Specific Gravity	Gravel %	Sand %	% passing 75 micron	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cohesion C kPa	Frictional angle deg	Water Absorption %	Porosity %	Dry Unit weight kN/m3	Specific Gravity	Point Load Index derived compressive strength Mpa	Unconfined compressive strength Mpa
12	1.5	D	15	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	4.5	D	25	_	_	0	63	37	30	Non Plastic		_	_	_	_		_	_	_
	6.0	D	21	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	7.5	D	17	_	_	0	61	39	_	_	_	_	_	_	_	_	_	_	_
	8.5	U	16	18	_	_	_	_	_	_	_	2	46	_	_	_	_	_	_
	9.0	D	21	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	10.5	D	25	_	_	0	67	33	_	_	_	_	_	_	_	_	_	_	_
	13.5	D	28	_	_	0	75	25	_	_	_	_	_	_	_	_	_	_	_
	15.0	D	21	_	_	0	33	67	_	_	_	_	_	_	_	_	_	_	_
	16.5	D	27	_	_	1	66	33	_	_	_	_	_	_	_	_	_	_	_
	18.5-19.0	C	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	7.35	_
13	1.5	D	15	_	_	6	51	43	_	_	_	_	_	_	_	_	_	_	_
	3.0	D	17	_	2.69	_	_	_	42	20	22	_	_	_	_	_	_	_	_
	4.5	D	23	_	_	8	52	40	_	_	_	_	_	_	_	_	_	_	_
	5.5	U	13	20	_	_	_	_	_	_	_	5	43	_	_	_	_	_	_
	6.0	D	20	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	7.5	D	18	_	_	1	62	37	_	_	_	_	_	_	_	_	_	_	_
	9.0	D	17	_	2.60	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	10.5	D	16	_	_	8	60	32	_	_	_	_	_	_	_	_	_	_	_
	12.0	D	13	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	13.5	D	14	_	_	1	57	42	_	_	_	_	_	_	_	_	_	_	_
	15.0	D	12	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	16.5	D	17	_	_	1	42	57	_	_	_	_	_	_	_	_	_	_	_
	18.0	D	13	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	19.5	D	18	_	_	1	58	41	_	_	_	_	_	_	_	_	_	_	_

Project No: S-864

Prepared By:KSV Checked By: TV Date: 17-12-2015 **PLATE 3A**

L&T Realty

SUMMARY OF TEST RESULT OF GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF "RAINTREE BOULEVARD"AT BYATARAYANAPURA, BANGALORE

SGES

Borehole No.	Depth, m	Sample Type	SOIL PARAMETERS											ROCK PARAMETERS					
			CLASSIFICATION & INDEX									SHEAR PARAMETER		PHYSICAL PROPERTIES					
						Grain Size Distribution			Atterberg Limit										
			Water Content %	Unit Weight (kN/m^3)	Specific Gravity	Gravel %	Sand %	% passing 75 micron	Liquid Limit %	Plastic Limit %	Plasticity Index %	Cohesion C kPa	Frictional angle deg	Water Absorption %	Porosity %	Dry Unit weight kN/m3	Specific Gravity	Point Load Index derived compressive strength Mpa	Unconfined compressive strength Mpa
14	1.5	D	17	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	3.0	D	11	_	_	_	_	_				_	_	_	_	_	_	_	_
	4.5	D	17	_	_	18	48	34	_	_	_	_	_	_	_		_	_	_
	6.0	D	11	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	7.5	D	12	_	_	0	56	44	_	_	_	_	_	_	_	_	_	_	_
	9.0	D	7	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	10.5	D	8	_	_	2	63	35	_	_	_	_	_	_	_	_	_	_	_
	11.5	U	8	17.34					_	_	_	20	48	_	_	_	_	_	_
	12.0	D	9	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	13.5	D	16	_	_	0	50	50	_	_	_	_	_	_	_	_	_	_	_
	16.5-18.0	C	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	44.12	_
	18.0-19.3	C	_	_	_	_	_	_	_	_	_	_	_	0.07	0.19	26.0	2.73	_	103
15	1.5	D	19	_	_	0	40	60	_	_	_	_	_	_	_	_	_	_	_
	3.0	D	15	_	_	_	_	_	29	NP	_	_	_	_	_	_	_	_	_
	4.5	D	17	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	5.5	U	21	20	2.57	0	49	51	_	_	_	10	38	_	_	_	_	_	_
	6.0	D	13	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	7.5	D	17	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	9.0	D	20	_	_	0	57	43	_	_	_	_	_	_	_	_	_	_	_
	10.5	D	15	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	12.0	U	14	19.84	_	_	_	_	_	_	_	10	47	_	_	_	_	_	_
	12.5	D	20	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	13.0-13.64	C	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	13.64-14.0	C	_	_	_	_	_	_	_	_	_	_	_	0.11	0.32	28.05	2.60	_	160.51
	14.0-15.5	C	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	120.14

Project No: S-864

Prepared By:KSV Checked By: TV Date: 17-12-2015 **PLATE 3B**

L&T Realty

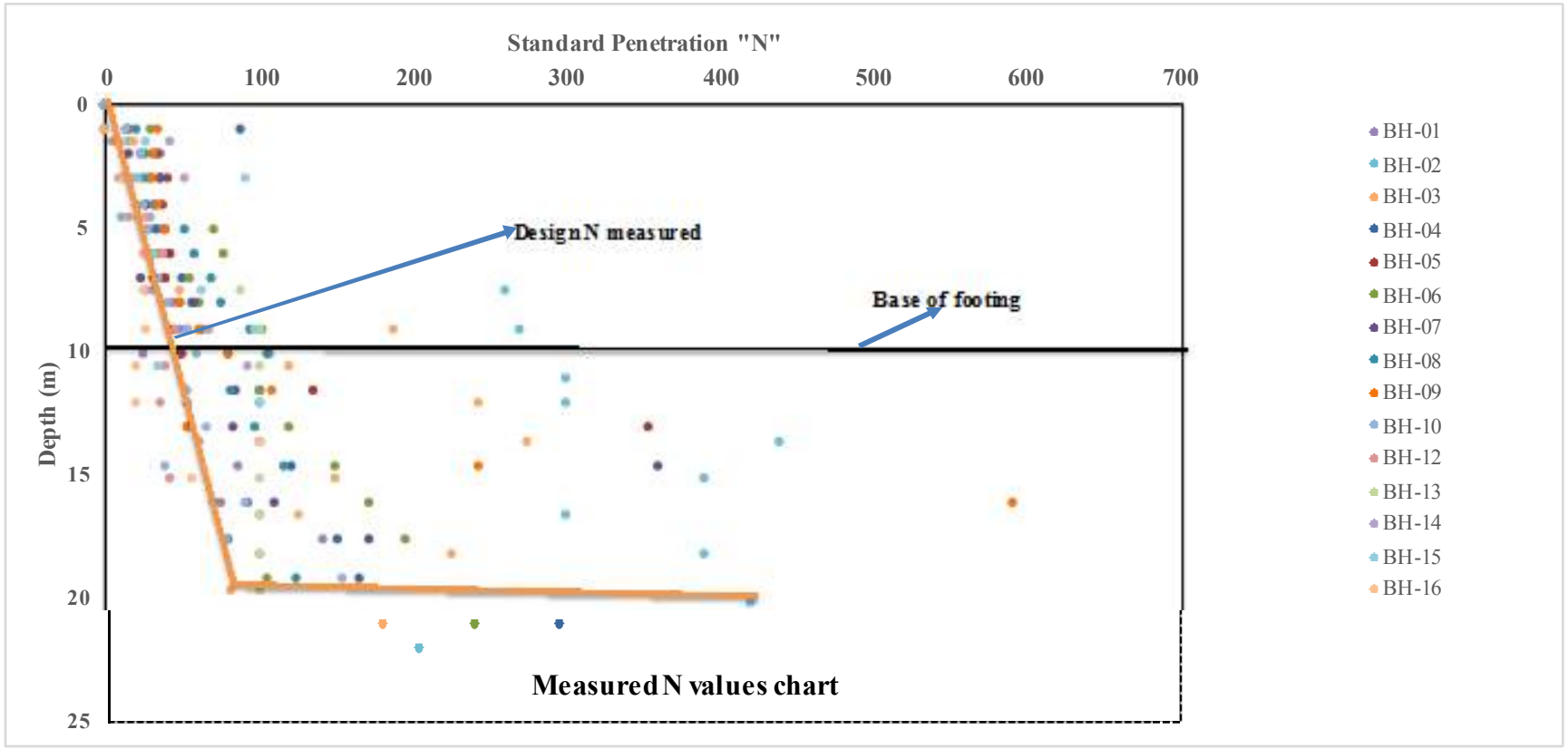
SUMMARY OF TEST RESULT OF GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF "RAINTREE BOULEVARD"AT BYATARAYANAPURA, BANGALORE

SGES

Borehole No.	Depth, m	Sample Type	SOIL PARAMETERS											ROCK PARAMETERS					
			CLASSIFICATION & INDEX									SHEAR PARAMETER		PHYSICAL PROPERTIES				Point Load Index derived compressive strength Mpa	Unconfined compressive strength Mpa
			Water Content %	Unit Weight (kN/m^3)	Specific Gravity	Grain Size Distribution			Atterberg Limit			Cohesion C kPa	Frictional angle deg	Water Absorption %	Porosity %	Dry Unit weight kN/m3	Specific Gravity		
						Gravel %	Sand %	% passing 75 micron	Liquid Limit %	Plastic Limit %	Plasticity Index %								
16	1.5	D	12	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	3.0	D	15	_	_	0	59	41	30	15	16	_	_	_	_	_	_	_	_
	4.5	D	25	_	_	2	14	84	52	22	30	_	_	_	_		_	_	_
	6.0	D	26	_	2.71	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	7.5	D	42	_	_	0	7	93	76	34	42	_	_	_	_	_	_	_	_
	9.0	D	42	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	10.0	U	45	18	_	0	8	92	_	_	_	28	32	_	_	_	_	_	_
	10.5	D	50	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
	12.0	D	57	_	_	0	8	92	_	_	_	_	_	_	_	_	_	_	_
	13.5	D	30	_	_	27	50	23	_	_	_	_	_	_	_	_	_	_	_
	15.0	D	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_

Project No: S-864

Prepared By:KSV Checked By: TV Date: 17-12-2015 **PLATE 3C**


Standard Penetration "N"
0
100
200
300
400
500
600
700
Depth (m)
0
5
10
15
20
25
Design N measured
Base of footing
BH-01
BH-02
BH-03
BH-04
BH-05
BH-06
BH-07
BH-08
BH-09
BH-10
BH-12
BH-13
BH-14
BH-15
BH-16
Measured N values chart

SAMPLE CALCULATION

Tengs Equation:

qa=0.07*(N-3)*Fd*Rw*Sa

Peck, Hansen & Thornburn:

qa=0.088*N*Rw*Sa

Bowle's

qa=12.5*N*((B+0.3)/B)^2*(1+0.33(D/B))

Where, N= Corrected SPT N value at footing level, Cn*N'=0.81*N'
Rw=Water table correction =0.5
Fd=Depth correction =2
Sa=Allowable settlement = 50mm
D-Depth of footing
B=Width of footing

Net allowable Bearing Pressure for N Value of 50

Author	Net allowable Bearing Pressure, t/m2		
	6m width of footing	12m width of footing	15m width of footing
Tengs Method	130.4	119.5	108.7
Peck, Hansen and Thornburn	88.6	88.6	88.6
Bowle's	86.0	67.4	63.9
IS:8009 Part 1-1976	90.9	90.9	90.9

Net allowable Bearing Pressure for N Value of 60

Author	Net allowable Bearing Pressure, t/m2		
	6m width of footing	12m width of footing	15m width of footing
Tengs Method	158.6	145.4	132.2
Peck, Hansen and Thornburn	106.3	106.3	106.3
Bowle's	103.2	80.9	76.7
IS:8009 Part 1-1976	111.1	111.1	111.1

Net allowable Bearing Pressure for N Value of 70

Author	Net allowable Bearing Pressure, t/m2		
	6m width of footing	12m width of footing	15m width of footing
Tengs Method	186.8	171.2	155.7
Peck, Hansen and Thornburn	124.0	124.0	124.0
Bowle's	120.4	94.4	89.4
IS:8009 Part 1-1976	142.8	142.8	142.8

SARATHY GEOTECH & ENGINEERING SERVICES PVT LTD

TERMS AND SYMBOLS USED ON LOGS

SOIL TYPES


Sand


Silt


Clay


Gravel


Weathered/disintegrated rock


Rock


Fill

SAMPLER TYPE


Thin-Walled Tube


Split-Barrel


No-Recovery

STRENGTH OF COHESIVE SOIL

Consistency	ASTM Undrained Shear Strength (kN/m^2)	(ksf)
Very soft	< 12.5	< 0.25
Soft	12.5 to 25	0.25 to 0.5
Firm	25 to 50	0.5 to 1.0
Stiff	50 to 100	1.0 to 2.0
Very stiff	100 to 200	2.0 to 4.0
Hard	> 200	> 4.0

RELATIVE DENSITY OF GRANULAR SOIL

Estimated Natural Density	Estimated Relative Density	SPT N Value
Very loose	0.00 to 0.15	0 to 4
Loose	0.15 to 0.35	4 to 10
Medium dense	0.35 to 0.65	10 to 30
Dense	0.65 to 0.85	30 to 50
Very dense	0.85 to 1.00	> 50

SOIL GRAIN SIZE

B.I.S. STANDARD

COBBLES	GRAVEL			SAND			SILT			CLAY
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	

60 20 6 2 0.6 0.2 0.06 0.02 0.006 0.002

SOIL GRAIN SIZE IN MILLIMETERS

ASTM STANDARD

U.S. STANDARD SIEVE

3" 3/4" 4 10 40 200

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

75 19 4.75 2.00 0.425 0.075

SOIL GRAIN SIZE IN MILLIMETERS

SECONDARY CONSTITUENTS

	ASTM D 2487-93		BS 5930 : 1981
Traces	Particles are present but estimated to be less than 5%	w/occasional	less than 5%
Few	5 to 10% of particles present	with	5 to 20%
Little	15 to 25% of particles present	w/some	20 to 35%
Some	30 to 45% of particles present	sandy/gravelly	35 to 65%

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 3 mm (1/8 inch) thick extending through the sample.
Seam	Inclusion 3 mm (1/8 inch) to 76 mm (3 inches) thick extending through the sample.
Layer	Inclusion greater than 76 mm (3 inches) thick extending through the sample.
Laminated	Soil sample composed of alternating partings of seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Composed of 12 to 50% material which is soluble in dilute hydrochloric acid.
Carbonate	Composed of more than 50% material which is soluble in dilute hydrocholoric acid.
Well Cemented	Sample can not be manually broken down but individual grains can be dislodged.
Slightly Cemented	Sample can be broken down manually without difficulty and individual grains can be dislodged.
Moderately Cemented	Intermediate between slightly and well cemented.
Coralline	Composed predominantly of recognizable and intact coral pieces and fragments.
Shelly	Composed predominantly of recognizable and intact shell pieces and fragments.

ANNEXURE 3

Grams: "Water Sup" Bangalore

Fax: 080 – 22945105
Phone: 22945105

BANGALORE WATER SUPPLY AND SEWERAGE BOARD
2nd Floor, Cauvery Bhavan, K.G.Road, Bangalore-560009

No.BWSSB/EIC/CE(M)/ACE(M)-I/DCE(M)-II/TA(M)-I/ 5284 /2015-16 Dated:20/8/2015

To

M/s. L & T Construction Equipment Ltd.,
No.38, Cubbon Road,
Bangalore-560001.

Sir,

Sub: Issue of No Objection Certificate for the modified proposal of the proposed for Residential & Commercial Building at Sy. No. 88/1, 88/2(P), 89/1, 89/2, 90, 91, 92/1, 93/1, 93/2, 93/3, 93/4, 93/5, 94/1, 94/2, 94/3, 94/4, 95/1, 95/2, 96/1,96/2, 97/1, 97/2, 97/3, 98/1(P), 98/2, 98/3, 98/4, 99, 100/1(P), 101/1B, 101/2, 101/3(P), 102/1, 102/2, 102/3, 103, 104/1, 104/2, 104/3, 104/4, Byatarayanapura Village, Yelahanka Hobli, Bangalore North Taluk, Bangalore. (CMC area)

Ref : 1) Requisition letter from M/s. L & T Construction Equipment Ltd., dt: 7.5.2015.
2) No. BWSSB/EECMC-3/PB/1146/2014-15 dt: 26.11.2014.
3) Proceedings review meeting dt: 25.06.2015. (Case No.24)
4) O.N. approved by 'C' dt:10.07.2015.
5) File No.1245
6) No.BWSSB/EIC/CE(M)/ACE(M)-I/DCE(M)-II/TA(M)-I/ 3750 /15-16 dt: 15.7.15.

Preamble: M/s. L & T Construction Equipment Ltd., during November-2014 had applied for NOC to the proposed Residential & Commercial Building at Sy. No. 88/1, 88/2(P), 89/1, 89/2, 90, 91, 92/1, 93/1, 93/2, 93/3, 93/4, 93/5, 94/1, 94/2, 94/3, 94/4, 95/1, 95/2, 96/1,96/2, 97/1, 97/2, 97/3, 98/1(P), 98/2, 98/3, 98/4, 99, 100/1(P), 101/1B, 101/2, 101/3(P), 102/1, 102/2, 102/3, 103, 104/1, 104/2, 104/3, 104/4, Byatarayanapura Village, Yelahanka Hobli, Bangalore North Taluk, Bangalore. Accordingly a demand notice was issued for remitting Rs.9,40,15,042/- towards BCC charges and Rs.1,15,00,495/- towards GBWASP charges vide letter No.BWSSB/EIC/CE(M)/ACE(M)-I/TA(M)-II/ 13073 dt:29.1.2015.

