APPENDIX -I
(See Paragraph – 6)
FORM 1

(I) Basic Information

<table>
<tr><th>S. No.</th><th>Item</th><th>Details</th></tr>
<tr><td>1.</td><td>Name of the Project</td><td>Proposed residential complex of Chandigarh Armed Police, Village Dhanas, U.T. Chandigarh</td></tr>
<tr><td>2.</td><td>S. No in the Schedule</td><td>The project is categorized B under item No. 8b (as per “NABET schedule project falls under category 38) of Schedule – Gazette Notification dated Sept. 14, 2006 and its amendments.</td></tr>
<tr><td>3.</td><td>Proposed capacity / area / length /tonnage to be handled/command area/lease area / numbers of wells to be drilled</td><td>Total plot area of the project is 52.93 acre (214198.3 sqm.) out of which 80% (171343.9 sqm) is allotted for housing complex as per approved zoning plan. The housing complex plans to have Type-II, III, IV & V modular flats with area details given below
<table>
<tr><th>Type of houses S+6</th><th>Builtup area on individual floor (sqm)</th><th>No of blocks</th><th>Total floor area -6 floors (sqm).</th><th>Total builtup area of blocks (sqm) excluding stilt</th><th>Total builtup area of blocks (sqm) including stilt</th></tr>
<tr><td>Type II</td><td>379.19</td><td>53</td><td>24489.54</td><td>120583.09</td><td>138667.4</td></tr>
<tr><td>Type III</td><td>409.49</td><td>11</td><td>26446.74</td><td>27026.81</td><td>31085.35</td></tr>
<tr><td>Type IV</td><td>314.42</td><td>8</td><td>20306.16</td><td>15092.03</td><td>17317.53</td></tr>
<tr><td>Type V</td><td>476.97</td><td>2</td><td>30804.84</td><td>5723.72</td><td>6561.24</td></tr>
<tr><td>Total</td><td></td><td></td><td></td><td>168425.66</td><td>193634.59</td></tr>
</table>
Total plot area (residential)= 155839.09 sqm.
FAR= Total covered area on all floors/ Plot area
=168425.66/ 155839.09= 1.08 achieved against permissible FAR 1.5
The remaining 20% of the area is earmarked for institutional area (15%), commercial (2.5%) and religious area (2.5%).
The 20% area marked as above is 42839.66 sqm. and approx. built up area is 7962 sqm. thus the total built up area for the residential + institutional, school, commercial comes out 201596.59 sqm.</td></tr>
<tr><td>4.</td><td>New/Expansion/ Modernization</td><td>New project</td></tr>
<tr><td>5.</td><td>Existing Capacity / Area etc.</td><td>-</td></tr>
<tr><td>6.</td><td>Category of Project i.e. ‘A’ or ‘B’</td><td>Category B</td></tr>
<tr><td>7.</td><td>Does it attract the general condition? If yes, please</td><td>No, it does not attract general condition</td></tr>
</table>

	specify.	
8.	Does it attract the specific condition? If yes, please specify.	No, it does not attract specific condition
9.	Location	
	Plot/Survey/Khasra No.	Pocket-5 of Draft Chandigarh Master Plan -2031, in village Dhanas, along Dakshin Marg extension road. Plot is allotted by Chandigarh Administration. (Land Papers, Index Map and Zoning Plan attached as Annexures -I, II and III respectively)
	Village	Dhanas
	Tehsil	Chandigarh
	District	Chandigarh
	State	U. T. Chandigarh
10.	Nearest railway station/airport alongwith distance in kms.	Chandigarh railway station = 13.98km Chandigarh airport = 14.00km
11.	Nearest Town, city, District Headquarters along with distance in kms.	Nearest city, Chandigarh - 6.0 km Nearest District HQ, Sector -17, Chandigarh
12.	Village Panchayats, Zilla Parishad, Municipal Corporation, Local Body (complete postal address with telephone nos. to be given)	A. Village Panchayat, 1) Sarpanch- Sh. Kuljeet Singh Sandhu Mob. No. 9878447793 2) BDPO - Sh. Ram Lubhaya, Rural Development & Panchayats, Sector-19 Chandigarh, Phone: 0172- 2700350 B. Municipal Corporation 1) Councilor (Ward No.5): Sh. Subhash Chawla Municipal Corporation Sector-17, Chandigarh, Phone: 0172-2714916 2) Sh. Ajit Balaji Joshi (Deputy Commissioner) Estate Office Building, Sector-17, Chandigarh, Phone: 0172-2700109
13.	Name of the applicant	Inspector General of Police, U.T. Chandigarh.
14.	Registered Address	Inspector General of Police Union Territory Police Headquarters, Sector-9, Chandigarh
15.	Address for correspondence	As above
	Name	Mr. Satish Kumar
	Designation (Owner/Partner/CEO)	SDPO Union Territory Police Headquarters, Sector-9, Chandigarh
	Address	Chandigarh Police Headquarters, Sector 9. U.T Chandigarh
	Pin Code	160009
	E-mail	Igp-chd@nic.in, psdpocentral-chd@nic.in
	Telephone No.	0172-2760865, 09779580908
	Fax. No.	do
16.	Details of Alternative Sites	No alternative site examination required as the area is

	examined, if any. Location of these sites should be shown on a toposheet.	already earmarked on approved Draft Development Plan 2031 of Chandigarh.
17.	Interlinked Projects	There is no interlinked project
18.	Whether separate application of interlinked project has been submitted?	Not applicable
19.	If yes, date of submission	Not applicable
20.	If no, reason	Not applicable
21.	Whether the proposal involves approval / clearance under: if yes, details of the same and their status to be given. (a) The forest (Conservation) Act, 1980? (b) The Wildlife (Protection) Act, 1972? (c) The C.R.Z Notification, 1991?	 a. For Non applicability of Forest Act on the approved land/ NOC from the Department of Forest/ Wildlife, Chandigarh (attached as Annexure –IV) b. For Non applicability of Wildlife Act on the approved land/ NOC from the National Board of Wildlife . New Delhi/ Department of Forests & Wildlife, Chandigarh (attached as Annexure -V). where distance of the project site from Sukhna lake and Bird sanctuary is authenticated c. Not Applicable
22.	Whether there is any Government Order / Policy relevant/ related to the site?	A copy of the letter from the Chief Engineer to SE construction circle Chandigarh vide memo no. W/208/11327 dated 13.06.2008 where in cost estimate of construction of 204 nos. houses were approved for the proposed residential CAP complex, Dhanas, UT. Chandigarh (Annexure-VI) A copy of the letter from the Chief Architect, Chandigarh Administration to IGP, Chandigarh vide memo no. Arch/ 2013/10760 dated 30.08.2013 where in design of the CAP complex has been revised and proposed 1458 housed has been approved (Annexure-VII) A copy of the letter from the Chief Architect Chandigarh administration to the Chief Engineer, Chandigarh vide memo no. Arch /2014 dated 29.08.2014 where in design of the complex has been re-revised and 1656 houses have been approved according the new plinth area norms (Annexure-VIII) Rough cost estimate of construction of all types of houses from Engineering Deptt. Chandigarh administration also enclosed.