Now, vide their letter dt: 7.5.2015 has stated that there is certain modification in the proposed project and requested to issue a revised demand note as per the modified plan. As per the revised drawing submitted / details furnished by the applicant, the NOC for proposed Residential & Commercial Building comprising of Residential Buildings Block-1B (Wing-18, 19 & 20), Block-3 (Wing-21-30), Block-4 (Wing-31-48) each consisting of 2 BF + GF + 14 Upper Floor, Block-2 (Wing-1-17) each consisting of 2 BF + GF + 15 Upper Floor, Block-5 (Wing-49-58), Block-6 (Wing-59-68), Block-7 (Wing-69-73) & Block-8(EWS-1+02LIG) each consisting of 2 BF + GF + 15 Upper Floors, Commercial Building (Block-1A) consisting of 2 BF + GF + 10 Upper Floor, Retail Building consisting of 2 BF + GF + 4 Upper Floors for 4554 flats & 2 Nos. of Club House each consisting of 2 BF + GF + 3 Upper Floor.

The site area is 266319.00 Smt. The proposed built up area is 1214620.51 Smt. The developers needs to pay **Rs.1,21,46,205/-** towards NOC charges and BCC charges **Rs.6,90,75,762/-** as per the modified proposal since the area comes under erstwhile Byatarayanpura CMC area. Water requirement after completion will be 3500 KLD & STP is 2800 KLD. The Water supply pipeline has been laid under GBWASP and UGD pipeline under KMRP scheme. Water supply will be given subject to availability of water at the time of sanction of connection. **NOC can be given with usual conditions and payment of NOC & BCC charges**.

******

Please find herein enclosed a copy of plan endorsed for **'No objection Certificate'** from BWSSB for providing water supply and underground facilities, subject to the following conditions.

1) The water supply to the premises / layouts / society will be provided subject to the availability of water prevailing at the time of sanctioning the connection.

2) The party has to bear the cost of line estimate for both water supply and U.G.D lines, if there is no network near by the premises. Also, if the existing water supply and UGD lines needs up gradation, the cost towards upgrading the existing system has also to be borne by the developers.

3) The party has to pay the necessary prorata and other charges towards the building as specified by the Board prevailing at the time of sanction.

4) Rain water should not be let into the Board sewer line, which is against to the BWSSB Act.

5) The party should not provide sanitary points in cellar or Basement floor.

6) The applicant must create suitable structure/facility for rain water harvesting and ground water recharge.

7) The quantum of water supply and pressure will not be guaranteed.

8) Tertiary treated water available at BWSSB sewage treatment plants should be used for construction purpose in order to conserve potable water or otherwise they should make their own arrangements.

9) The party has to make arrangement for treatment plant for treating the waste water generated in their premises to achieve the standards as per the Annexures-I, II & III are enclosed herewith.

10) The applicant should make provisions for dual piping system to distinguish the use of the treated water for flushing, gardening and other purposes.
Drinking water pipe colour - Blue
Treated water pipe colour - Light Orange

11) The applicant should not allow the untreated sewage out of the premises. The applicant is solely responsible for any environmental pollution.

12) If there are no UGD lines in the above area and until Board's sewer lines are provided, the developers should treat the sewage and treated effluent should be used for non potable purposes.

13) The difference in amount collected towards NOC charges & other charges as applicable, between the proposed area & actual construction area shall be paid at the time of seeking water supply and sanitary connections.

14) The applicant has to bear the share of providing water supply feeder mains, sewer sub- mains and waste water treatment plant, if demanded by the Board.

15) The party has to ear-mark the land if required for construction of GLR, OHT, sump tank, pump house service station etc., and land should be handed over to BWSSB "free of cost".

16) If any BWSSB lines are passing through the premises, the necessary shifting charges has to be borne by the developers. Further, set back has to be provided as directed by Board for safety of the pipelines.

17) The party should abide the "Rules and Regulations of BWSSB" from time to time.

18) BWSSB reserves the right to sanction or reject the water supply or UGD Connections without assigning any reasons.

19) NOC issued will be revoked if any dispute arises at any stage.

20) NOC issued should be produced at the time of availing connection along with plan.

21) If the above area falls under Tippagondanahalli catchment area this NOC will automatically be treated as cancelled.

22) Buildings or any permanent structure should not be constructed for a minimum distance of width of 5.00 mtrs adjacent to storm water drain, Nala, Raja Kaluve & Valleys.

23) The building including basement should be above the High Flood level of adjacent valleys, storm water drain, low lying area.

24) Under any circumstances the NOC charges & BCC Charges will not be refunded. Even if NOC cancelled for any reasons.

25) Land acquired or notified for BWSSB infrastructure development or earmarked for BWSSB works should not be encroached or constructed any structures if violated penal action will be initiated.

The proposed project is for Residential & Commercial Building to be constructed on a sital area of is 266319.00 Smt. The proposed project building consists of Block-1B (Wing-18, 19 & 20), Block-3 (Wing-21-30), Block-4 (Wing-31-48) each consisting of 2 BF + GF + 14 Upper Floor, Block-2 (Wing-1-17) each consisting of 2 BF + GF + 15 Upper Floor, Block-5 (Wing-49-58), Block-6 (Wing-59-68), Block-7 (Wing-69-73) & Block-8(EWS-1+02LIG) each consisting of 2 BF + GF + 15 Upper Floors, Commercial Building (Block-1A) consisting of 2 BF + GF + 10 Upper Floor, Retail Building consisting of 2 BF + GF + 4 Upper Floors for 4554 flats & 2 Nos. of Club House each consisting of 2 BF + GF + 3 Upper Floor with a built up area is 1214620.51 Smt. The premises falls under the jurisdiction of erstwhile Byatarayanapura CMC area.

The Developer has paid an amount of **Rs.6,90,75,762/- BCC** charges vide receipt No.32646 dt: 19.8.2015.

The Developer has paid an amount of **Rs.1,21,46,205/- N.O.C** charges vide receipt No.32647 dt: 19.8.2015.

The above NOC file is entered in the Central office register vide No.1245.

Yours faithfully

20/8/15

Chief Engineer(M)
BWSSB

20/8/15

O.C. Approved by CE(M)

Note: Water supply to your premises cannot be assured.

ANNEXURE-I

The disposal of trend leachates from Industrial into Board's sewers shall follow the standard namely

Sl No	Parameters	
1	Suspended solids, mg/1, max	600
2	Dissolved solids (inorganic) mg-1, max	2100
3	PH value	5.5 to 9.0
4	Ammonical nitrogen (as N), mg/1,max	50
5	Total Kjeldahl nitrogen (as N0, mg/1, max	-
6	Biochemical oxygen demand (3 days at 27 C) max)mg/1)	350
7	Chemical oxygen demand, mg/, max	-
8	Arsenic (as As), mg/1, max	0.2
9	Mercury (as Hg), mg/1, max	0.01
10	Lead (as Pb), mg/1, max	1.0
11	Cadmium (as Cd), mg/1, max	1.0
12	Total Chromium (as Cr), mg/1, max	2.0
13	Oil and Grease mg/L, max	2.0
14	Hexavalent Chromium (as Cr + 6) mg/L, max	2
15	Selenium (as Se) mg/L, max	0.05
16	Copper (as Cu), mg/1, max	3.0
17	Zinc (as Zn), mg/1, max	15
18	Nicket (as Ni), mg/1, max	3.0
19	Cyanide (as CN), mg/1, max	2.0
20	Chloride (as CI), mg/1, max	1000
21	Fluoride (as F), mg/1, max	15
22	Phenolic compounds (as	5.0
23	Radioactive materials a) Alpha emitters (Micro Curie/ml)max b) Beta emitters (Micro Curie/ml) max	 10 10
24	Bio-assay test	90% survival of fish after 96 hours in 100 % effluent
25	Manganese (as Mn)mg/L	2
26	Iron (as Fe) Mg/L	3
27	Vanadium (as V)	0.2
28	Nitrate Nitrogen mg/L	-
29	Sulphates (as SO4) mg/L	1000
30	Chlorides (as CL) mg/L	600
31	Boron (as B) mg/L, max	2.0
32	Percent sodium max	3.0

Chief Engineer-M
BWSSB.
Bangalore.

ANNEXURE-II

Usage of existing ground water from borewells / open wells for any purpose including drinking is to be considered after ensuring its quality. The following specifications for drinking water quality shall apply for monitoring purpose, namely:-

Sl. No.	Parameters	IS 10500 : 1991 Desirable limit (Mg / l except for PH)
1	Arsenic	0.05
2	Cadmium	0.01
3	Chromium	0.05
4	Copper	0.05
5	Cyanide	0.05
6	Lead	0.05
7	Mercury	0.001
8	Nickel	-
9	Nitrate as NO_3	45.0
10	PH	6.5-8.5
11	Iron	0.3
12	Total hardness (as $CaCO_3$)	300.0
13	Chlorides	250
14	Dissolved solids	500
15	Phenolic compounds (as C_6H_5OH)	0.001
16	Zinc	5.0
17	Sulphate (as SO_4)	200

ANNEXURE-III

Bio-Medical Waste

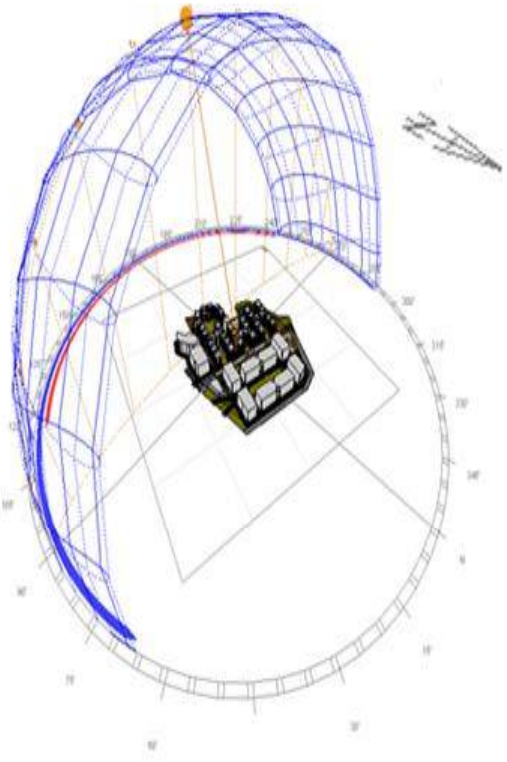
Liquid Waste	
Waste generated form laboratory and washing, cleaning, house-keeping and disinfecting activities	Disinfection by chemicals treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection before discharge into sewers
Chemical Waste	
Chemicals used in production of biological, chemicals used in disinfection, as insecticides, etc.,	Chemical treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection before discharge into sewers
Sewage generated in apartments treated with re-cycling plant / Sewerage Treatment Plant on land use	Should be treated BOD_5 - 20 mg / L Suspended solids - 30 mg / L

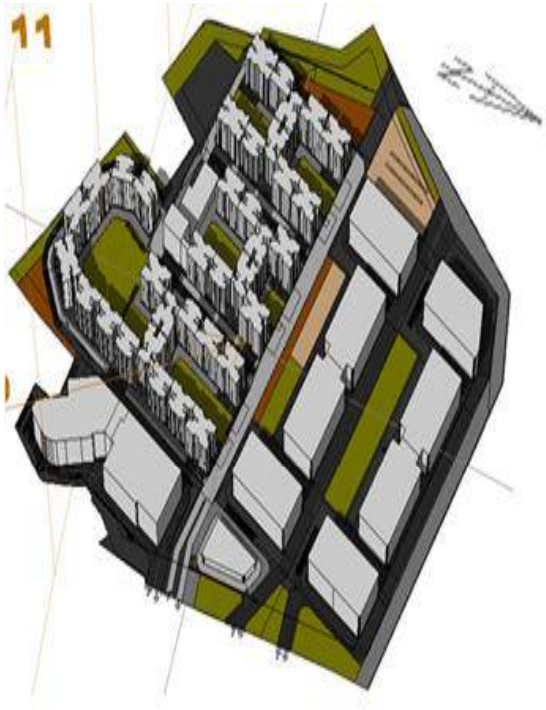
Chief Engineer.M
BWSSB.
Bangalore.

20/8/15

ANNEXURE 4

Shadow Analysis





Annual sun path experience by the Project based on it's geography & orientation

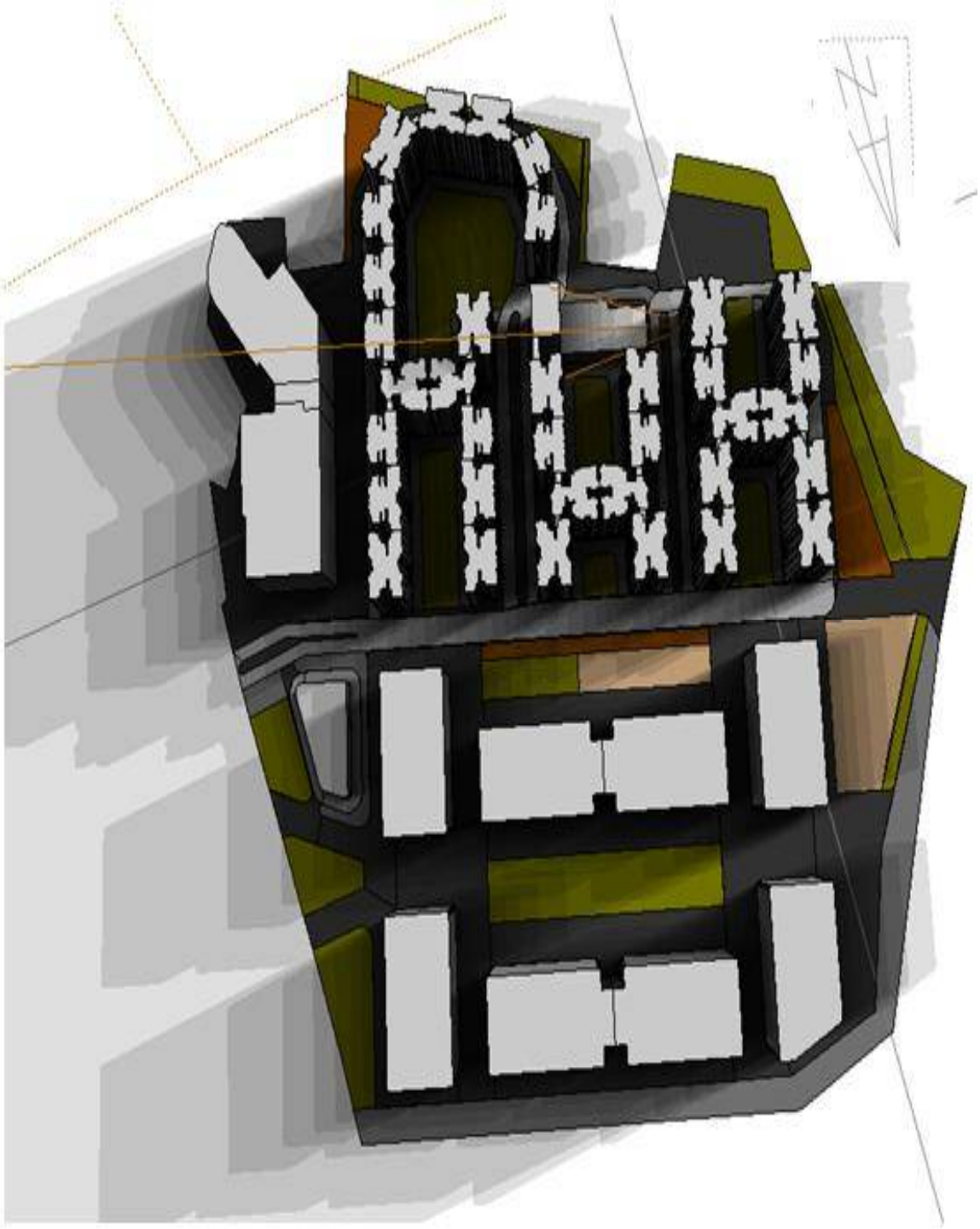
Shadow analysis at 21st September 12.pm

RESULTS AND SUMMARY

The analysis of the building rooftops and shading caused due to surrounding buildings has a positive impact on reducing direct radiation on many building surfaces thereby reducing heat ingress. While this is a positive benefit, this analysis is also key to ascertain which buildings rooftops will be shaded and which will remain unaffected to identify best locations for roof top solar PVs for maximum efficiency

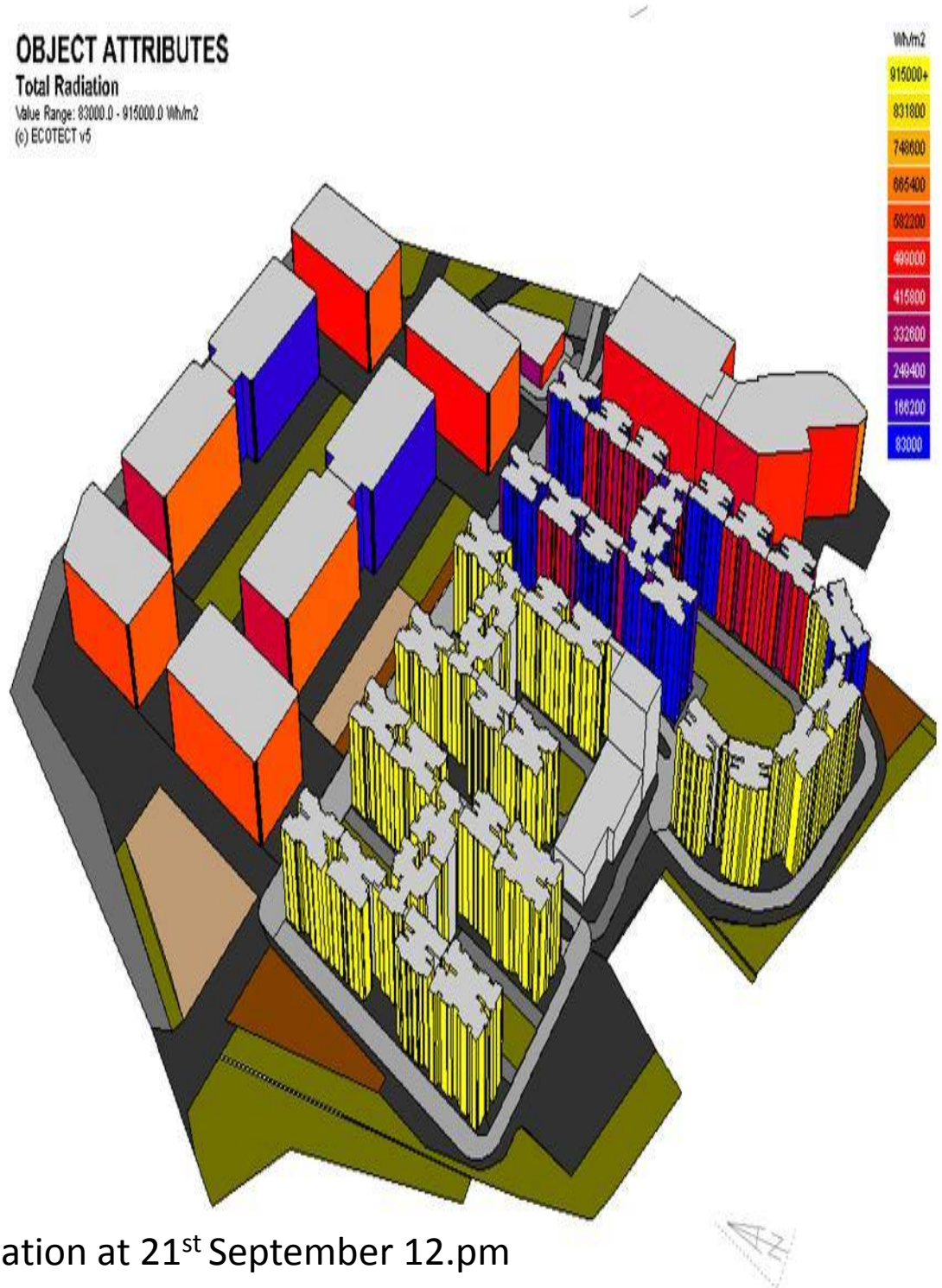
The conclusion is most of the building roof tops in the commercial parcel and a good part of the residential rooftops are not shaded and even the shading that falls on the buildings are mostly on the façade/building envelope and this is quite good in terms of helping reducing heat ingress. However the roofs are not shaded so that it will not affect the performance of solar PVs.

Annual Shadow Range Plot



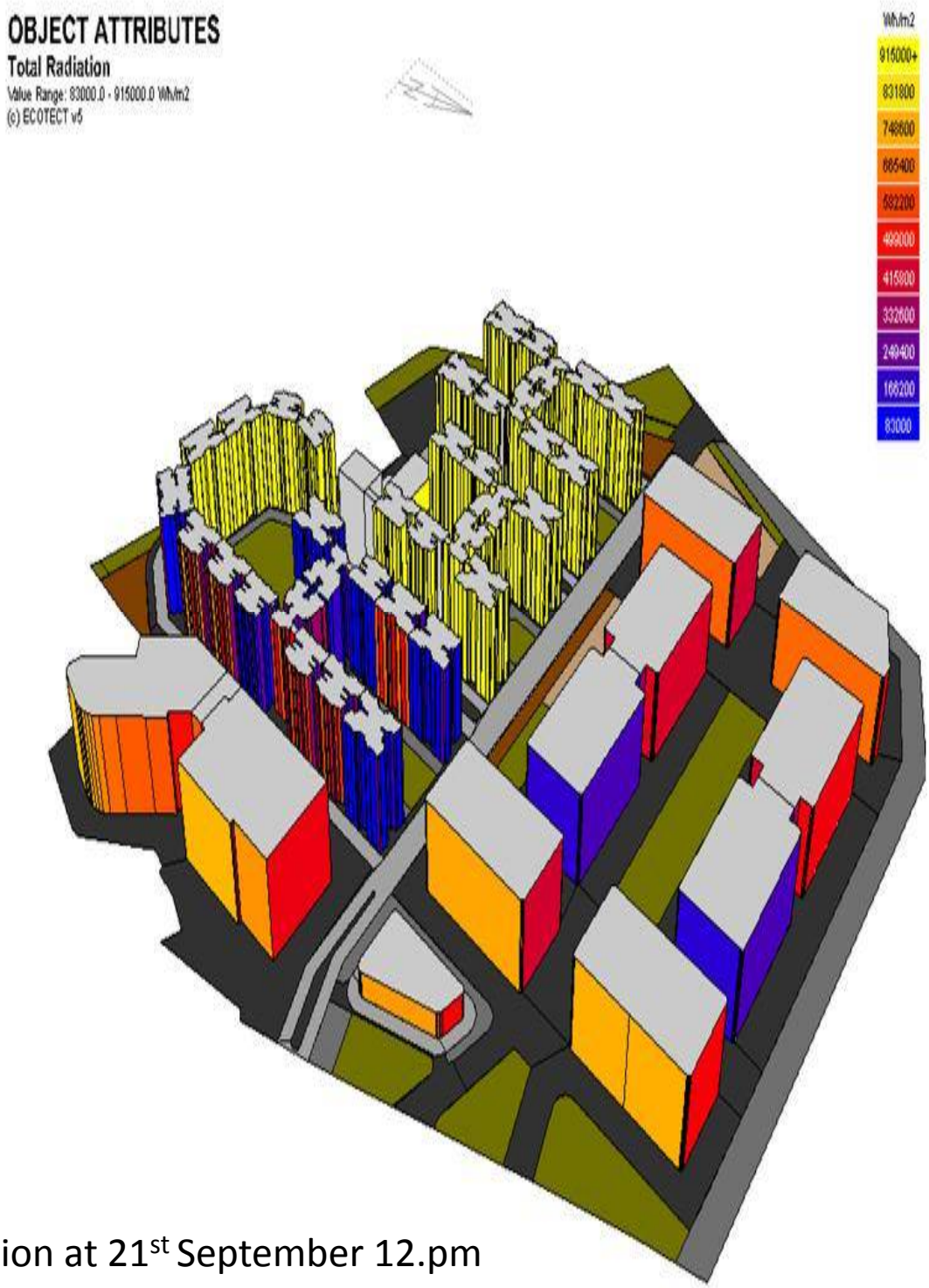
Shading at 21st September 6.am to 6.pm

Solar Radiation Analysis



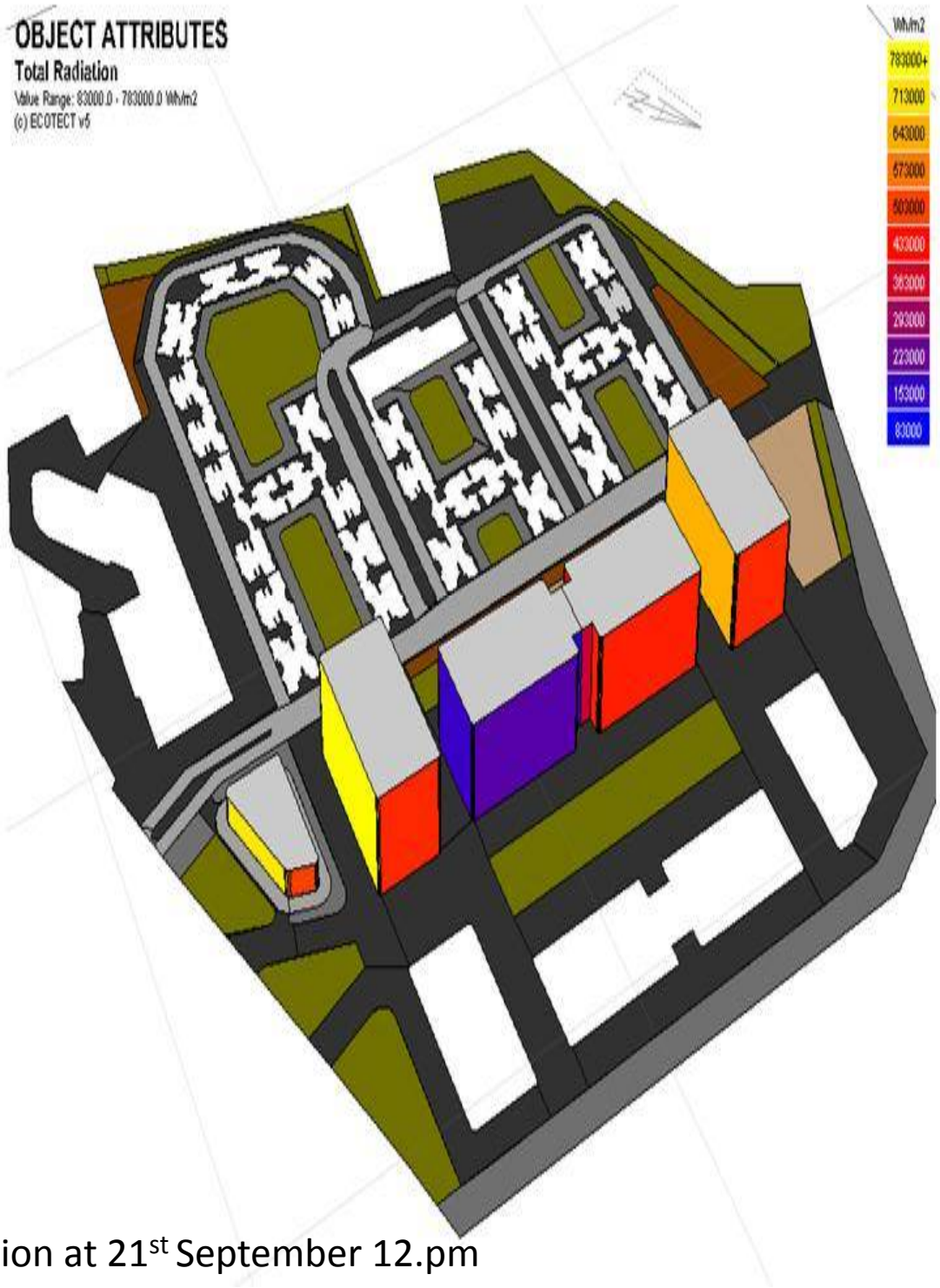
Radiation at 21st September 12.pm

Solar Radiation Exposure:



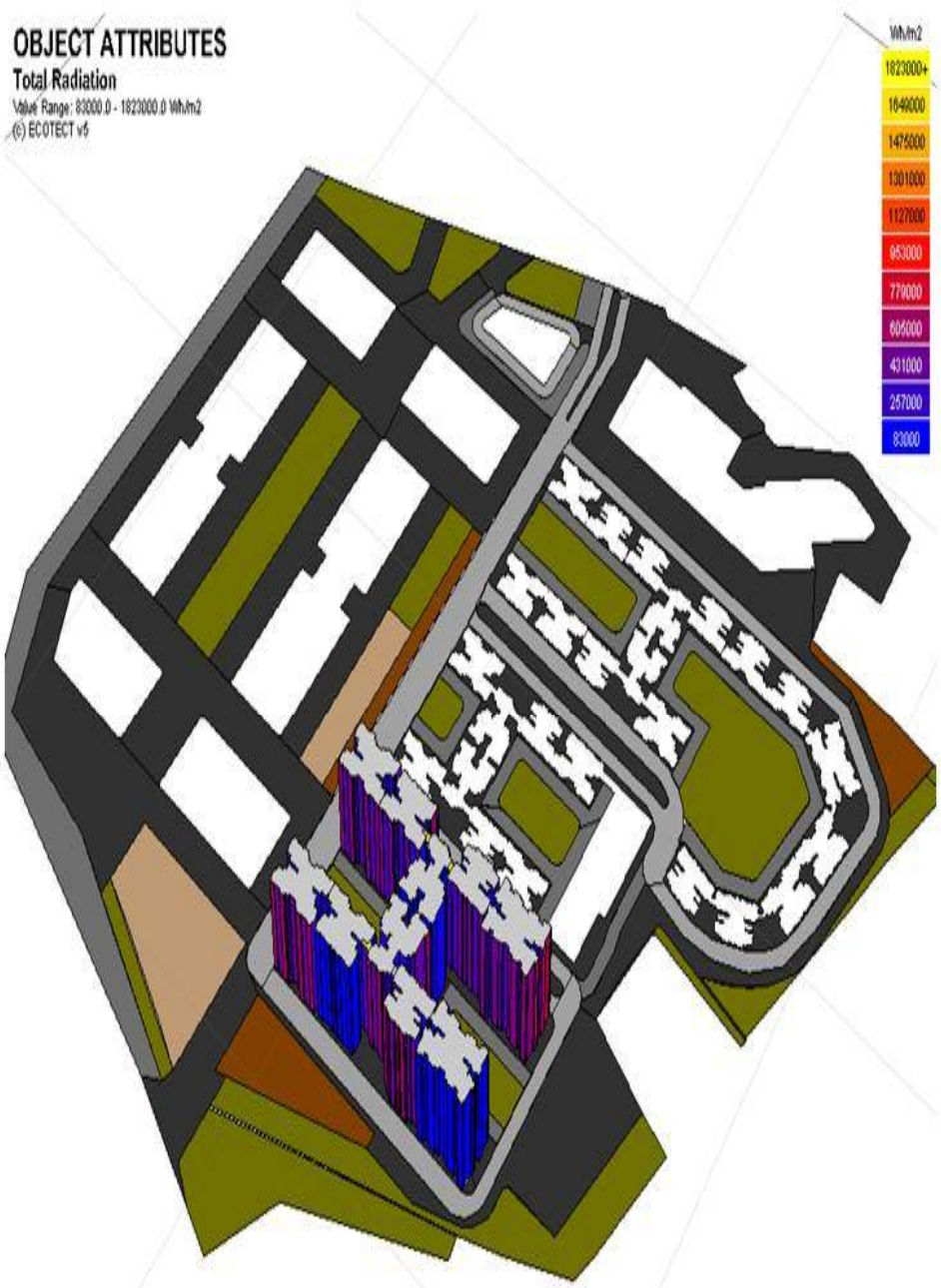
Radiation at 21st September 12.pm

Solar Radiation Exposure:



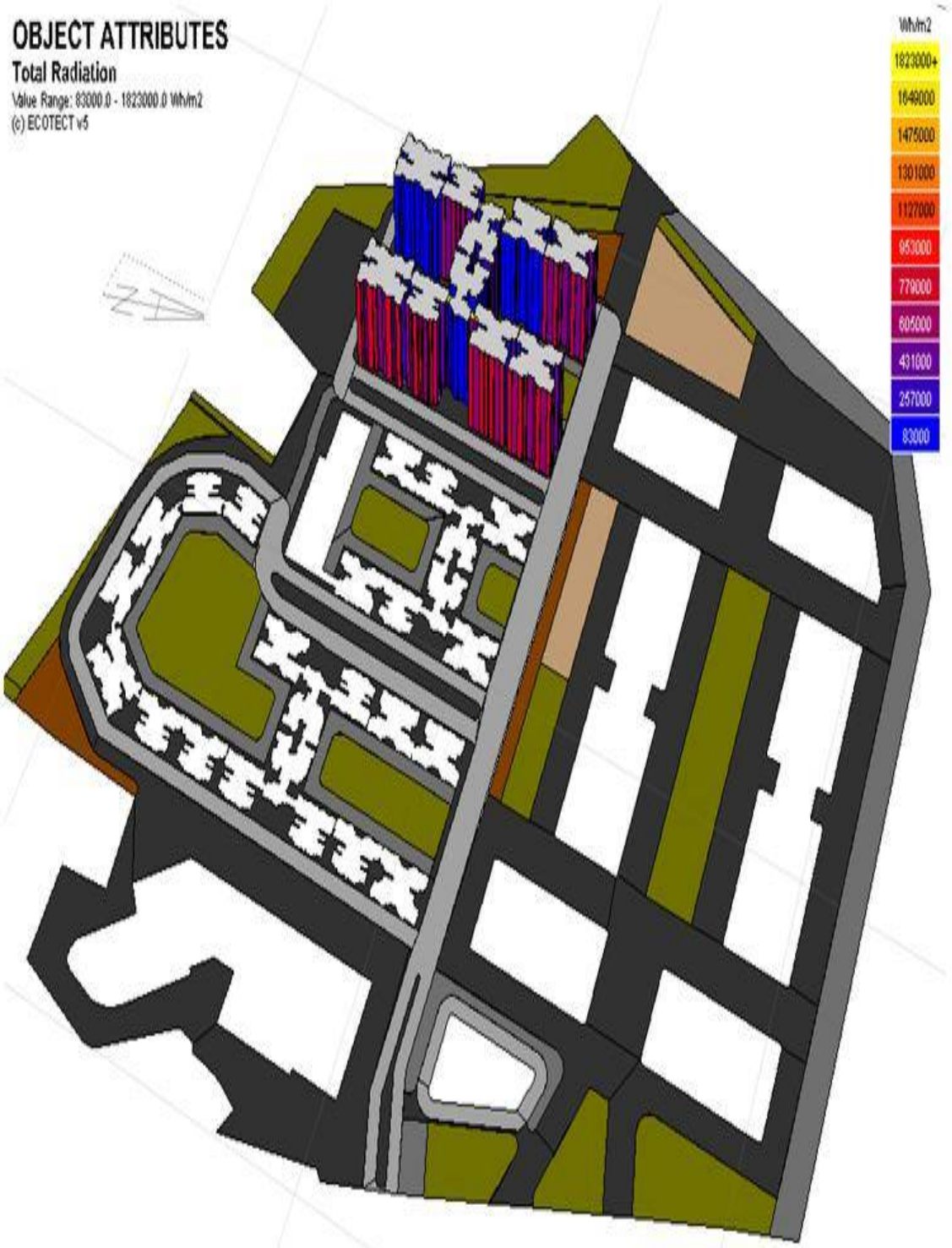
Radiation at 21st September 12.pm

Solar Radiation Exposure:



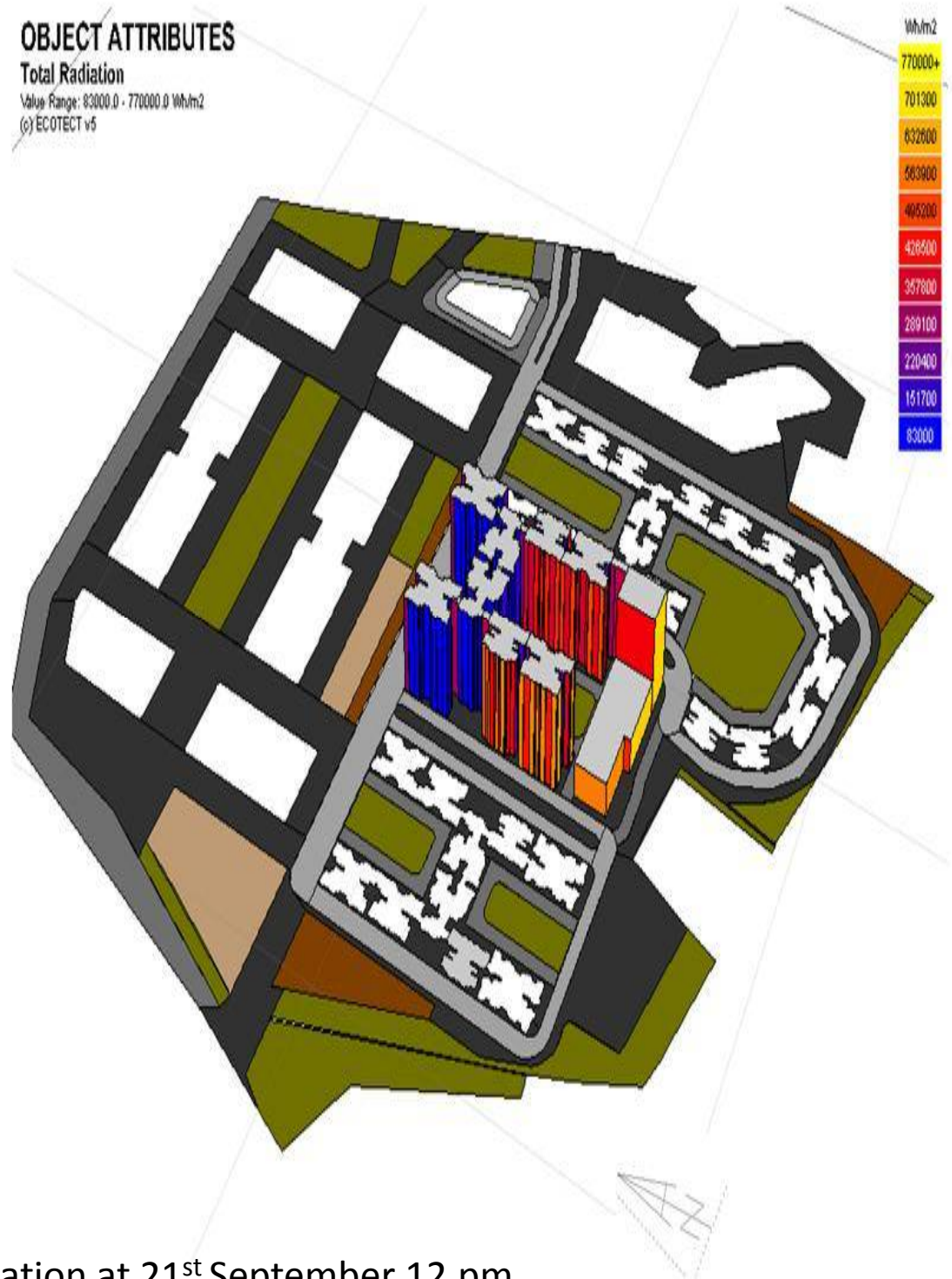
Radiation at 21st September 12.pm

Solar Radiation Exposure:



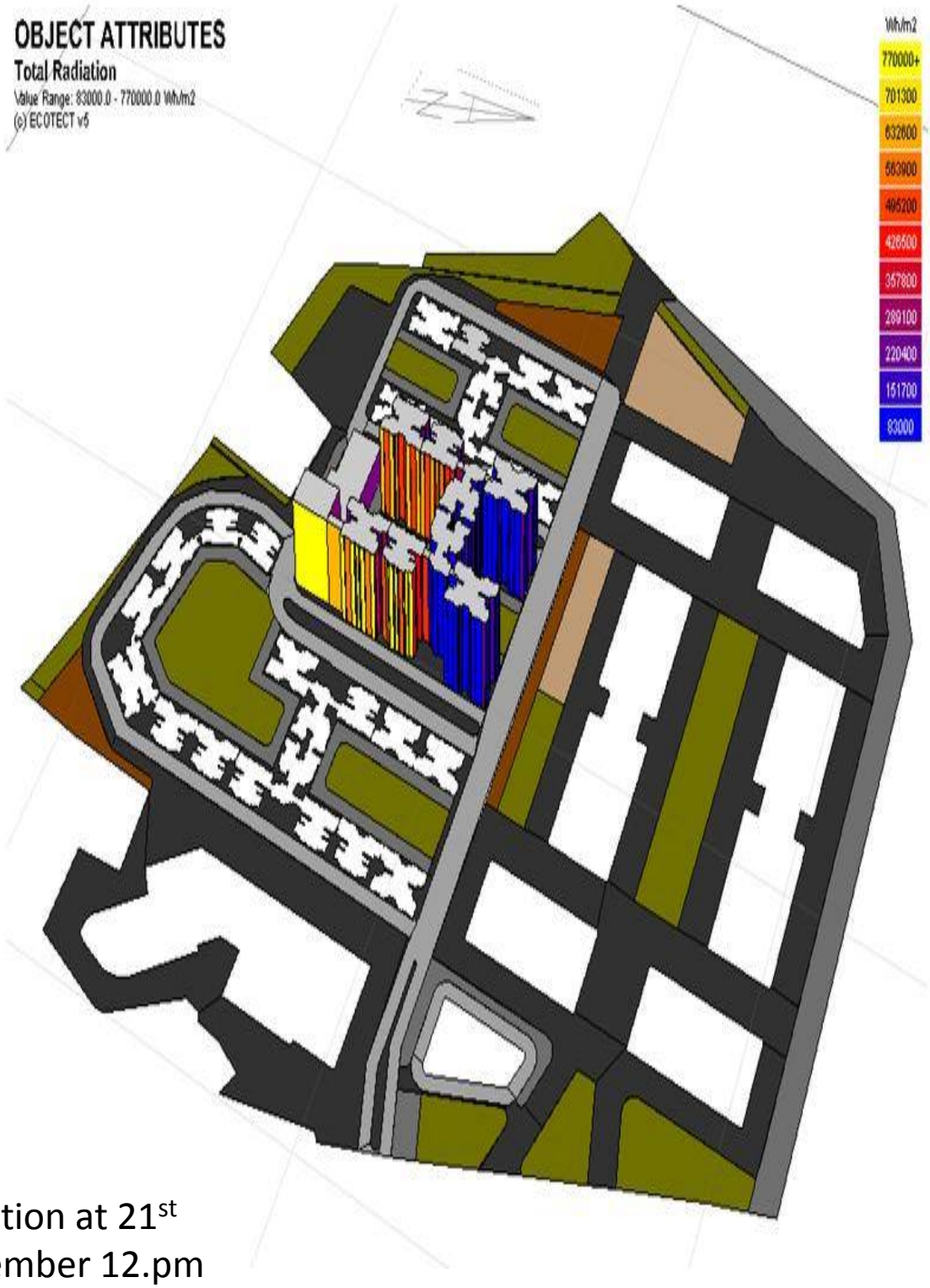
Radiation at 21st September 12.pm

Solar Radiation Exposure:



Radiation at 21st September 12.pm

Solar Radiation Exposure:



Radiation at 21st September 12.pm

ECBC Compliance - Electrical

	ECBC Complinace for Commercial		
S. No.	**ECBC Code No**	**Code Description**	**Code Compliance**
	Mandatory Provisions		
1	7.2.1	Lighting Control	Automatic Lighting controls - Internal Basement & Common Area lighting control through timer switches and External Lighting control through PV sensor & Astronomical time switches
2	7.2.1.1	Automatic Lighting Shut Off	Scheduling Control: Using a time scheduling device to control lighting systems according to pre determined schedules for all Basement Areas
3	7.2.1.4	Exterior Lighting Control	External Lighting spaces are controlled by Photo Voltaic sensor or astronomical time switch that is capble of automatically turning On / Off the lights depending on the day light
4	7.2.2	Exit Signs	LED exit signs considered with built in backup power supplies
5	7.2.3	Exterior Building Lights	High Presuure Sodium Vapour Lights considered with efficacy morethan 70%
	Prescriptive Interior Lighting Power Compliance		
6	7.3.1	Interior Lighting Power	As per ECBC Table 7.1, Building Area method the LPD level of Office spaces is achieved 7.5 W/Sqm against to 10.8 W/Sqm recommended
			The parking area LPD level is achieved 1.4 W/Sqm against recommended level of 3.2 W/Sqm

	Prescriptive Exterior Lighting Power Compliance		
7	7.3.5	Exterior Lighting Power	1 W/ sft LPD considered and achieved for Building Entrances with canopy
			For Building Facades - 0.1 W/Sft LPD Considered
	Electrical Power		
8	8.2.1.1	Transformer Losses	Dry typeTransformers meeting the requirements as per IS 2026, Part - 2 and meeting the requirements as per ECBC Table 8.2, with Efficiency of 98.4 %
9	8.2.2	Energy Efficient Motors	Efficiency morethan 92% and meeting the requirements of Table 8.4
10	8.2.3	Power Fcator Correction	Power Factor Improvement upto 0.99
11	8.2.4	Check Metering & Monitoring	All the Energy Meters considered In Main & Sub LT Panels will provide the complete information regarding Demand Load (in KVA), Energy Consumption (kWH), Line to Line & Line to Neutral Voltages, Current Consumption (Amps), Reactive Power (kVARh), THD etc.
12	8.2.5	Power Distribution Losses	Cable size selection considering the Voltage Drop limited to 3% at farthest point and max. distribution losses limited to 1% of total power usage

ECBC Compliance: Building Parameters

Parameters	Commercial Buildings		Residential Buildings	
	Design Details	ECBC Parameters	Design Details	ECBC Parameters
Exterior Wall construction U-value – W/sqm K	0.65	Max 0.44	2.51	Max 0.44
Roof construction U-value – W/sqm K	0.4	Max 0.409	2.17	Max 0.409
Roof Finish – Reflectance Coefficient	0.45	Min 0.3	0.45	Min 0.3
Fenestration Type - Vertical	DGU	NA	SGU	NA
Fenestration – SHGC (coefficient)	0.3	Max 0.25 (WWR <40%)	0.82	Max 0.25 (WWR <40%)
Fenestration – U-value - W/sqm K	1.8	Max 3.3	5.7	Max 3.3
Fenestration – VLT (coefficient)	0.3	Min 0.27	0.8	Min 0.27
Overhangs/Shading	As per design	NA	As per design	NA
HVAC COP	Air cooled chillers – Min 2.9 at ARI Water Cooled chillers – Min 6.1 at ARI	AS per ECBC based on TR and type of chillers		Min 2.2

ECBC Compliance: Building Parameters

Parameters of Design features	Segment 1 Residential buildings- T1 to T6		Segment 2, 3 & 4 Commercial Towers A, B& Retail	
	Design Details	ECBC Parameters	Design Details	ECBC Parameters
Exterior Wall Construction- U Value: W/m^2K	2.51	MAX 0.44	0.654	MAX 0.44
Roof Construction- U Value: - W/m^2K	2.17	MAX 0.409	0.33	MAX 0.409
Roof Finish- Reflectance coefficient.	0.45	MIN 0.30	0.45	MIN 0.30
Fenestration type Vertical	Single	NA	Double	NA
Fenestration SHGC Coefficient (rated)	0.82	MAX 0.25 *(WWR≤40%)*	0.31	MAX 0.20 *(40%<WWR≤60%)*
Fenestration U-value : W/m^2K	5.7	MAX 3.30	1.8	MAX 3.30
Fenestration VLT Coefficient	0.88	MIN 0.27	0.38	MIN 0.13
Overhangs/ Shading	All windows	NA	None	NA
HVAC COP	3.1 *(BEE 3 STAR)*	MIN 2.2	Same as ECBC Base Case	NA

ECBC Compliance: Cooling Equipment Schedule

COOLING EQUIPMENT SCHEDULE								
Equip. ID	Brand Name	Model No	Capacity Kw	Total L/s	OSA CFM / ECONO	SEER OR EER	IPLV	Location
	SEZ TOWER S1							
1	Carrier	30XW1052	1250	59.82	NA	6.4	7.89KW/kw	Terrace
2	Carrier	30XA0852	820	29.19	NA	3.1	4.46 kw/kw	Terrace
	SEZ TOWER S2							
3	Carrier	30XW1262	1240	62.48	NA	5.7	7.9KW/kw	Terrace
4	Carrier	30XA1002	973	34.6	NA	3.0	4.3 kw/kw	Terrace
	SEZ TOWER S3							
5	Carrier	30XW1262	1240	62.48	NA	5.7	7.9KW/kw	Terrace
6	Carrier	30XA1002	973	34.6	NA	3.0	4.3 kw/kw	Terrace
	SEZ TOWER S4							
7	Carrier	30XW1264	1260	66.6	NA	5.9	7.9KW/kw	Terrace
8	Carrier	30XA1002	973	34.6	NA	3.0	4.3 kw/kw	Terrace
	SEZ TOWER S5							
9	Carrier	30XW1264	1260	66.6	NA	5.9	7.9KW/kw	Terrace
10	Carrier	30XA1002	973	34.6	NA	3.0	4.3 kw/kw	Terrace
	SEZ TOWER S6							
11	Carrier	30XW1052	1250	59.82	NA	6.4	7.89KW/kw	Terrace
12	Carrier	30XA0852	820	29.19	NA	3.1	4.46 kw/kw	Terrace
	Commercial C1							
13	Carrier	30XW1264	1260	66.6	NA	5.9	7.9KW/kw	Terrace
14	Carrier	30XA1002	973	34.6	NA	3.0	4.3 kw/kw	Terrace
	Commercial C2							
15	Carrier	30XW1264	1260	66.6	NA	5.9	7.9KW/kw	Terrace
16	Carrier	30XA1002	973	34.6	NA	3.0	4.3 kw/kw	Terrace
	Commercial C3							
17	Carrier	30XW1264	1260	66.6	NA	5.9	7.9KW/kw	Terrace
18	Carrier	30XA1002	973	34.6	NA	3.0	4.3 kw/kw	Terrace
	Commercial C4							
19	Carrier	30XW1264	1260	66.6	NA	5.9	7.9KW/kw	Terrace
20	Carrier	30XA1002	973	34.6	NA	3.0	4.3 kw/kw	Terrace

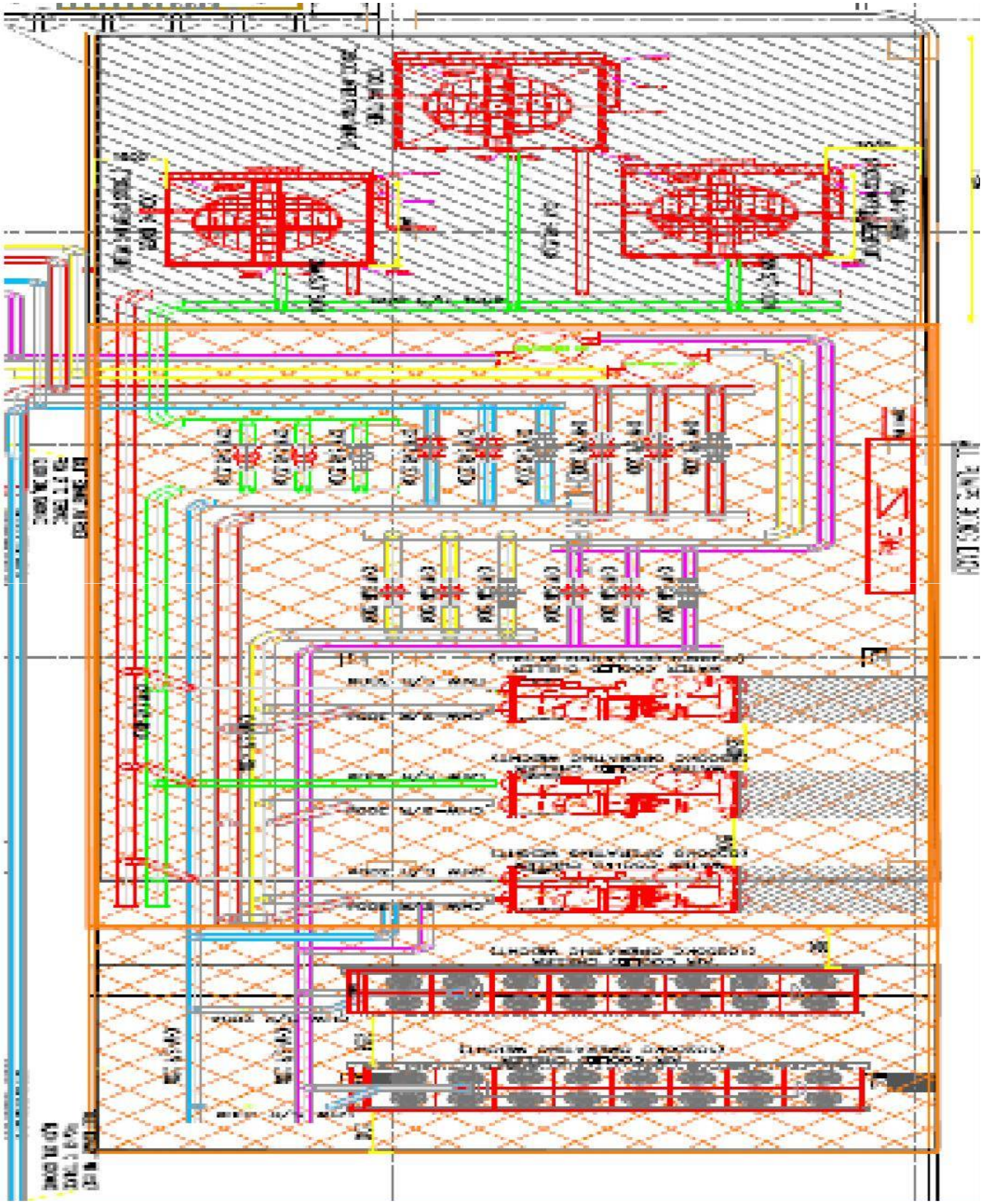
ECBC Compliance: Fan Equipment Schedule

FAN EQUIPMENT SCHEDULE							
Equip. ID	Brand Name	Model No	Total L/s	SP	KW	Flow Control	Location of Service
	SEZ TOWER S1						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
	SEZ TOWER S2						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
	SEZ TOWER S3						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
	SEZ TOWER S4						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
	SEZ TOWER S5						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM

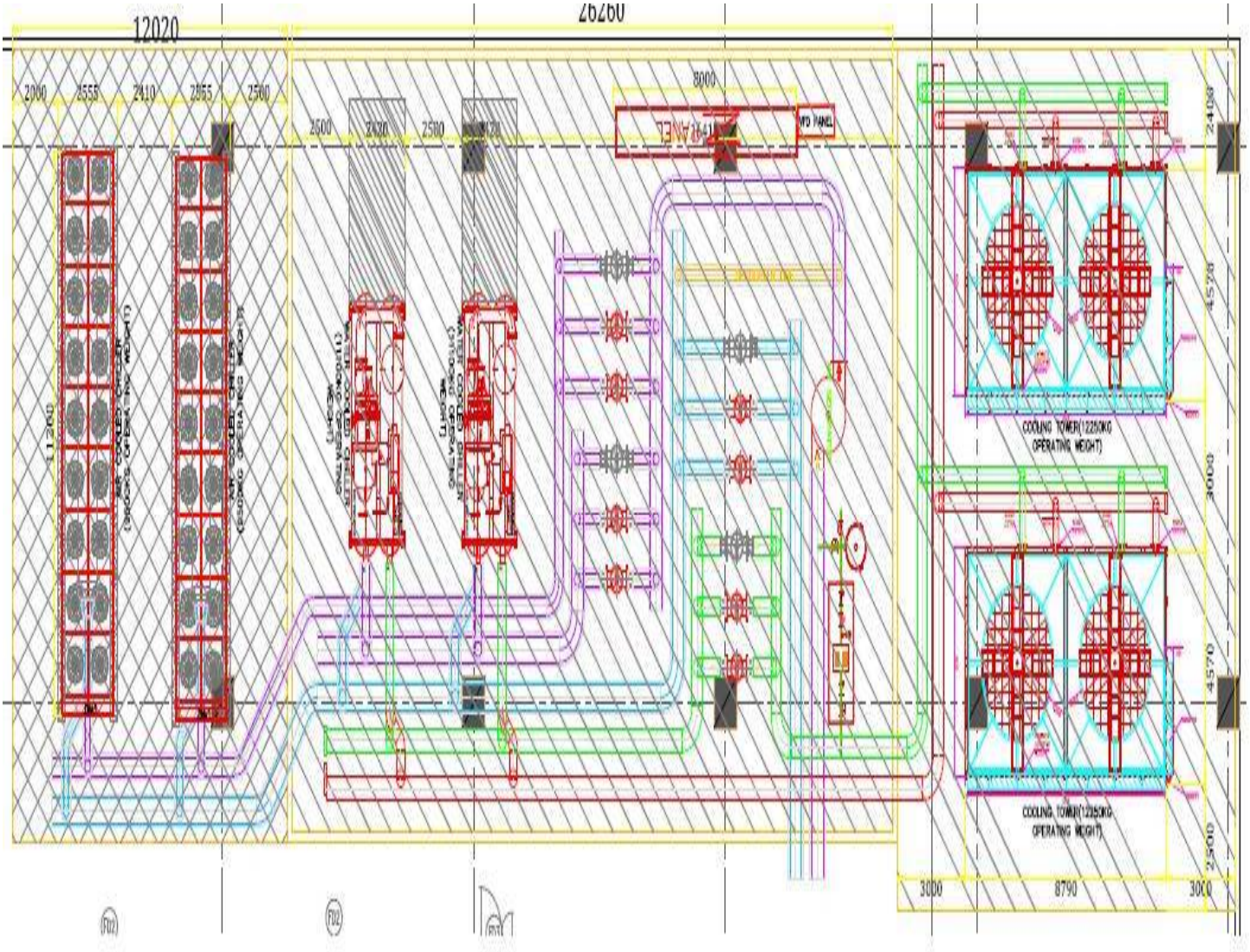
ECBC Compliance: Fan Equipment Schedule

FAN EQUIPMENT SCHEDULE							
Equip. ID	Brand Name	Model No	Total L/s	SP	KW	Flow Control	Location of Service
	SEZ TOWER S6						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
	Commercial C1						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
	Commercial C2						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
	Commercial C3						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
	Commercial C4						
1	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
2	VTS	VS 350	9.72	65	9.0	VFD	AHU ROOM
3	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM
4	VTS	VS 400	11.11	65	11.0	VFD	AHU ROOM

ECBC Compliance: Chiller Plant room layout – SEZ 1



ECBC Compliance: Chiller Plant room layout – SEZ 2 & COM



TYPICAL PLANT ROOM LAYOUT

ECBC Compliance: Typical floor HVAC layout

Energy Savings: Residential

SR NO	DESCRIPTION	WATTS	WORKING HOURS /DAY	ENERGY CONSUMED USING CONVENTIONAL METHOD(IN kWh)PER DAY	ENERGY CONSUMED USING CONVENTIONAL METHOD(IN kWh) PER ANNUM	ENERGY CONSUMED INCORPORATING ENERGY SAVING METHODS(IN kWh) PER DAY	ENERGY CONSUMED INCORPORATING ENERGY SAVING METHODS(IN kWh) PER ANNUM	ENERGY SAVINGS IN kWh PER ANNUM	PERCENTAGE OF ENERGY SAVING(%)	ASSUMPTIONS
1	LIFT	864	4	3456	1261440	2850	1040250	221190	18	LIFT CONSIDERED ON VFD DRIVES & USE OF REGENERATIVE BRAKING,WHICH WILL RESULT 30% OF TOTAL CONNECTION IN OVERALL 20% LIFT LOAD SAVING
2	DOMESTIC & FLUSHING PUMPS	290	3	870	317550	650	237250	80300	25.29	ALL WATER PUMP MOTORS WILL BE HIGH EFFICEIENCY MOTOR WITH IE2 MOTOR WITH SOFT STARTERS AND WITH HIGH/LOW LEVEL SENSORS.FOR MAXIMUM SAVING
3	STP LOAD	250	10	2500	912500	2200	803000	109500	12.00	ALL PUMPS IN STP WILL BE HIGH EFFICIENCY FIVE STAR RATED & WITH LEVEL SENSORS
4	VENTILATION LOAD(BASEMENT,STP, PUMP ROOM ETC)	3567	6	21402	7811730	18500	6752500	1059230	13.56	FRESH AIR BY NATURAL
5	ENERGY GENERATION THROUGH SOLAR CELLS	72	12	864	315360	864	315360	315360		*ROOF TOP SOLAR PV SYSTEM WITH ONLINE CENTRALIZED PV CELLS
6	CAR PARKING LEVEL LIGHTS	161	12	1932	705180	1500	547500	157680	22.36	REPLACEMENT OF 36W COMPACT FLORESCENT LAMP INTO 28W T5 LIGHTIS FOR PARKING AREA
7	STAIRCASE LIGHTS	45	12	540	197100	400	146000	51100	25.93	REPLACEMENT OF 36W COMPACT FLORESCENT LAMP INTO 28W T5 LIGHTIS FOR STAIRCASE AREA

Energy Savings: Residential-Contd..

8	TYPICAL FLOOR LOBBY LEVEL	210	10	2100	766500	1800	657000	109500	14.29	REPLACEMENT OF 18W CFL INTO 12W LED LIGHT &TIMER CONTROL OPERATION TO REDUCE AMOUNT OF LIGHT AT DIFFERENT STAGES FOR BUILDINGS.
9	PUBLIC AREA &LANDSCAPE LIGHTS	180	10	1800	657000	1200	438000	219000	33.33	PUBLIC ARREA & LANDSCAPE LIGHTS REQUIREMENT SHALL BE MET BY REPLACEMENT OF 150W MH INTO 60W LED
10	SOLAR HEATING SYATEM	544	4	2176	794240	2176	794240	794240	100	
10	ENERGY CONSUMPTION PER DAY(IN Kwh)			**37640**		**32140**				
11	**ENERGY CONSUMED PER ANNUM(IN kWh) BY CONVENTIONAL METHOD**				**13738600**			**3117100**		
12	**ENERGY CONSUMED PER ANNUM(IN kWHh) WITH ENERGY SAVING METHOD**						**11731100**			
13	**TOTAL ENERGY SAVING (%)**								**23**	

Energy Savings: Commercial & SEZ

Description	MD(KW)	Annual Diversity	Annual conssumption (KW-h) per annum	% savings	KWH saved per Annum	Savings due to
Lighting	3716	0.8	856135	20.00	171227	Using of LED& CFL instead of Conventional light fixtures. Intelligent Lighting controls based on Occuoancy / day light.
Normal Power	929	0.7	187279	7.14	13377	Use of BEE rated equipments
Computer power	7432	0.8	1712269	15.00	256840	Use of Eneregy Star rated computer / equipments.
AHU Loads	2787	0.7	561838	20.00	112367	Use of EFF -1 motors,VFD drives for demand based controls.
HVAC Chillars	7432	0.7	1498235	30.00	449470	Use of high COP chilars with VFD.
HVAC Pumps	1858	0.7	374559	25.00	93639	Use of EFF -1 motors,Variable speed pumping systems.
Common Area						
Common Area Lighting	1486	0.8	342454	25.00	6008	Using of LED& CFL instead of Conventional light fixtures. Intelligent Lighting controls based on Occuoancy / day light , Electronic ballast instead of Conventional ballast , day light based controller ,
Stairacse Lighting	22	1	96360	100.00	96360	100% solar lighting for Staircase.
Ventilation	1858	0.45	240788	16.67	40131	Use of CO sensers for demand based ventilation.
Lifts	929	0.7	187279	12.86	24079	Use of Group controls and variable speed drives
Pumps	929	0.6	160525	20.00	32105	Use of BEE rated equipments
Total KWH			**6217722**		**1295603**	
% savings				**20.84**		

ANNEXURE 5

Traffic Impact Assessment Studies

For

"L&T Raintree Boulevard"

At Byatarayanapura Village, Yelahanka Hobli,
Bellary Road, Bangalore.

Prepared by,

Prof. M N Sreehari,
Advisor to Govt of Karnataka for Traffic, Transport & Infrastructure,
Expert member - Smart Cities, GoI,
NABET-QCI Accredited Consultant for MoEF,
Road safety expert for NHAI projects for GoI,

M/s Consortia of Infrastructure Engineers

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Introduction

M/S L&T Construction Equipment Limited - Realty Division approached **M/s. Consortia of Infrastructure Engineers** to carry out the Traffic Impact Assessment studies for the proposed expansion "RAINTREE BOULEVARD" at Khatha No. 239/240/275/88/1 & 240/276/89/1, of Ward No. 07, and Survey Nos. 88/1 to 104/4 of Byatarayanapura Village, Yelahanka Hobli, Bengaluru North Taluk, Bengaluru.

The proposed development encompasses total area of 65.51 Acres (2,65,117.47 Sqm.) and having a total built up area of 12,74,698.07 Sqm consisting of Residential, SEZs, Retail &Commercial blocks.

The project site is situated on the Bellary Main Road (NH – 44), the proposed project site falls under the Residential Zone according to the BDA CDP Plan (2015), the site is easily accessible by all major roads, the NH – 44 Bellary road is the major road connecting the project site.

Total Car Parking Provided/Proposed: **11,377 Nos.**

For Residential Apartments : 2805 Nos.
For Commercial blocks : 8572 Nos.

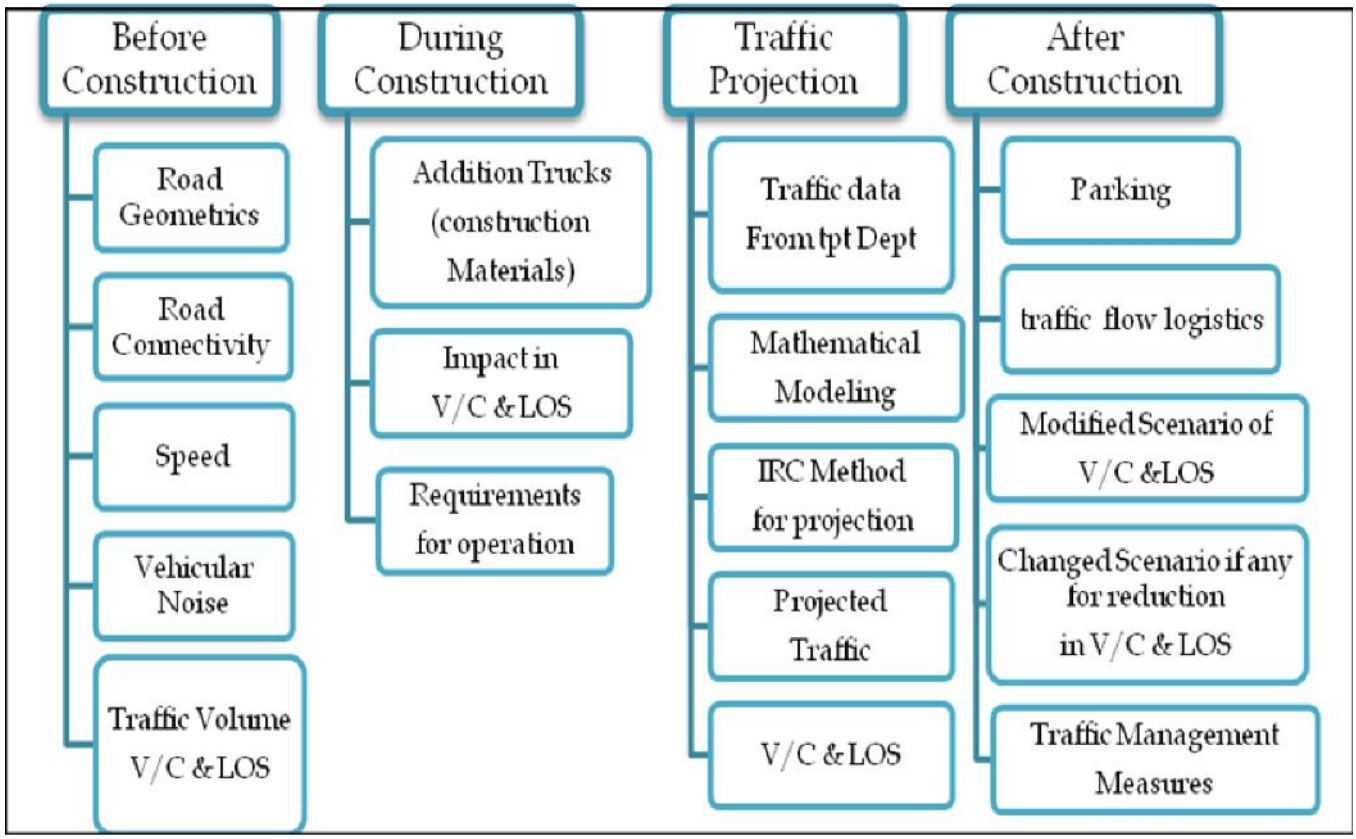
The entry/exit to the proposed property development shall be conflict free and the traffic dispersal shall be smooth.

The entry/exit point to the proposed site will be improved geometrically with appropriate traffic control systems, street furniture's and pedestrian facilities.

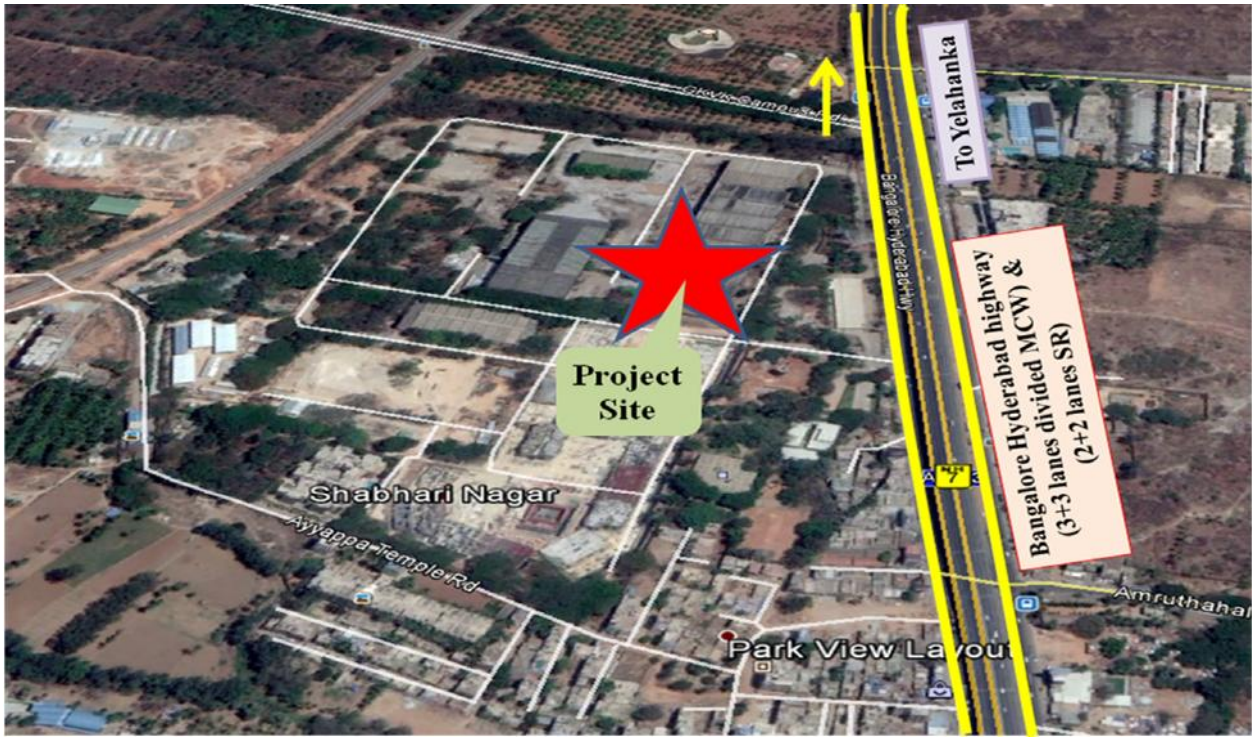
Traffic Impact Assessment

The proposed expansion project is a mixed use project consisting of Residential, Commercial, SEZ and Retail units. The proposed site is adjacent to NH-44, which is capable of accommodating the traffic inflow to the region.