23.	Forest land involved (hectares)	Not any forest land involved
24.	Whether there is any litigation pending against the project and / or land in which the project is proposed to be set up? (a) Name of the Court (b) Case No. (c)Orders/directors of the Court, if any and its relevance with the proposed project.	No litigation is pending against the project

(II) Activity

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

S.No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	No Yes	**Land Use:** The project is coming up in Pocket -5, of Draft Development Master Plan-2031 of Chandigarh. The plot area (52.9 acres, 214198.3 sqm has been allotted to Chandigarh Police by Chandigarh Administration. It is a vacant plot. The site is earmarked for residential development; hence no change in landuse is envisaged as per approved draft development plan of Chandigarh. **Land Cover:** The intensity of the land cover will change from a vacant plot to a housing complex *in accordance with the development plan regulation of the administration towards the village bye laws"* to blend it with the existing local environment of Chandigarh. Thus there will be a permanent change in land use of the plot.
1.2	Clearance of existing land, vegetation and buildings?	No Yes	**Buildings:** There is no existing building at site except a security post and barbed wire boundary wall of the CAP complex. **Land & vegetation:** The proposed site is an open land, full of vegetation

<table>
<tr><td></td><td></td><td></td><td>mainly, native trees, shrubs, herbs, wild dried bushes and thorny plants. The CP Division 6, Chandigarh surveyed the plot and enumerated the girthwise details of plants. A total of 3728 number of trees fall in the area (detailed survey report attached as Annexure- IX). It is opined that only those trees which fall in the alignment of the blocks and the internal roads will be identified and necessary action for their removal as per suggestion of Department of Horticulture, Chandigarh Administration, will be taken through Executive engineer, Div. No. 2, UT Chandigarh well before the execution of work at site. As per preliminary study of the tree details of the survey plan approx. 787 small & medium trees will remain undisturbed whereas 2941 (small & medium) trees will be felled. A compensatory plantation of 14705 trees will be undertaken at site suggested by the Chandigarh administration.</td></tr>
<tr><td>1.3</td><td>Creation of new land uses?</td><td>No</td><td>The project is coming up on a designated land earmarked for residential CAP complex as per Draft Development Master Plan-2031 of Chandigarh. However, project specific internal land use classification is as below:
<table>
<tr><th>Sr. No</th><th>Land use</th><th>Area (sqm)</th><th>% of total area</th></tr>
<tr><td>1.</td><td>Plot Area</td><td>214198.3</td><td>100.00</td></tr>
<tr><td>2.</td><td>Covered Area of buildings at ground floor</td><td>30705.0</td><td>14.33</td></tr>
<tr><td>3.</td><td>Open Areas</td><td>183493.3</td><td>85.67</td></tr>
<tr><td>a.</td><td>Landscape area & green strip (shelter trees around the periphery)</td><td>62294.00</td><td>29.08</td></tr>
<tr><td>b.</td><td>Water bodies</td><td>10709.91</td><td>5.00</td></tr>
<tr><td>c.</td><td>Lawns & playground and landscape area</td><td>45574.97</td><td>21.27</td></tr>
<tr><td>d.</td><td>Parking slots (marked parking)</td><td>15591.23</td><td>7.27</td></tr>
<tr><td>e.</td><td>Peripheral Roads & driveway parking (open)</td><td>24750.00</td><td>11.55</td></tr>
<tr><td>f.</td><td>Internal roads</td><td>19312.28</td><td>9.02</td></tr>
<tr><td>g.</td><td>STP Area</td><td>5260.91</td><td>2.47</td></tr>
</table></td></tr>
<tr><td>1.4</td><td>Pre-construction investigations e.g. bore houses, soil testing?</td><td>No</td><td>There will be no physical impact on the locality due to the soil testing or other pre-construction investigations</td></tr>
<tr><td>1.5</td><td>Construction works?</td><td>Yes</td><td>(Please see Conceptual plan)
Total plot area of the project is 52.93 acre (214198.3 sqm.) out of which 80% (171343.9 sqm) is allotted for housing complex as per approved zoning plan. The housing</td></tr>
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<tr><td></td><td></td><td></td><td>complex plans to have Type-II, III, IV & V modular flats with area details given below
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The 20% area marked as above is 42839.66 sqm. and approx. built up area is 7962 sqm. thus the total built up area for the residential + institutional, school, commercial comes out 201596.59 sqm.

The construction activities will be confined within the project site, there will be no physical changes due to project development activities outside the project boundary.
Approved Layout Plan of the CAP complex and the section plans of Type of Houses attached as Annexure-X and Annexrue-Xa – d respectively.</td></tr>
<tr><td>1.6</td><td>Demolition works?</td><td>No</td><td>--</td></tr>
<tr><td>1.7</td><td>Temporary sites used for construction works or housing of construction workers?</td><td>No</td><td>The project site will have temporary store rooms, site office, construction camps for housing workers during project development, which will be removed later</td></tr>
<tr><td>1.8</td><td>Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations</td><td>Yes</td><td>- The complex will have multi storeyed blocks with maximum of 7 storeys (Maximum height 23.165m).
- There is no basement. There will be total 74 blocks of houses, 53 of Type II, 11 of Type III, 8 of Type IV and 2 of Type V.
- Each block has stilt + 6 storeys.
- In addition shopping centre, school, community centre,</td></tr>
</table>

			dispensary, gurudwara and mandir will have maximum height of 10.97m.
1.9	Underground works including mining or tunneling?	No	-
1.10	Reclamation works?	No	-
1.11	Dredging?	No	-
1.12	Offshore structures?	No	-
1.13	Production and manufacturing processes?	No	-
1.14	Facilities for storage of goods or materials?	Yes	Separate raw material storage yard will be maintained as per U.T. Norms. • Cement will be separately stored under cover in bales. • Sand will be stacked neatly under tarpaulin cover. • Bricks and steel will be laid in open. • The raw material handling yard will be located within the project site and separated by enclosures.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	**Liquid Effluent:** During construction phase, sewage will be treated and disposed through septic tanks with soak pits. During operation phase ~ 843 Kld of the waste water will be generated and treated upto tertiary level in the proposed sewage treatment plant (STP) of capacity (1.00 mld). The treated sewage will be used in dual plumbing, flushing and horticulture. Dewatered / dried sludge from STP will be used as manure in horticulture. **Solid Waste** **Construction Phase** Leftover cement, mortars, aggregates, sand and other inorganic material will be recycled and reused in embankment or other construction works. **Operation Phase** Approximately 4500 kg/day of domestic solid waste is estimated to be generated from the project activity out of which biodegradable will be approx. 2700 kg/day, non biodegradable comprising paper plastics, cans, glassware/ paper will be approx. 1575 kg/day and hazardous waste - used oil, including medical waste from