Traffic Management Study Process Flow Chart



Google Image showing the Project Location



Site Plan

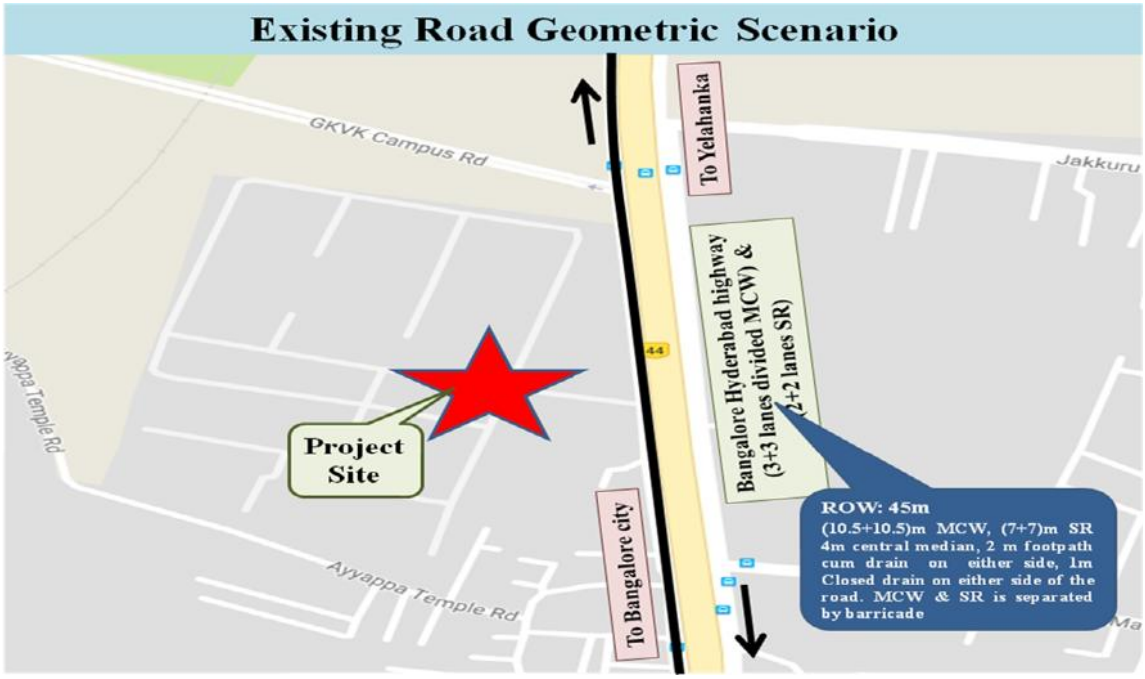
Road Connectivity:

- The project is located along NH-44 which has got a RoW of 45m and 67m also at some locations with (3+3) lanes Main Carriage way and (2+2) lanes Service road which connects to Hyderabad on one side and Bangalore City on other side. Road condition is very good & requires sign boards markings along service road towards Hyderabad.
- NH-44 is having (3+3) lanes main CW on either side under the elevated road which directly links to airport. The through traffic will always use the elevated road, where as local vehicles will use the carriage way and move on to service roads to reach the exact destination.
- Various other road connectivities such as Baglur road, Jakkur road is also developed which has reduced the pressure on NH-44.
- The condition of the pavement is very good as it is newly laid.
- The project can also be accessed from other places such as Hebbal, Jakkur, Yelahanka etc.
- Hence pressure will not develop to any one particular road and traffic gets distributed to various roads as stated above.

Road Geometric Scenario

Road	ROW (m) / CW (m) / Lanes	Surface Condition	Street lights	Drainage width	Road		Remarks
					Marking	Signs	
Bangalore Hyderabad highway (3+3 MCW & 2+2 SR)	45 (10.5+10.5) MCW (7+7) SR 3+3 MCW 2+2 SR	Very good	A	A	A	A	-

Note: A – Available NA – Not Available



Photos of study Roads Date:18/07/2017

Bangalore -Hyderabad Highway

Bangalore -Hyderabad Highway

Bangalore -Hyderabad Highway

Bangalore -Hyderabad Highway

Speed Spectrum for the Study Road (kmph)

Bangalore – Hyderabad highway (NH-44, new Airport Road)		2 Wh		3 Wh		4 Wh (C,J,V)		Buses/ Lorries	
		Max	Min	Max	Min	Max	Min	Max	Min
Bangalore city	MCW	64	32	46	29	68	32	54	28
	SR	49	28	38	26	56	26	49	26
Yelahanka	MCW	62	34	48	30	62	36	56	30
	SR	50	30	40	28	59	30	53	29

The observed speed indicates that the vehicles are well within the speed limits and hence the road safety is ensured.

Methodology for Traffic Surveys

Manual traffic counts were conducted to cover all the vehicular movements on the road. The Vehicles are classified as follows.

- Two Wheeler
- Three Wheeler
- Car/Jeep
- Bus
- LCV (Light Commercial Vehicle)
- HCV (Heavy Commercial Vehicle)

The collected traffic volume data is computed using the commonly used spreadsheet package. The traffic volume data collected has been processed direction wise.

The peak hourly directional vehicular movement data was used to plan and design the improvement scheme for the existing road.

Data Analysis

The data and pertinent information collected from the traffic surveys have been analysed to obtain the required information concerning traffic characteristics on the said road.

The data was analysed to study hourly variation of traffic, peak hourly flows, traffic composition etc. The counts were classified by category of vehicles and by direction of movement. The various vehicle types having different sizes and characteristics were converted into equivalent passenger car units. The passenger car unit (PCU) factors recommended by Indian Road Congress in 'Guidelines for capacity of Urban roads in Plain Areas' (IRC 106-1990) were used and same is given in table below.

Recommended PCU factors for various types of vehicles in urban roads:

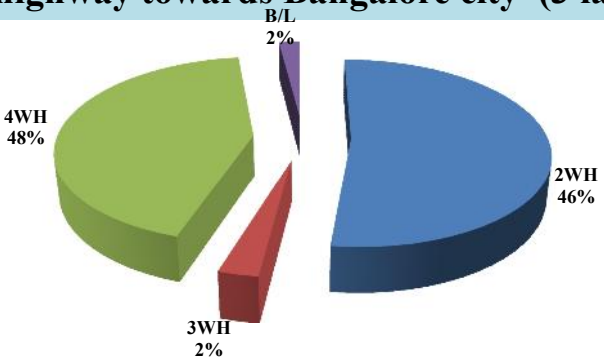
Sl. No.	Vehicle Type	Equivalent PCU Factors	
		% composition of vehicle type	
		Up to 10%	10% and above
A.	**Fast Vehicles**		
1.	Two wheeler	0.5	0.75
2.	Passenger car, Pickup van	1.0	1.0
3.	Auto Rickshaw	1.2	2.0
4.	Light Commercial Vehicle	1.4	2.0
5.	Truck or Bus	2.2	3.7
6.	Agricultural Tractor, Trailer	4.0	5.0
B.	**Slow Vehicles**		
1.	Cycle	0.4	0.5
2.	Cycle Rickshaw	1.5	2.0
3.	Tonga (Horse drawn Vehicle)	1.5	2.0
4.	Hand cart	2.0	3.0

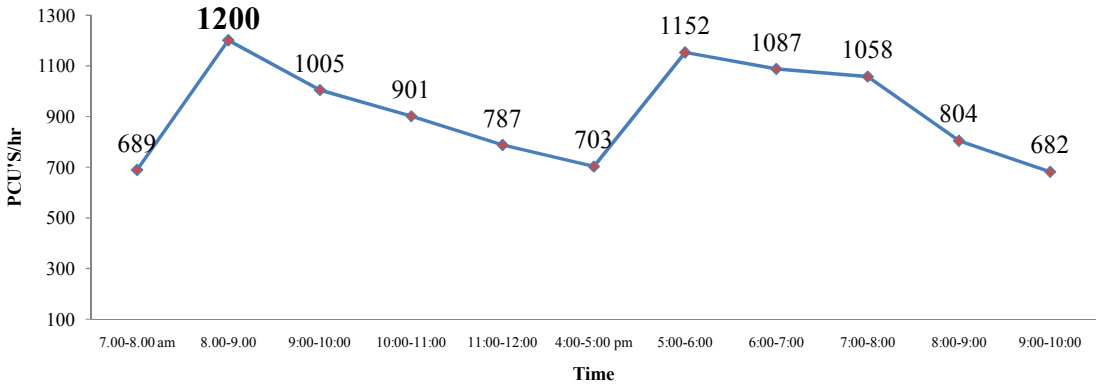
Real time traffic scenario along Bangalore- Hyderabad highway towards Bangalore city (3 lanes MCW)

Time	2Wh	3Wh	4Wh	B/L	Total	V/C
7.00-8.00 am	329(247)	24(29)	389(389)	11(24)	753(689)	0.26
8.00-9.00	**694(521)**	**37(44)**	**576(576)**	**27(59)**	**1334(1200)**	**0.44**
9:00-10:00	549(412)	29(35)	512(512)	21(46)	1111(1005)	0.37
10:00-11:00	486(365)	21(25)	472(472)	18(40)	997(901)	0.33
11:00-12:00	428(321)	25(30)	401(401)	16(35)	870(787)	0.29
4:00-5:00 pm	357(268)	18(22)	392(392)	10(22)	777(703)	0.26
5:00-6:00	702(5270	27(32)	562(562)	14931)	1305(1152)	0.43
6:00-7:00	583(437)	45(54)	541(541)	25(55)	1194(1087)	0.40
7:00-8:00	454(341)	52(62)	604(604)	23(51)	1133(1058)	0.39
8:00-9:00	375(281)	34(41)	453(453)	13(29)	875(804)	0.30
9:00-10.00 pm	341(256)	22(26)	378(378)	10(22)	751(682)	0.25

Note: The highest peak observed is **1200 PCU's/hr** as per IRC-106:1990 during **8:00 am to 9:00 am**

Vehicle Composition and Traffic flow distribution Bangalore-Hyderabad highway towards Bangalore city (3 lanes MCW)



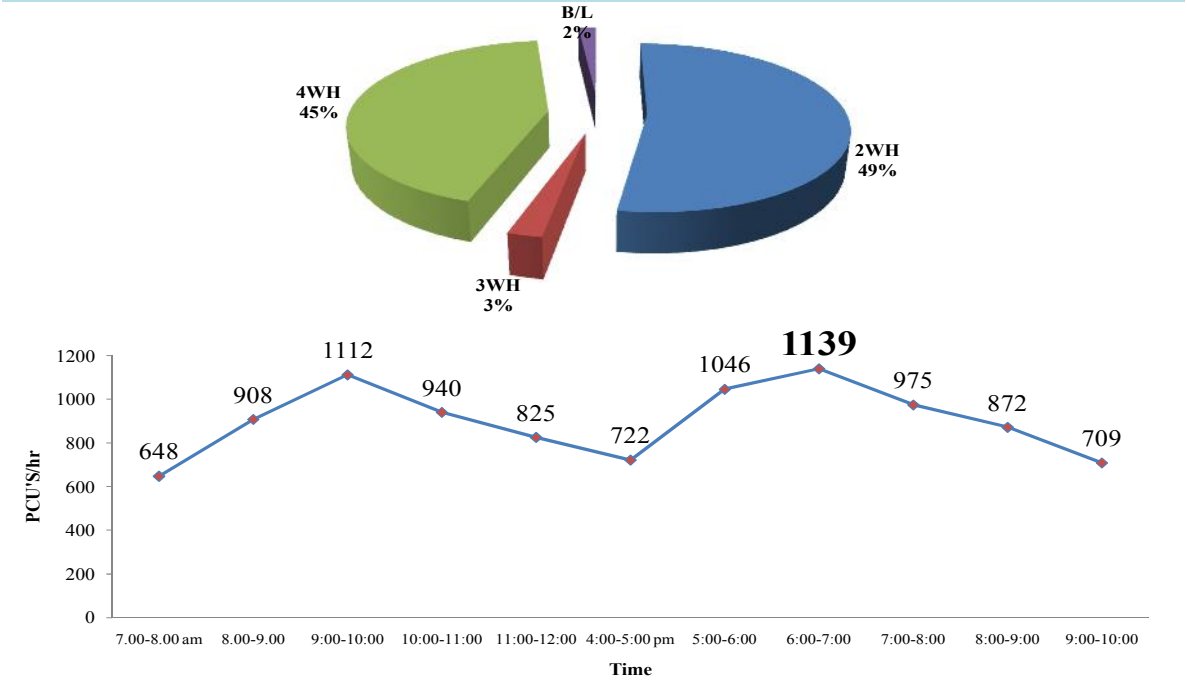


Real time traffic scenario along Bangalore- Hyderabad highway towards Yelahanka (3 lanes MCW)

Time	2Wh	3Wh	4Wh	Bus/ Lorries	Total	V/C
7.00-8.00am	389(292)	12(14)	313(313)	13(29)	727(648)	0.24
8.00-9.00	503(377)	19(23)	471(471)	17(37)	1010(908)	0.34
9:00-10:00	630(473)	43(52)	530(530)	26(57)	1230(1112)	0.41
10:00-11:00	594(473)	34(41)	412(412)	19(42)	1059(940)	0.35
11:00-12:00	493(370)	28(34)	389(389)	15(33)	925(825)	0.31
4:00-5:00pm	402(302)	17(20)	356(356)	20(44)	795(722)	0.27
5:00-6:00	608(456)	23(28)	512(512)	23(51)	1166(1046)	0.39
6:00-7:00	**672(504)**	**30(36)**	**553(553)**	**21(46)**	**1276(1139)**	**0.42**
7:00-8:00	561(421)	26(31)	483(483)	18(40)	1088(975)	0.36
8:00-9:00	489(367)	19(23)	434(434)	22(48)	964(872)	0.32
9:00-10:00 pm	356(267)	14(17)	390(390)	16(35)	776(709)	0.26

Note: The highest peak observed is 1139PCU's/hr as per IRC-106:1990 during 6.00 pm to 7.00 pm

Vehicle Composition and Traffic flow distribution along Bangalore- Hyderabad highway towards Yelahanka (3 lanes MCW)

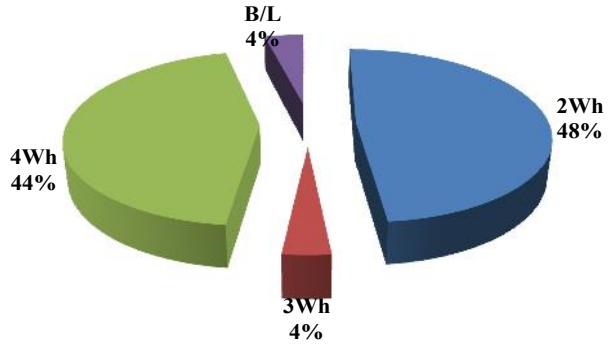


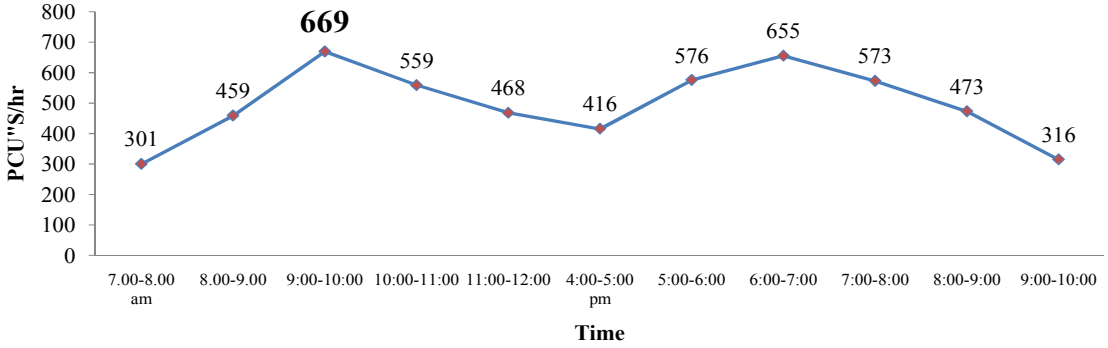
Real time traffic scenario along Bangalore- Hyderabad highway towards Bangalore city (2 lanes SR)

Time	2Wh	3Wh	4Wh	B/L	Total	V/C
7.00-8.00am	162(122)	15(18)	137(137)	11(24)	325(301)	0.17
8.00-9.00	203(152)	18(22)	228(228)	26(57)	475(459)	0.26
9:00-10:00	**356(267)**	**22(26)**	**301(301)**	**34(75)**	**713(669)**	**0.37**
10:00-11:00	281(211)	20(24)	278(278)	21(46)	600(559)	0.31
11:00-12:00	293(220)	16(19)	194(194)	16(35)	519(468)	0.26
4:00-5:00pm	275(206)	19(23)	156(156)	14(31)	464(416)	0.23
5:00-6:00	315(236)	21(25)	264(264)	23(51)	623(576)	0.32
6:00-7:00	340(255)	24(29)	312(312)	27(59)	703(655)	0.36
7:00-8:00	274(206)	26(31)	290(290)	21(46)	611(573)	0.32
8:00-9:00	243(182)	17(20)	231(231)	18(40)	509(473)	0.26
9:00-10:00 pm	180(135)	13(16)	132(132)	15(33)	340(316)	0.18

Note: The highest peak observed is 669 PCU's/hr as per IRC-106:1990 during 9.00 am to 10.00 am

Vehicle Composition and Traffic flow distribution along Bangalore- Hyderabad highway towards Bangalore city (2 lanes SR)



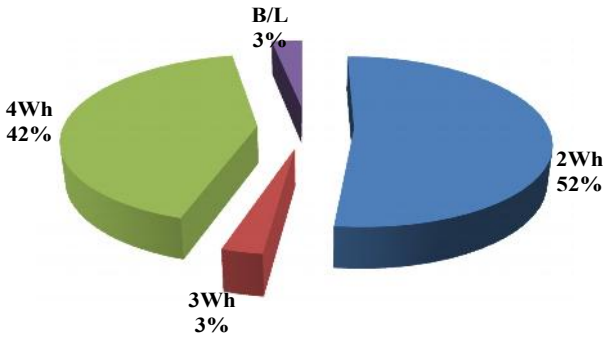


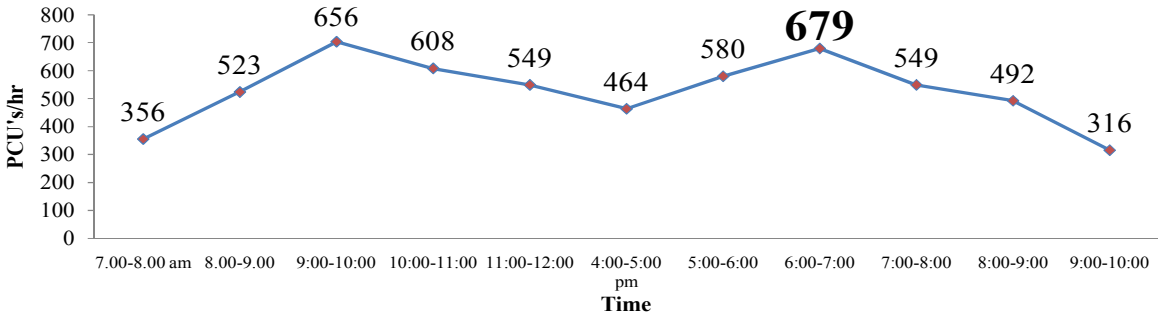
Real time traffic scenario along Bangalore- Hyderabad highway towards Yelahanka (2 lanes SR)

Time	2Wh	3Wh	4Wh	B/L	Total	V/C
7.00-8.00 am	189(142)	11(13)	172(172)	13(29)	385(356)	0.20
8.00-9.00	284(213)	16(19)	247(247)	20(44)	567(523)	0.29
9:00-10:00	401(301)	22(26)	278(278)	23(51)	724(656)	0.36
10:00-11:00	358(269)	19(23)	270(270)	21(46)	668(608)	0.34
11:00-12:00	337(253)	17(20)	236(236)	18(40)	608(549)	0.30
4:00-5:00 pm	294(221)	20(24)	186(186)	15(33)	515(464)	0.26
5:00-6:00	307(230)	23(28)	280(280)	19(42)	629(580)	0.32
6:00-7:00	**368(276)**	**26(31)**	**312(312)**	**27(59)**	**733(679)**	**0.38**
7:00-8:00	271(203)	18(22)	291(291)	15(33)	595(549)	0.30
8:00-9:00	246(185)	15(18)	250(250)	18(40)	529(492)	0.27
9:00-10:00	157(118)	13(16)	156(156)	12(26)	338(316)	0.18

Note: The highest peak observed is **679 PCU's/hr** as per IRC-106:1990 during **6.00 pm to 7.00 pm**

Vehicle Composition and Traffic flow distribution along Bangalore-Hyderabad highway towards Yelahanka (2 lanes SR)





Real Time Traffic Scenario for Study road

Bangalore – Hyderabad highway (NH-44, new Airport Road)		**V**	**C**	**Existing V/C Ratio**	**LOS**
Bangalore city	MCW	1200	2700	0.44	**C**
	SR	669	1800	0.37	**B**
Yelahanka	MCW	1139	2700	0.42	**C**
	SR	679	1800	0.38	**B**

V/C	**LOS**	**Performance**
0.0 - 0.2	A	Excellent
0.2 - 0.4	B	Very Good
0.4 - 0.6	C	Good
0.6 - 0.8	D	Fair/Average
0.8 - 1.0	E	Poor
1.0& Above	F	Very Poor

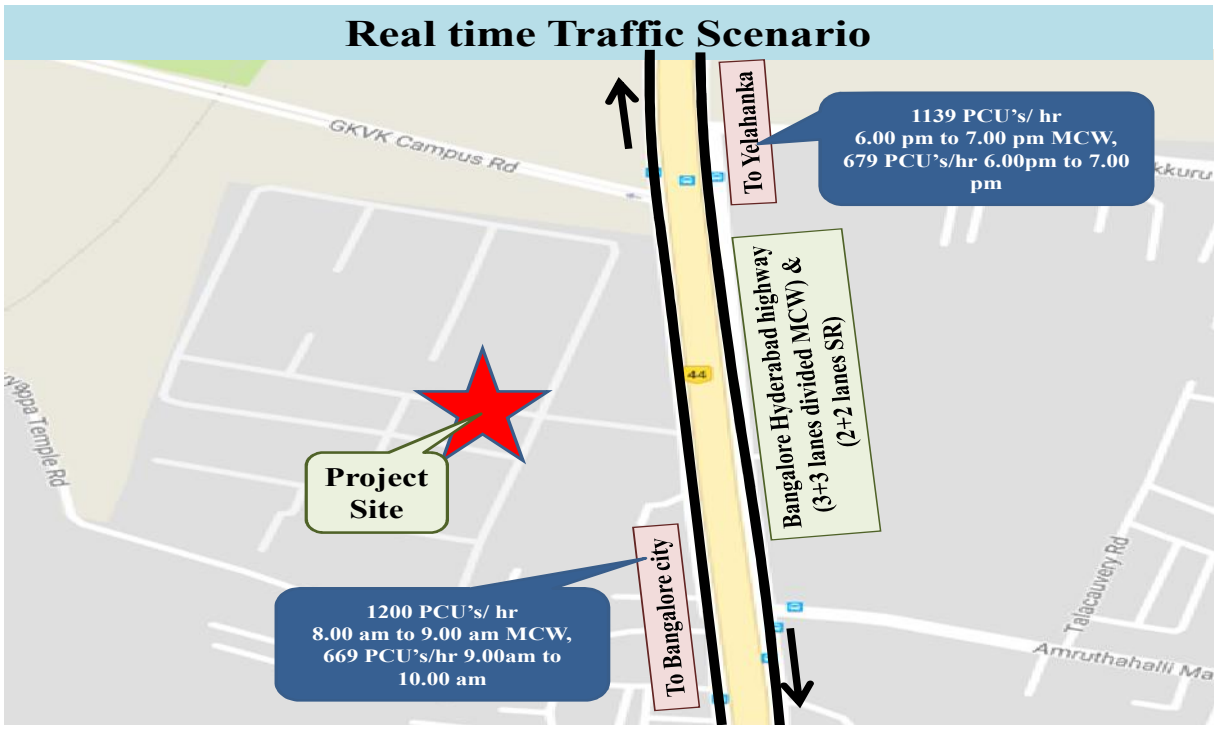
V= Volume in PCU's/hr & C= Capacity in PCU's/ hr LOS = Level of Service

Note: IRC is accepting the fact that, in Indian roads the real congestion starts when V/C ratio is >1, i.e., for forced flow. Till this limit the road is free for traffic movement without any impediments. Hence it is acceptable as normal up to V/C =1 and the performance will be taken as good only

Real Time Traffic Scenario

- The Project is located along Bangalore-Hyderabad highway, entry/ exit provided along the same.
- All types of vehicles i.e., 2Wh, 3Wh, 4Wh, and Buses/Lorries move along the study road.

Bangalore – Hyderabad highway (NH-44, new Airport Road)		As per study (per minute)			
		2wh	3wh	4wh	B/L
Bangalore city	MCW	11 or 12	1 or 2	9 or 10	1 or 2
	SR	5 or 6	1 or 2	5 or 6	1 or 2
Yelahanka	MCW	11 or 12	1 or 2	9 or 10	1 or 2
	SR	6 or 7	1 or 2	5 or 6	1 or 2



During Construction

- The addition of 10 lorries per day carrying construction material do not change any significantly the traffic flow.
- V/C during construction (lorries) =0.44, 0.37, 0.42 & 0.38
- The present level of service will remain "**C, B, C & B**" along Bangalore–Hyderabad Highway towards Bangalore city (MCW and SR) and then towards Yelahanka (MCW and SR) respectively.

- Number of trucks coming to the site (off peak hours)

  Day time –10 no's.

  Night time –Nil.
- The addition does not make any significant change for traffic movement at any given time.
- Vehicles carrying construction materials are well covered to prevent any spillage.
- Vehicles hired for construction material will be in good condition and conforms to noise and air emission standards.
- Vehicles will operate only during non peak hours.

Parking Logistics

Car park Requirement (for Residential)

Apartment Area in sq.m	**No. of APTS**	**No. of Cars**	**Total**
Less than 50 sqm	210	1 per 2 apts	105
50sq.m -150sq.m	928	1	928
150sqm -225sq.m	1103	1	1103
225sqm -300sq.m	0	2	0
TOTAL	2241 apts		2136 cars
Additional 10% visitors car parking			214 cars
Car parking for club(1 car per 50 sqm)			120cars
Total Requirement(for Residential)			**2470 cars**

Total Car Parking Provided

SL no.	**Level**	**No's**
1	Surface Parking	**45**
2	Residential Basement 1	**1410**
3	Residential Basement 2	**1350**
Total Car Parking Provided		**2805**

Commercial Parking Requirement

Activity	**Parking at**	**Total No.**
Commercial	Total FAR Area	427850
	50 sq.mtrs = 1 car Park on FAR	
Car Parking Required		**8557**

Car Parking Provided

Sl no.	**Level**	**Total No.**
1	Basement 4	2140
2	Basement 3	2147
3	Basement 2	2150
4	Basement 1	1874
5	Surface Parking	260
Total Car Parking Provided		**8571**

- Car Parking **Required** for the both the Residential and commercial is 2470+8557 **=11027 no.**
- Car Parking **Provided** for the both the Residential and commercial is 2805+8571**= 11376 no.**

TRAFFIC FLOW LOGISTICS

- Total traffic generated from this project = 11376 PCU's.
- Generally the residential vehicles will egress in the morning and in the same time commercial vehicles will ingress and vice versa during evening. Hence considering the opposite strategies in entry and exit, out of the two activities commercial activity generates higher number of vehicles and the impact is more from commercial (8571 PCU's) as compared to Residential (2805 PCU's).
- In commercial activity, the vehicles will operate in shifts basis and considering 3 shifts per day, the total traffic generated per shift will be,

- 8571/3 =2857 PCU's/Shift.
- This traffic is distributed for 2 hours peak in each shift.
- Therefore, the hourly volume in PCU's will be 2857/2 =1429 PCU's/hr.
- This hourly generated 100% traffic (1429 PCU's/hr) will exit to service road of Bangalore- Hyderabad highway towards Yelahanka.
- Since the service road is operated by two way traffic flow and as per the traffic flow pattern considering the urban activities towards the bangalore city is more, 60% of the traffic will move towards Bangalore city side and remaining 40% will move towards Yelahanka/Devanahalli side after joining main CW.

  Though, all the vehicles will find immediate joining to main CW but uses the service road before joining.

  i.e., 60%X 1429= 857 PCU's/hr will move along Bangalore- Hyderabad highway towards Bangalore city (MCW) .

  40%X 1429= 572 PCU's/hr will move along Bangalore- Hyderabad highway towards Yelahanka (MCW).

Modified V/C and LOS after adding generated traffic to existing traffic

Bangalore – Hyderabad highway (NH-44, new Airport Road)		**Existing scenario**				**Modified scenario**		
		V	**C**	**V/C**	**LOS**	**V**	**V/C**	**LOS**
Hebbal/ Bangalore city	MCW	1200	2700	0.44	**C**	1200+857= 2057	0.76	**D**
	SR	669	1800	0.37	**B**	669	0.37	**B**
Yelahanka	MCW	1139	2700	0.42	**C**	1139+572=1711	0.63	**D**
	SR	679	1800	0.38	**B**	679+1429=2108	1.17	**F**

Projected traffic for next Three years based on individual vehicular growth as per IRC : 37-2001

Bangalore – Hyderabad highway (NH-44, new Airport Road	Vehicle Type	2Wh	3Wh	4Wh	Buses/lorries	Total
	% Growth	7.68	6.53	11.82	7.14	
Bangalore city	MCW	1005(753)	51(61)	1007(1007)	38(84)	**2100(1905)**
	SR	515 (387)	30 (36)	526 (526)	48(106)	**1120 (1054)**
Yelahanka	MCW	973(730)	41(49)	967(967)	30(65)	**2011(1811)**
	SR	533(400)	36(43)	545(545)	38(84)	**1152(1072)**

Note: Considering the neighboring development if any along with traffic growth potential based on the socio-economic growth. The equation as recommended by IRC to work out the future generated traffic.

Changed Scenario -1 (After Commuter Rail System in Operation)

Commuter Rail System (CRS) is also proposed from Yeshwanthpur to Yelahanka. As per the studies, about 15% of road traffic will be shared by CRS.

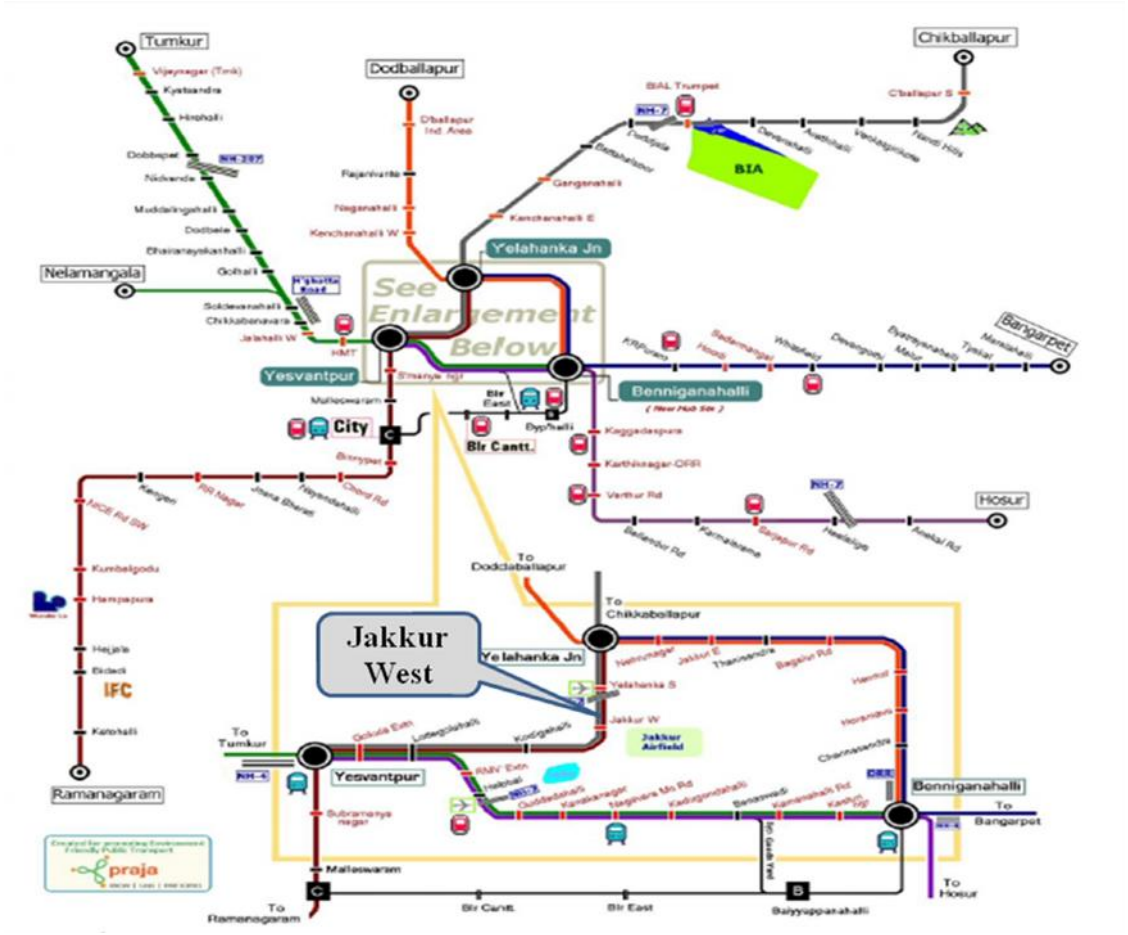
0.15 x2762= 414 Then the traffic reduces to 2762 – 414 = 2348 along Bangalore-Hyderabad highway towards Bangalore city (MCW).

0.15x 1054 = 158 Then the traffic reduces to 1054– 158 = 896 along Bangalore-Hyderabad highway towards Bangalore city (SR).

0.15x 2383 = 357 Then the traffic reduces to 2383– 357 = 2026 along Bangalore-Hyderabad highway towards Yelahanka (MCW).

0.15x 2501 = 375 Then the traffic reduces to 2501- 375 = 2126 along Bangalore-Hyderabad highway towards Yelahanka (SR).