<table>
<tr><td></td><td></td><td></td><td>dispensary & e-waste will be approx. 225 kg/day.
It will be collected, segregated and disposed off as per HSW / MSW disposal norms by Chandigarh municipal corporation and authorized vender approved by CPCC.</td></tr>
<tr><td>1.16</td><td>Facilities for long term housing of operational workers?</td><td>No</td><td>On–site housing facilities will be provided for maintenance team/ labour. The impact due to this will be negligible</td></tr>
<tr><td>1.17</td><td>New road, rail or sea traffic during construction or operation?</td><td>No</td><td>There will be no new road or rail construction. The project site has good connectivity to sector roads. Only internal roads/ paths will be developed for vehicular movements for transportation of construction materials during construction phase whereas internal tracks and paths will be developed for traffic circulation during operational phase.
The increased traffic levels (considering 100% occupancy) due to proposed project will be 2174 equivalent car units on roads. Details of parking facilities proposed within the project site is as under:-
<table>
<tr><td>Required parking as per Chandigarh Administration Laws

Extra 20 % of 1656 (for visitors)</td><td>1 ECS x 1272 + 1.25 ECS x 264 + 2 ECS x 96 + 2 ECS x 24 = 1842 ECS

=331.2 ECS</td></tr>
<tr><td>Total Required Parking</td><td>2174 ECS</td></tr>
<tr><td colspan="2">Parking details as follows:</td></tr>
</table>
<table>
<tr><th>Type of Parking</th><th>Total Area (in sq.m.)</th><th>% plot area</th><th>Total no of ECS</th></tr>
<tr><td>Total stilt Parking (@30 sq.m. per ECS)</td><td>19247.79</td><td>8.98</td><td>641.6</td></tr>
<tr><td>Total Open parking slots around blocks (@25 sq.m. per ECS)</td><td>15591.23</td><td>7.27</td><td>623.6</td></tr>
<tr><td>Road / Driveway parking at the peripheral (@25 sq.m. per ECS)</td><td>24750.00</td><td>11.55</td><td>990</td></tr>
<tr><td>TOTAL PARKING PROVIDED</td><td>59589.02</td><td>27.82</td><td>2255 against required 2174</td></tr>
<tr><td colspan="4">Parking provided as per norms of Ministry of Urban Development, GOI dated 16.09.2009 and 23.05.2012.</td></tr>
</table></td></tr>
<tr><td>1.18</td><td>New road, rail, air</td><td>No</td><td>The area is already developed. It is well connected by road</td></tr>
</table>

	waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?		to whole of the city, so there will be no alteration of routes or laying down of new routes due to project activity.
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	Not applicable, since the development of site does not alter any surroundings so there will be no need for closure or diversion of transport routes.
1.20	New or diverted transmission lines or pipelines?	No	--
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	No river is present near the project or crossing the project site, hence no impoundment damming, culverting, realignment or other changes to the hydrology of surface water courses are applicable here
1.22	Stream crossings?	No	As such no river or drain is passing through the project site.
1.23	Abstraction or transfers of water form ground or surface waters?	No	The Water requirement during construction will be maintained and operated by Public Health department, Chandigarh Administration. Rain water harvesting will be done for capturing maximum runoff through trenches and recharge wells
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	Yes	The run-off will increase paved surface however increased run-off will be managed by well designed rainwater harvesting system.
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	All the construction material (bricks, steel, sand, timber will be transported to the site in covered trucks) adequate parking space within the project site for loading & unloading the material will be provided. Adequate parking (stilt & open) space for 2255 ECS against 2174 ECS will be provided in operation phase to the residents and commercial occupants of the premises.
1.26	Long-term dismantling or decommissioning or restoration works?	No	No long term dismantling / decommissioning is proposed.
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	**--**
1.28	Influx of people to an area in either temporarily or permanently?	Yes	During Construction phase, labour will be hired by the contractor which will stay in temporary construction camps inside the CAP premises. During operation phase, about 8300 people will stay

			permanently in the residential complex and thus add to existing population of the area.
1.29	Introduction of alien species?	No	No alien species will be introduced
1.30	Loss of native species or genetic diversity?	No	The site has local vegetation which will be cleared during site development as per suggestion of Department of Horticulture, Chandigarh Administration. No endangered, threatened or endemic species exists in the study area, so insignificant impact is visualized on the flora and fauna of the project site
1.31	Any other actions?	No	----

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

S. No.	Information/checklist confirmation	Yes/ No	Details thereof (with approximate quantities/ rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)	Yes	The proposed CAP complex is construction of new housing project as per Master Plan 2031 • Total plot area of the project is 52.93 acre (214198.3 sqm.) out of which 80% (171343.9 sqm) is allotted for housing complex as per approved zoning plan. The housing complex plans to have Type-II, III, IV & V The housing complex will have multi storeyed blocks with maximum of 7 storeys (Maximum height 76 feet) and no basement. Each block has stilt + 6 storeys There will be total 74 blocks of houses, 53 of Type II, 11 of Type III, 8 of Type IV and 2 of Type V. • In addition, shopping centre, school, community centre, dispensary, gurudwara and mandir have been proposed will have maximum height of 36 feet. • The green area 62294 sqm. contributes 29.08% of the total plot area (in addition 5% to the water bodies) • Open space on the plot will be utilized for internal roads network, pavements, landscaping and gardening.
2.2	Water (expected source & competing users) unit: KLD	Yes	- Average water requirement will be 129 m^3/ day during construction phase. During operational phase a total of 1328 Kld water is required out of which 654 Kld of fresh water and 674 Kld is recycled treated water. Total waste water generation will be 842 kld which includes 80% of sewege generation from domestic uses and