Commuter rail connectivity along NH-44



Changed Scenario -1 (Commuter Rail System in operation)

Bangalore – Hyderabad highway (NH-44, new Airport Road)		Modified V/C and LOS after adding the generated traffic				Changed Scenario (After introducing Commuter Rail)			
		V	C	V/C	LOS	V	C	V/C	LOS
Bangalore city	MCW	2762	2700	1.02	F	2348	2700	0.87	E
	SR	1054	1800	0.59	C	896	1800	0.50	C
Yelahanka	MCW	2383	2700	0.88	E	2026	2700	0.75	D
	SR	2501	1800	1.39	F	2126	1800	1.18	F

Changed Scenario-2 after Namma METRO To KIAL

NOTE: Phase-1 of Metro extension is proposed from Gottigere to KIAL. Once the complete route is operational, as per the projection made by RITES/BMRCL, there will be reduction of 40% traffic along NH-44 service road.

Since the project site resides along the Metro path, NH-44 service road experiences reduction of 40 % traffic.

i.e., 0.4 x 2348 = 939 Then the traffic reduces to 2348 – 939 = 1409 along Bellary road towards Bangalore city (MCW).

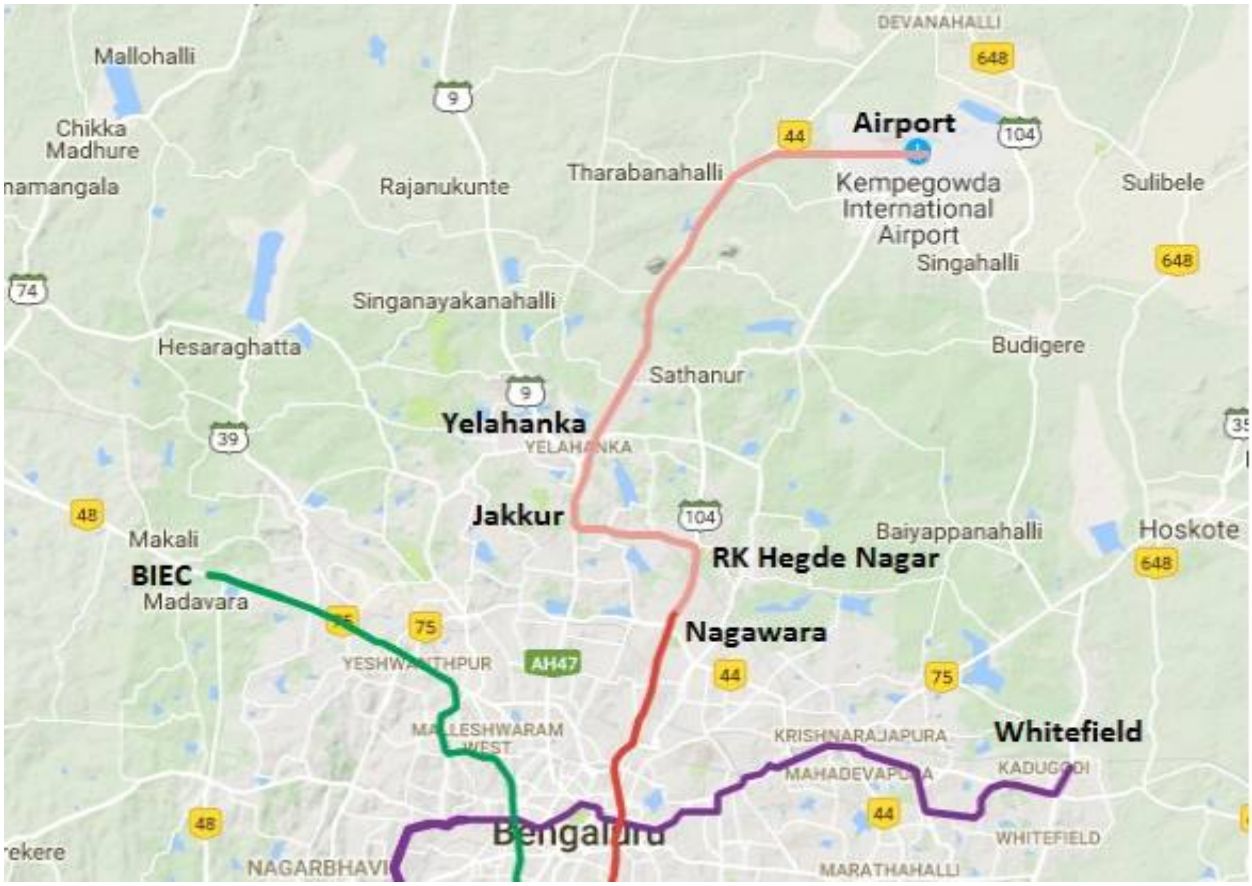
0.4 x 896 = 358 Then the traffic reduces to 896 - 358 = 538 along Bellary road towards Bangalore city (SR).

0.4 x 2026 = 810 Then the traffic reduces to 2026 – 810 = 1216 along Bellary road towards Yelahanka (MCW).

0.4 x 2126 = 850 Then the traffic reduces to 2126 – 850 = 1276 along Bellary road towards Yelahanka (SR).

Bangalore – Hyderabad highway (NH-7, new Airport Road)		**Changed Scenario-1 (After introducing Commuter Rail)**				**Changed Scenario-2 (After Namma METRO)**			
		V	**C**	**V/C**	**LOS**	**V**	**C**	**V/C**	**LOS**
Bangalore city	MCW	2348	2700	0.87	**E**	1409	2700	0.52	**C**
	SR	896	1800	0.50	**C**	538	1800	0.30	**B**
Yelahanka	MCW	2026	2700	0.75	**D**	1216	2700	0.45	**C**
	SR	2126	1800	1.18	**F**	1276	1800	0.71	**D**

METRO alignment to KIAL



Consolidated V/C and level of service for changed scenarios

Bangalore – Hyderabad highway (NH-7, new Airport Road)		Existing		Changed V/C and LOS by adding generated traffic		Projected traffic after Five years		Modified V/C and LOS by adding the generated traffic		Changed Scenario-1 After introducing commuter rail system		Changed Scenario-2 (After Namma METRO)	
		V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS
Bangalore city	MCW	0.44	C	0.76	D	0.70	D	1.02	F	0.87	E	0.52	C
	SR	0.37	B	0.37	B	0.59	C	0.59	C	0.50	C	0.30	B
Yelahanka	MCW	0.42	C	0.63	D	0.67	D	0.88	E	0.75	D	0.45	C
	SR	0.38	B	1.17	F	0.60	C or D	1.39	F	1.18	F	0.71	D

Structural and Non Structural Interventions:

Structural Measures:

- As per BDA-CDP Map, Bangalore- Hyderabad (NH-7) Road is already widened.
- Commuter Rail System (CRS) is also proposed from Yeshwanthpur to Yelahanka and Namma Metro Phase-2 is Proposed from Nagawara to Airport.
- A well defined high raised kerb footpath must be provided on either side for pedestrians walk and barricaded along all the study roads. This ensures to prevent haphazard crossing of pedestrians.
- To establish smooth entry & exit of vehicles, bell mouth shape geometry is provided at the gates. This ensures smooth transition for merging of vehicles.

Non-Structural Measures:

- Merging of vehicles will be performed only to left traffic from the exit gates, this ensures safety.
- Rubber humps will be introduced for the outgoing vehicles at the exit gate drive way. Not more than 3m from the gate.
- All gates are manned with efficient security who can guide the entry and exit of vehicles.
- All precautionary measures are ensured for the safety of construction laborers while working at the site.
- Amber blinker lights will be used at the gate to caution vehicles which are moving out. Sign boards will also to be installed to this effect.
- Adequate sign & guide posts for traffic as per IRC (Indian Roads Congress) or ITE (Institute of Transportation Engineers USA) to be installed along study roads.
- Road marking must be clearly painted so as to guide the drivers along study roads.

ANNEXURE 6

ENVIRONMENTAL CONDITIONS FOR BUILDINGS AND CONSTRUCTIONS

(CATEGORY '3': 50,000 to 1,50,000 Square meters)

MEDIUM	S.N	ENVIRONMENTAL CONDITIONS	COMPLIANCE
Topography and Natural Drainage	1	The natural drain system should be maintained for ensuring unrestricted flow of water. No construction shall be allowed to obstruct the natural drainage through the site. No construction is allowed on wetland and water bodies. Check dams, bio- swales, landscape, and other sustainable urban drainage systems (SUDS) are allowed for maintaining the drainage pattern and to harvest rain water. Buildings shall be designed to follow the natural topography as much as possible. Minimum cutting and filling should be done.	Natural sloping pattern within the project site will remain unaltered and the natural hydrology of the area will be maintained as it is so as to ensure natural flow of storm water The project site does not involve any wetland or water bodies.
Water conservation - Rain Water Harvesting, and Ground Water Recharge	2	A complete plan for rain water harvesting, water efficiency and conservation should be prepared. The local bye-law provisions on rain water harvesting should be followed. If local bye-law provisions are not available, adequate provision for storage and recharge should be followed as per the Ministry of Urban Development Model Building Bye- laws, 2016. A rain water harvesting plan needs to be designed where the recharge bores of minimum one recharge bore per 5,000 square meters of built up area and storage capacity of minimum one day of total fresh water requirement shall be provided. In areas where ground water recharge is not feasible, the rain water should be harvested and stored for reuse. The ground water shall not be withdrawn without approval from the Competent Authority. All recharge should be limited to shallow aquifer.	A detailed RWH plan as per the norms has been prepared and incorporated in the EIA report as per the requirements. Detailed Storm water management plan is provided in Section 9.4.4, Chapter 9 of the EIA report.
	2(a)	At least 20% of the open spaces as required by the local building bye-laws shall be pervious. Use of Grass pavers, paver blocks with at least 50% opening, landscape etc. would be considered as pervious surface.	A total of 95,442 Sqm of Landscape area has been provided out of which 63,628 sqm (24%) is on ground and is pervious.
	2(b)	Use of water efficient appliances should be promoted. Low flow fixtures or sensors be used to promote water conservation.	Only low flow fixtures and use of sensors shall be adopted for efficient use of water and to promote water conservation. Total water consumption shall come down from 135 LPCD to 86 LPCD by adopting low flow fixtures.

	2(c)	Separation of grey and black water should be done by the use of dual plumbing system. In case of single stack system separate recirculation lines for flushing by giving dual plumbing system shall be done.	Dual plumbing system has been adopted to separate grey and black water and separate recirculation lines for flushing shall be provided and is incorporated in the design.
Solid Waste Management	3	Solid waste: Separate wet and dry bins must be provided in each unit and at the ground level for facilitating segregation of waste. The provisions of the Solid Waste (Management) Rules 2016 and the e-waste (Management) Rules 2016, and the Plastics Waste (Management) Rules 2016 shall be followed.	Solid Waste Management shall be adopted as per The provisions of the Solid Waste (Management) Rules 2016 and the e-waste (Management) Rules 2016, and the Plastics Waste (Management) Rules 2016. Separate bins of size 240 Litre capacity shall be provided for Organic, Inorganic and Hazardous waste (20 nos each) for all the buildings.
	3 (a)	All non-biodegradable waste shall be handed over to authorized recyclers for which a written tie up must be done with the authorized recyclers.	All non biodegradable waste shall be handed over to authorized recyclers and MoU shall be made for the same.
	3(b)	Organic waste composter/Vermiculture pit with a minimum capacity of 0.3 kg/person/day must be installed.	Organic waste (5.49 MT/day) shall be treated using Organic Waste Convertor
Sewage Treatment Plant	4	Onsite sewage treatment of capacity of treating 100% waste water to be installed. Treated waste water shall be reused on site for landscape, flushing, cooling tower, and other end-uses. Excess treated water shall be discharged as per CPCB norms. Natural treatment systems shall be promoted. Sludge from the onsite sewage treatment, including septic tanks, shall be collected, conveyed and disposed as per the Ministry of Urban Development, Central Public Health and Environmental Engineering Organization (CPHEEO) Manual on Sewerage and Sewage Treatment Systems, 2013.	Total water requirement for the project is 3788 KLD and STP's of total capacity of 3700 KLD shall be installed. For Residential blocks: 1x710KLD, 2x350KLD, 1x 140 KLD; Commercial & Retail block: 1 x 800 KLD, 1x500 KLD, 1x850KLD A detailed STP feasibility report is attached as Annexure 7 to the EIA Report

Energy	5	Compliance with the Energy Conservation Building Code (ECBC) of Bureau of Energy Efficiency shall be ensured. Buildings in the States which have notified their own ECBC, shall comply with the State ECBC. Outdoor and common area lighting shall be LED. Concept of passive solar design that minimize energy consumption in buildings by using design elements, such as building orientation, landscaping, efficient building envelope, appropriate fenestration, increased day lighting design and thermal mass etc. shall be incorporated in the building design. Wall, window, and roof u-values shall be as per ECBC specifications.	Compliance to ECBC has been followed in the design and planning of the project. Efficient utilization of solar energy to minimize energy consumption in buildings by using design elements, such as building orientation, landscaping, efficient building envelope, appropriate fenestration, increased day lighting design and thermal mass etc. shall be incorporated in the building design.
	5(a)	Solar, wind or other Renewable Energy shall be installed to meet electricity generation equivalent to 1% of the demand load or as per the state level/ local building bye-laws requirement, whichever is higher.	Solar energy shall be used as per the norms as energy conservation measure. Details are mentioned in Section 5.3, Chapter 5 of the EIA report.
	5(b)	Solar water heating shall be provided to meet 20% of the hot water demand of the commercial and institutional building or as per the requirement of the local building bye-laws, whichever is higher. Residential buildings are also recommended to meet its hot water demand from solar water heaters, as far as possible.	Top two floors of all the residential buildings shall be provided with solar water heating which shall account for 20% of total hot water demand.
	5(c)	Use of environment friendly materials in bricks, blocks and other construction materials, shall be required for at least 20% of the construction material quantity. These include flyash bricks, hollow bricks, AACs, FlyAsh Lime Gypsum blocks, Compressed earth blocks, and other environment friendly materials. Fly ash should be used as building material in the construction as per the provisions of the Fly Ash Notification of September, 1999 as amended from time to time.	Environment friendly materials in bricks, blocks and other construction materials shall be used. Fly ash shall be used as building material in the construction as per the provisions of the Fly Ash Notification of September, 1999 as amended from time to time.
Air Quality and Noise	6	Dust, smoke & other air pollution prevention measures shall be provided for the building as well as the site. These measures shall include screens for the building under construction, continuous dust/wind breaking walls all around the site (at least 3 meter height). Plastic/tarpaulin sheet covers shall be	During Construction, the periphery of entire project site has been covered with tall barricades. All the construction vehicles

		provided for vehicles bringing in sand, cement, murram and other construction materials prone to causing dust pollution at the site as well as taking out debris from the site. Wheel washing for the vehicles used be done. Sand, murram, loose soil, cement, stored on site shall be covered adequately so as to prevent dust pollution. Wet jet shall be provided for grinding and stone cutting. Unpaved surfaces and loose soil shall be adequately sprinkled with water to suppress dust. All construction and demolition debris shall be stored at the site (and not dumped on the roads or open spaces outside) before they are properly disposed. All demolition and construction waste shall be managed as per the provisions of the Construction and Demolition Waste Rules 2016. All workers working at the construction site and involved in loading, unloading, carriage of construction material and construction debris or working in any area with dust pollution shall be provided with dust mask. For indoor air quality the ventilation provisions as per National Building Code of India.	shall be covered with tarpaulin sheets and its ensured that all vehicles are maintained properly. All construction and demolition waste are stored in designated areas and is being disposed to authorized recyclers (Rock Crystal). All workers are provided with dust masks and required PPE's.
	6(a)	The location of the DG set and exhaust pipe height shall be as per the provisions of the CPCB norms.	Location and stack height of DG sets are as per the CPCB norms.
Green Cover	7	A minimum of 1 tree for every 80 sq.mt. of and should be planted and maintained. The existing trees will be counted for this purpose. Preference should be given to planting native species.	The project will be provided with total green area amounting to 95,442 Sqm. Green belt development shall be carried out as per the guidelines with native species.
	7(a)	Where the trees need to be cut, compensatory plantation in the ratio of 1:3 (i.e. planting of 3 trees for every 1 tree that is cut) shall be done and maintained.	To minimize tree cutting, trees will be retained to maximum extent possible and is partnered with 2 PARA (SF), Hebbal, Bangalore for the transplantation of about 90 trees from the premises.
Top Soil Preservation and Reuse	8	Topsoil should be stripped to a depth of 20 cm from the areas proposed for buildings, roads, paved areas, and external services. It should be stockpiled appropriately in designated areas and reapplied during plantation of the proposed vegetation on site.	Top soil has been stored in designated space and covered with tarpaulin.

Transport	9	A comprehensive mobility plan, as per MoUD best practices guidelines (URDPFI), shall be prepared to include motorized, non-motorized, public, and private networks. Road should be designed with due consideration for environment, and safety of users. The road system can be designed with these basic criteria. 1. Hierarchy of roads with proper segregation of vehicular and pedestrian traffic. 2. Traffic calming measures. 3. Proper design of entry and exit points. 4. Parking norms as per local regulation.	Roads shall be designed with due consideration for environment, and safety of users. A comprehensive Traffic Management Study has been conducted by M/s Consortia of Infrastructure Engineers, an organization of repute and specializing in Transport Planning. The Traffic Impact Assessment Study report is attached as Annexure 8 to the EIA Report
Environment Management Plan	10	An environmental management plan (EMP) shall be prepared and implemented to ensure compliance with the environmental conditions specified in item number 1 to 9 above. A dedicated Environment Monitoring Cell with defined functions and responsibility shall be put in place to implement the EMP. The environmental cell shall ensure that the environment infrastructure like Sewage Treatment Plant, Landscaping, Rain Water Harvesting, Energy efficiency and conservation, water efficiency and conservation, solid waste management, renewable energy etc. are kept operational and meet the required standards. The environmental cell shall also keep the record of environment monitoring and those related to the environment infrastructure.	Environment management plan (EMP) has been prepared and incorporated in the EIA Report as Chapter 9. Strict compliance to the EMP measures shall be adopted both during construction and operation of the project. An Environment Monitoring Cell has been formed to ensure infrastructure like Sewage Treatment Plant, Landscaping, Rain Water Harvesting, Energy efficiency and conservation, water efficiency and conservation, solid waste management, renewable energy etc. are kept operational and meet the required standards.