<table>
<tr><td></td><td></td><td></td><td>100% of flushing uses. Total capacity of STP will be ~1000 Kld Treated water recovery from STP will be 674 kld out of which 319 kld will be used in flushing of toilets, 343 kld for green area development/ plantation and excess 12 kld treated water will be used for DG cooling etc.
- Water during construction and operation phase, will be maintained and operated by Public Health department, Chandigarh Administration
- Water conservation practices and rain water harvesting plan as per the guidelines, will be implemented to conserve the resources (See Annexure-XI)</td></tr>
<tr><td>2.3</td><td>Minerals (MT)</td><td>No</td><td></td></tr>
<tr><td>2.4</td><td>Construction material – stone, aggregates, sand / soil (expected source – MT)</td><td>Yes</td><td>The approx. quantities of construction materials required are as under.
<table>
<tr><th>Material</th><th>Quantity</th><th>Source</th></tr>
<tr><td>Coarse / Fine aggregate (cu.ft.)</td><td>326325</td><td rowspan="7">Local authorized vendors</td></tr>
<tr><td>Wood/Timber (cft.)</td><td>750</td></tr>
<tr><td>Cement (Tonne)</td><td>29550</td></tr>
<tr><td>Structural Steel (Tonne)</td><td>15410</td></tr>
<tr><td>Bricks (nos.)</td><td>37460097</td></tr>
<tr><td>Glass (sq.m)</td><td>10000</td></tr>
<tr><td>Sand (cft.)</td><td>2122928</td></tr>
</table></td></tr>
<tr><td>2.5</td><td>Forests and timber (source – MT)</td><td>Yes</td><td>Mentioned above at S. No. 2.4.</td></tr>
<tr><td>2.6</td><td>Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)</td><td>Yes</td><td>The power demand of about 4700 KW for the proposed project will be met by Electricity Department, Chandigarh for both construction and operation phase attached as Annexure-XII. A separate sub-station has been planned in the complex. In case of power failure silent DG sets have been planned.
Fuel requirement: High speed diesel / industrial oil with low sulphur content will be consumed for DG in case of power failure. HSD will be stored on the site in a drum / tin with proper identification mark / labels in identified area. Fire and safety measures will be taken as per the guidelines from the concerned authority.</td></tr>
<tr><td>2.7</td><td>Any other natural resources (use appropriate standard units)</td><td>Yes</td><td>Solar lighting & heating system provided</td></tr>
</table>

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

S.No.	Information/Checklist confirmation	Yes /No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	Yes	The proposed project is a residential development project and hence no storage of hazardous chemicals (as per rules) will be done, except HSD required to run stand by DG sets for which the quantity stored will be below the threshold limit specified in the MSIHC rules. Used oil, from DG set, will be disposed off according to MSIHC rules.
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	Yes	During construction phase, activities may result in pondage of water in the dug-out areas of site which have potential for creation of mosquitoes breeding and spreading of water borne diseases. The most important construction aspects are the impediment of temporary drainage by blocked silt traps or the ponding of water within foundation works. Other mosquito breeding sites may be created through the use of uncovered water tanks. The CAP will give careful attention to the design and maintenance of earthworks and drainage systems during construction to avoid the creation of significant habitat areas for mosquito larvae. The use of larvicides may be required to prevent mosquito breeding in silt traps.
3.3	Affect the welfare of people e.g. by changing living conditions?	Yes	Socio-economic standard of people around will increase because of increased employment opportunity provided by this project which inturn will lead to better quality of life of the people.
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,	No	Not Applicable
3.5	Any other causes	No	Not Applicable

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

<table>
<tr><th>S.No</th><th>Information/Checklist confirmation</th><th>Yes/No</th><th>Details thereof (with approximate quantities/ rates, wherever possible) with source of information data</th></tr>
<tr><td>4.1</td><td>Spoil, overburden or</td><td>No</td><td>----</td></tr>
<tr><td>4.2</td><td>Municipal waste (domestic and or commercial wastes)</td><td>Yes</td><td>Approx. 4500 Kg of solid waste comprising of paper, cardboard, plastics, kitchen waste and other general routine activities will be generated in the project. It will be non hazardous in nature mainly consisting of biodegradable and non biodegradable matter and will be disposed as per MC norms
<table>
<tr><td>Biodegradable</td><td>2700 kg/ day</td></tr>
<tr><td>Non biodegradable</td><td>1575 kg/day</td></tr>
<tr><td>Hazardous waste including Bio-medical and E-waste</td><td>225 kg/day</td></tr>
</table></td></tr>
<tr><td>4.3</td><td>Hazardous wastes (as per Hazardous Waste Management Rules)</td><td>Yes</td><td>Spent oil, if any, generated from DG sets, will be carefully stored in High Density Polythene (HDPE) drums separately afterwards sold to the vendors registered with CPCC. Care will be taken to avoid spills/leaks

Dispensary/ Bio-medical waste will be sent to the CPCC approved bio-medical waste disposal vendors.

E-waste generated will be disposed off through approved agencies of CPCB/ Chandigarh Pollution Control Committee as per electronic waste management and handling rules 2011.</td></tr>
<tr><td>4.4</td><td>Other industrial process wastes</td><td>No</td><td>Not applicable, as this is a residential construction project.</td></tr>
<tr><td>4.5</td><td>Surplus product</td><td>No</td><td>Not applicable, as this is the residential construction project.</td></tr>
<tr><td>4.6</td><td>Sewage sludge or other sludge from effluent treatment</td><td>Yes</td><td>Wet sludge generated from STP, will be used as manure in landscaping.</td></tr>
<tr><td>4.7</td><td>Construction or demolition wastes</td><td>Yes</td><td>Waste is generated at different stages of construction processes Waste comprises excessive cement mix or concrete left after work is over, rejection caused due to change in design or wrong workmanship etc. Estimated waste generation during construction rejection is 40-60 kg / sq. m.

Concrete appears in two forms in the waste. Structural elements of building have reinforced concrete, while foundations have mass non-reinforced concrete. Excavation</td></tr>
</table>

			of earth generates muck which will be used inside premises. Other wastes include top soil, clay, sand and gravel. These are normally reused as filler at the same site after completion of excavation work. Besides, miscellaneous materials like glass, plastic material and general refuse, scrap metal, cardboard, will be sent to the disposal site at Dadoomajra or as per facilities available with the administration. Thus it will not cause any health hazard in the project area.
4.8	Redundant machinery or equipment	No	**-**
4.9	Contaminated soils or other materials	No	**-**
4.10	Agricultural wastes	No	**-**
4.11	Other solid wastes	No	**-**

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources	Yes	Air emissions comprising PM, NOx, SO_2 and CO will be from the operation of 5 silent DG sets, if used, as the stand by power source. The DG stack of adequate height (as per CPCB norms) will be provided to disperse pollutants generated from the DG set. • HSD will be used as fuel for DG set with 0.25 % sulphur content and specific gravity of 0.85 • The calorific value of HSD will be 10800 cal/ gm with negligible ash content. • The DG set will have four stroke engine with gross heat rate of 2000 kcal/Kwh • The HSD consumption would be about 45 l/ hr Besides DG sets, air emissions will also be from the vehicles approaching and leaving the complex. Hence, there will be air emissions in the vicinity of the housing complex SPM, NOx, SO_2 and CO, hydrocarbons. The relevant calculations for estimation of emission rates are as below: Sulphur Dioxide HSD Consumption Rate : 45 l/ hr Sulphur Content : 0.25% HSD Density : 0.85 kg/ltr. Emission rate = 45 ltr/ hr x 0.85 kg/ ltr x 0.25/100 x 64/32

			= 0.191 kg/hr= 0.053 g/s. - Oxides of Nitrogen For calculation of oxides of nitrogen emission rate, the emission limit of 710 ppm (1455.5 mg/Nm^3) is considered. The rate of emission NOx is given below: Emission rate = 1455.5 mg/ Nm^3 x 0.190 Nm^3/s x 1/1000= 0.27 g/s Based on these low level of emission rates from the stacks of DG sets, it can be inferred that the area in and around the proposed project site is unlikely to be significantly affected due to the proposed project activities. However following measures will be taken: --Environmentally compliant D.G. Set with proper stack height will be installed to maintain the emissions within the norms. --PUC certified vehicles will be used --Landscape area will help to contain the emissions --Adequate width of driveways proposed to avoid traffic congestion during peak hours.
5.2	Emissions from production processes	No	There is no production process.
5.3	Emissions from materials handling including storage or transport	Yes	The emissions expected from construction phase will be dust arising from material handling and vehicular emission from transport vehicles. These will be restricted to the construction site only. These include emissions due to idling of the vehicles during loading and unloading activities which will be very minimal as vehicles will be with EURO Engine. Besides, construction machinery used will be properly maintained.
5.4	Emissions from construction activities including plant and equipment	Yes	During construction, the dust emission sources will be from excavation, haul road movements, construction & material handling which would impact increased levels of PM_{10}, $PM_{2.5}$, NO_X, HC, VOC etc. The impact will be however, be reversible, marginal and temporary in nature. The impact will be confined within the project boundary and is expected to be negligible outside the project boundaries. **Mitigation** measures like: minimizing drop heights of debris, enclosures, covered transport, use of barriers, wetting surface by sprinkling water, plantation, avoid idling of vehicles etc. will be followed. Proper upkeep and maintenance of vehicles, sprinkling of water on roads at construction site, providing sufficient vegetation etc. are some of the proposed measures that would greatly

<table>
<tr><td></td><td></td><td></td><td>reduce the impact on the air quality during the construction phase of the project.
Other diffused source of gaseous emissions from the construction site would be if the labour uses fuel wood for cooking and heating during winters. The construction contractor will ensure that such practice is not adopted by the labors and they are provided with LPG cylinders for cooking in their labour camps.</td></tr>
<tr><td>5.5</td><td>Dust or odours from handling of materials including construction materials, sewage and waste</td><td>Yes</td><td>The dust and odour emanating from various project activities will be controlled by:
<table>
<tr><th>Source</th><th>Impact</th><th>Mitigation</th></tr>
<tr><td>Earth works for buildings, roads and parkings.
• Storage of spoil and fill.
• Operation of machinery
Vehicle movements</td><td>Dust generation
•Wind-generated dust from exposed areas of soil and mounds of stored soil.</td><td>Water sprinkling
• Predominant wind direction will be considered for siting stockpiles.
• Stockpiles will exist for the shortest possible time.
• Stockpiles will be enclosed or securely sheeted.</td></tr>
<tr><td>• Storage, Handling and transportation of SW.</td><td>•Release of gases may irritate eyes, cause cough or sore throat,</td><td>• During construction the waste will be collected and stored at earmarked places.
• In operational phase separate colour coded bins will be provided for collection.
• Waste will be collected and transferred on regular basis.</td></tr>
<tr><td>Sewage sludge</td><td>Odour</td><td>Filter press and proper sludge digestion</td></tr>
<tr><td>STP operation</td><td>Odour</td><td>Bushes with active fragrance planted in down wind</td></tr>
<tr><td>Paint material</td><td>Odour
VOCs</td><td>Low VOC products (paints, adhesives, sealants) will be used</td></tr>
</table></td></tr>
</table>

5.6	Emissions from incineration of waste	No	---
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	The construction waste generated will be reused back for construction of roads and paved areas within the project area. It is ensured that no burning of waste occurs on site.
5.8	Emissions from any other sources	No	**-----**

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

S.No.	Information/Checklist confirmation	Yes /No	Details thereof (with approximate quantities/ rates, wherever possible) with source of information data with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	**Yes**	The machinery which will be used for construction will be of high standard and will adhere to international standards. These standards itself take care of noise pollution control, vibration control and air emission control hence insignificant impact due to construction machinery is envisaged. During the operational phase, noise will be generated from the DG sets, if used during power failure, pump room, vehicular movement and general noise characteristic of a residential complex. The DG set room will be isolated from the outside environment with proper acoustic arrangement to control. The noise levels outside the DG room will be maintained within the CPCB norms both during day & night time. However the worst case scenario for noise pollution would occur when all DG sets are running together. The impact of noise generated at source has been predicted by the use of equation and certain assumptions. For an approximate estimation of dispersion of noise in the surroundings from the source point, a standard mathematical model for sound wave propagation is used. The equation for sound wave propagation is as follows: Noise (Receptor) = Noise (source) – 20 Log [Distance (Receptor)/ distance (Source)] For prediction, flat terrain and environmental attenuation factors are not considered so as to formulate the worst case scenario. With control measures, the total noise at 1 m distance from the DG set room will be about 75 dB(A) . This will reduce further and at about 50 m distance, the noise would be about 50-52 dB(A). So, the location of the DG set room will

			be in such a way that the noise level has minimum impact on the residents of the complex. Thus the noise in operation phase of the project would have minor or no negative impact on the overall acoustic of the CAP complex and immediately adjacent areas. The effect of high noise on operating personnel in DG and pump room will be considered and appropriate mitigation measures adopted. Continuous exposure to high noise levels above 90 dB(A) affects the hearing capacity of the workers / operators and hence would be avoided. To prevent these effects, it has been recommended by Occupational Safety and Health Administration (OSHA) that the exposure period of affected persons be limited.
6.2	From industrial or similar processes	No	--
6.3	From construction or demolition	Yes	Noise will be generated during construction by various construction machinery and equipments which would be intermittent and of short duration. More trucks and vehicles will be required to transport construction material and machinery to and from the site. Heavy construction traffic for loading and unloading, fabrication and handling of equipment and construction materials are likely to cause an increase in the ambient noise levels from the site, the areas near to the complex are likely to be affected more. It is usually observed that the machinery produces noise levels in the range 68-92 dBA. Factors like air absorption, vegetal cover etc. would result in significant attenuation of atleast 25-30 dBA at 100 m distance. The resultant noise levels on proposed project at 100 m distance at peak level of construction are anticipated to be about 50-55 dBA, which is well within the limit for residential area during the day time, Hence, the noise levels are considered to have insignificant impact. Further to minimize these potential impacts, major construction activities would be scheduled during normal daylight working hours The construction contractor will use equipments that with appropriate noise muffling devices resulting in the least possible noise
6.4	From blasting or piling	No	No such activity will take place in the project.
6.5	From construction or operational traffic	Yes	There may be increase in the noise levels due to traffic arising due to the construction of the CAP complex. which will be minimized by: • Effective traffic management by providing sufficiently wide driveways to avoid traffic congestion especially

			during the peak hours. • Provisions of internalized designated parking for smooth traffic movement • Landscape & green belt area will help in reducing the noise propagation.
6.6	From lighting or cooling systems	No	--
6.7	From any other sources	No	--

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

S.No	Information/Checklist confirmation	Yes /No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials	No	No hazardous material of any sort will be used or stored during construction or operation phase of the project. If used it will be disposed off according to SHW norms as discussed at S.No 1.15.
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	No sewage generated will be discharged either into the water body or on land. The treated effluent from STP will be used in dual plumbing and green area development inside the campus.
7.3	By deposition of pollutants emitted to air into the land or into water.	Yes	Minor air emissions will be generated due to increased vehicular movement and occasionally use of DG set for which effective measure (described in S.No. 5.3) will be taken. Hence no deposition of pollutants emitted to air into the land or into water. No such pollutant will be emitted into the air so as to deposit into the land or water.
7.4	From any other sources	No	-
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	There is no risk anticipated for long term build up of pollutants in the environment from any of the source

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances	Yes	Detailed at S. No 8.2
8.2	From any other causes	Yes	Fire fighting system in the proposed CAP complex will consist of fire detection system and fire fighting system as per IS: 2189. Automatic Fire Detection with different type of heat and smoke detector and Alarm system will be provided to meet the requirement of the National Building Code. The proposed complex will be provided with adequate fire protection arrangements such as underground fire water storage tank, one over head fire water storage tank, fire pump, wet riser system, hose reel hose box, sprinkler system, manual fire alarm system, portable fire extinguisher, fire pump, emergency light. Each floor will be provided loop zone from main fire alarm panel on the central security room. A repeater panel will be provided in guard room of the complex. The materials used for construction of the building will be of low flame rating. The construction of electric substation and installation of transformers, LT and HT panels will be as per the provisions specified by the concerned authorities. Also there is provision of automated lighting controls with day light sensors. Each transformer will be separated from the other by fire resistant shield wall extending up to one meters on sides above the highest point of the transformer so that fire risk is minimized.
8.3	Could the project be affected by natural disasters causing environmental damage	No	**Floods:** The flood plain of Patiala ki Rao and other streams in the area is very small, as the river is in their young stage (because of nearby origin from hills) hence the flooding chance will be negligible. However

	(e.g. floods, earthquakes, landslides, cloudburst etc)?		maximum rainfall intensity is taken in to consideration in designing internal drainage line, rainwater harvesting structure & number to minimize water logging / flooding problems Annexure-XI. **Earthquakes:** The project area is located in Seismic Zone IV of Seismic map of India, due allowance will be given in designing of civil structures of the proposed residential CAP complex which will be done as per National Building Code (NBC)-2005. They are: - Building designed as an earthquake resistant RCC framed structure. - The design of frame structures is based on stipulation of IS codes of earthquake design (IS:1893-2002)

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

S. No.	Information/Checklist confirmation	Yes /No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting**. c**ities, ancillary development or development stimulated by the project which could have impact on the environment e.g.:	Yes	The proposed project site is located in the periphery of the Chandigarh city and is already a part of Draft Master Plan 2031of Chandigarh.
	• Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.)	Yes	The project will have positive impact on the ancillary infrastructure like roads, markets, public health, amenities, conveyance facilities etc. in the area.
	• Housing development	Yes	The project is proposed Housing development only.
	• Extractive industries	No	Not applicable, as this is a building construction project.
	• Supply industries	No	Not applicable, as this is a building construction project.

	• Other	No	Not applicable as this is a building construction project
9.2	Lead to after-use of the site, which could have an impact on the environment.	Yes	The site will be used for residential purpose.
9.3	Set a precedent for later developments.	No	Because of declaration of New Chandigarh many other developers coming in to the area.
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects.	No	--

(III) Environmental Sensitivity

S.No.	Areas	Name/ Identity	Aerial distance (within 15 km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value.	1. Sukhna Wildlife Sanctuary 2.City Bird Sanctuary 3. Patiala-ki-Rao forests	6.4km 5.0 km 0.5 km
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests.	Sukhna Lake and Wetland Patiala ki Rao Dhanas Lake	6.4 Km 0.5 km 0.5 km
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	1.Sukhna Lake and Wetland 2.Dhanas Lake Habitat for number of migratory birds 3.Bird sanctuary located at Sector 21 Chandigarh	6.4 km 0.5 km 5.0 km
4	Inland, coastal, marine or underground waters	Ground water	--
5	State, National boundaries	State boundaries - Himachal Pradesh - Haryana - Punjab	 12 km 11 km 3 km

6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	NH-21 Dakshin Marg	About 3 km away. Dakshin Marg of Chandigarh immediately infront of project site.
7	Defence installations	Air Force Station, Western Command Chandimandir ITBP	14 km About 16 km 13 km
8	Densely populated or built-up area	Chandigarh Sector 38 West, 39, Milk colony Dhanas	Within 5 km
9	Areas occupied by sensitive man-made land uses *(hospitals, schools, places of worship, community facilities)*	**Hospitals:** (PGI sector-12, GMCH 16, 32, Fortis, Max Hospital) **Schools/ Colleges** (DAV, GCW, GCM, Panjab University sector-14, PEC, CCA etc.) **Worship places:** Mansa Devi, Jayanti Devi temple, saketri, Nada sahib **Community Facilities**: Number of Clubs, Hotels, Golf club, lake club of Chandigarh and other recreational sites.	Within 15 km radial area
10	Areas containing important, high quality or scarce resources *(Ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)*	High tourism (Sukhna Lake, Rock Garden, Rose garden, Leisure valley, Dhanas lake, Sector-42 lake) Botanical Garden, Sarangpur	Within 15 km radial area within 4 km
11	Areas already subjected to pollution or environmental damage. *(Those where existing legal environmental standards are exceeded)*	The overall air quality of Chandigarh is on increasing trend due to vehicular traffic and over exploitation of the peripheral villages	Within 15 km radial area.

12	Areas susceptible to natural hazard which could cause the project to present environmental problems (*Earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions*)		The area is classified as Zone-IV as per the Seismic Map of India, suitable seismic coefficients in horizontal and vertical directions respectively will be adopted while designing the structures.

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

Date:

Place:

Signature of the Applicant

Name:

Designation:

Address:

APPENDIX II
(See paragraph 6)

FORM-1A

(Only for Construction Projects listed under item 8 of the schedule)

CHECK LIST OF ENVIRONMENTAL IMPACTS

(Project proponents are required to provide full information and wherever necessary attach explanatory notes with the Form and submit along with proposed environmental management plan & monitoring programme)

SECTION -1 LAND ENVIRONMENT

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

About the Project

The proposed Residential Complex for Chandigarh Armed Police (CAP Complex) is located in the village Dhanas, U.T. Chandigarh along the extension road of Dakshin Marg, to the village. It covers an area of 52.93 acres (214198.3 m^2). The complex has been earmarked in the Draft Development Master Plan- 2031 of Chandigarh. In this plan the proposed developments in the periphery of Chandigarh is defined in 17 distinct pockets around the city of Chandigarh. The CAP project falls in Pocket -5. The total area of this pocket in the Master Plan is 258.062 acres, with residential complex for Chandigarh Armed Police (52.9 acres) in its centre as shown in Fig. 1.1a. The Administrative Approval of the CAP complex, the Approval for the revised Building plan and further approval for re-revised plinth level plan are attached as Annexures -VI, VII & VIII.

The core area around the proposed residential complex is having characteristics of semi urban culture. The residential areas comprising Milk Colony / Gawala colony that forms part of the village Dhanas exists infront, across the road. Many other developers are coming up with their residential projects in the area. The Chandigarh Armed Police is committed to develop all necessary infrastructures in its proposed complex. The boundary wall of the complex has been constructed (Pic. 1.1)

Pic. 1.1 Showing the Security Gate of the proposed residential complex of Chandigarh Armed Police (CAP Complex)

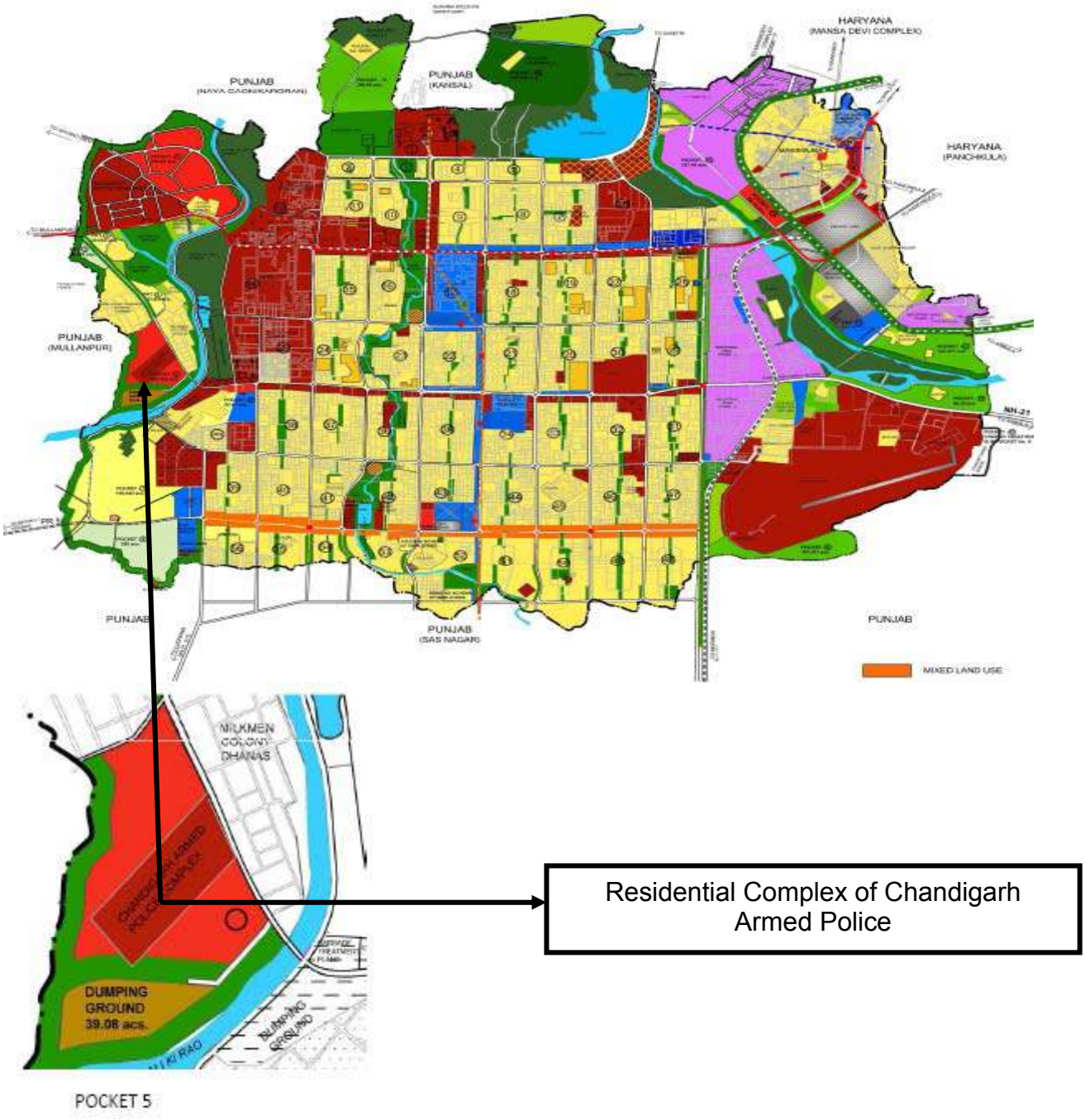

Fig. 1.1a Draft Development Master Plan of Chandigarh 2031 showing the site for Residential Complex of Chandigarh Armed Police in Pocket -5.

The project proposes to provide residential facilities for different classes of CAP personnel.

- The complex will have 4-Types of houses: 1272 of Type II, 264 of Type III, 96 of Type IV and 24 of Type V.
- There will be 53 blocks of Type-II houses, 11 blocks of Type-III, 8 blocks of Type-IV and 2 blocks of Type-V houses. Also there is a provision of servant houses with Type-IV and V houses. Thus total of 74 blocks.
- Each house has been designed with 2 or 3 bedrooms, kitchen, toilets, staircase, stilt and lift as per revised norms. (The layouts of the type of houses attached as Annexures-X a to d)
- Each of the block is 6- storeyed and has stilt parking at ground level.
- The complex is proposed to provide about 1656 dwelling units to house persons @ 209 persons per acre.
- Besides the houses, other infrastructure comprising of a community centre, a dispensary, a gurudwara, mandir, a shopping complex, substation, a school building, security posts, Sewage Treatment Plant have been planned in the campus as per Zoning Plan from Department of Urban Planning, Chandigarh Administration.

A. SITE LOCATION AND SURROUNDING FEATURES

The project site is located at approximate 30°46'6.59" N and 74°44'50.77" E at village Dhanas, U.T. Chandigarh and lies on Survey of India Toposheet No. H43K9. Fig 1.1 shows the location of the project site on topographical sheet H43K9 and 500 m, 2.5 km, 5.00 Km radial area around the site on the survey of India Sheets Nos. H43K9, H43K10, H43K13 & H43K14 (upto 5 Km radial area forms the study area for the impact analysis). The site is situated adjacent to Sector 38 West, and is very close to elite sectors 12, 14 and 15 of Chandigarh. The satellite imagery (Fig. 1.2) shows the location of the proposed complex and its surroundings. The site is on the main road, surrounded by residential areas of Sector 38-West on the left, Milk colony (village Dhanas) infront across the road, agricultural lands on the back side (WNW) and open dumping area for solid waste in (NW) as depicted in Pic. 1.2.

The shape of the plot is almost rectangular, terrain is almost flat. The highest and lowest levels of the plot are 101.689 m. and 94.870 m (msl) respectively as marked on the Survey Plan. The approved Layout Plan and approved Contour plan are attached as Annexures-X & XIII respectively.

The proposed project is planned and designed as per the regulations and norms laid down by Chandigarh Administration and will be consistent with the surrounding. There will be no change in land-use due to project activities.

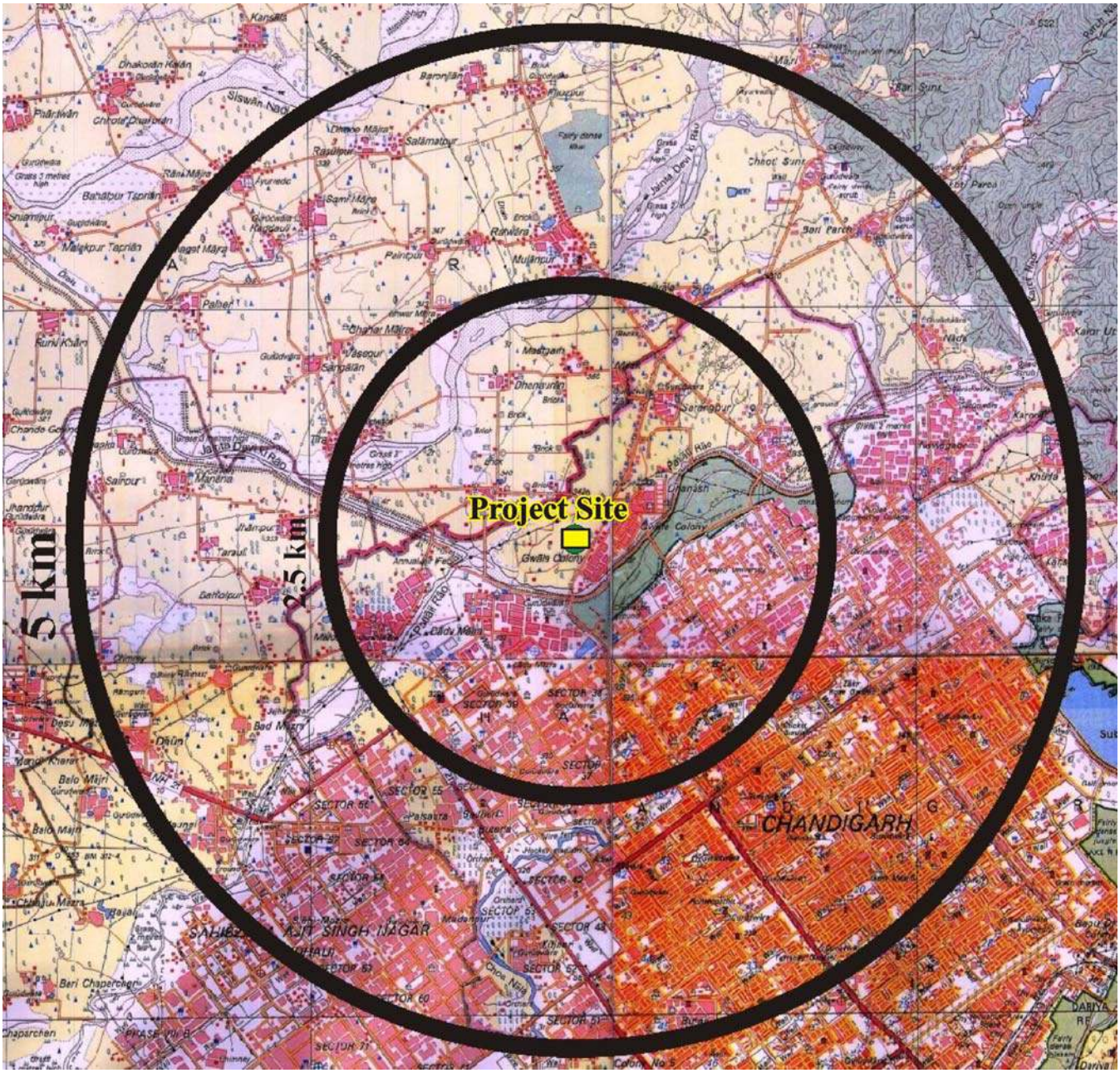

FIG. 1.1 Survey of India Topographical Sheets Nos. H43K9, H43K10, H43K13 & H43K14 showing the proposed project site and 2.5 & 5.0 Km radial area around. Upto 5 Km radial area forms “The Study Area”

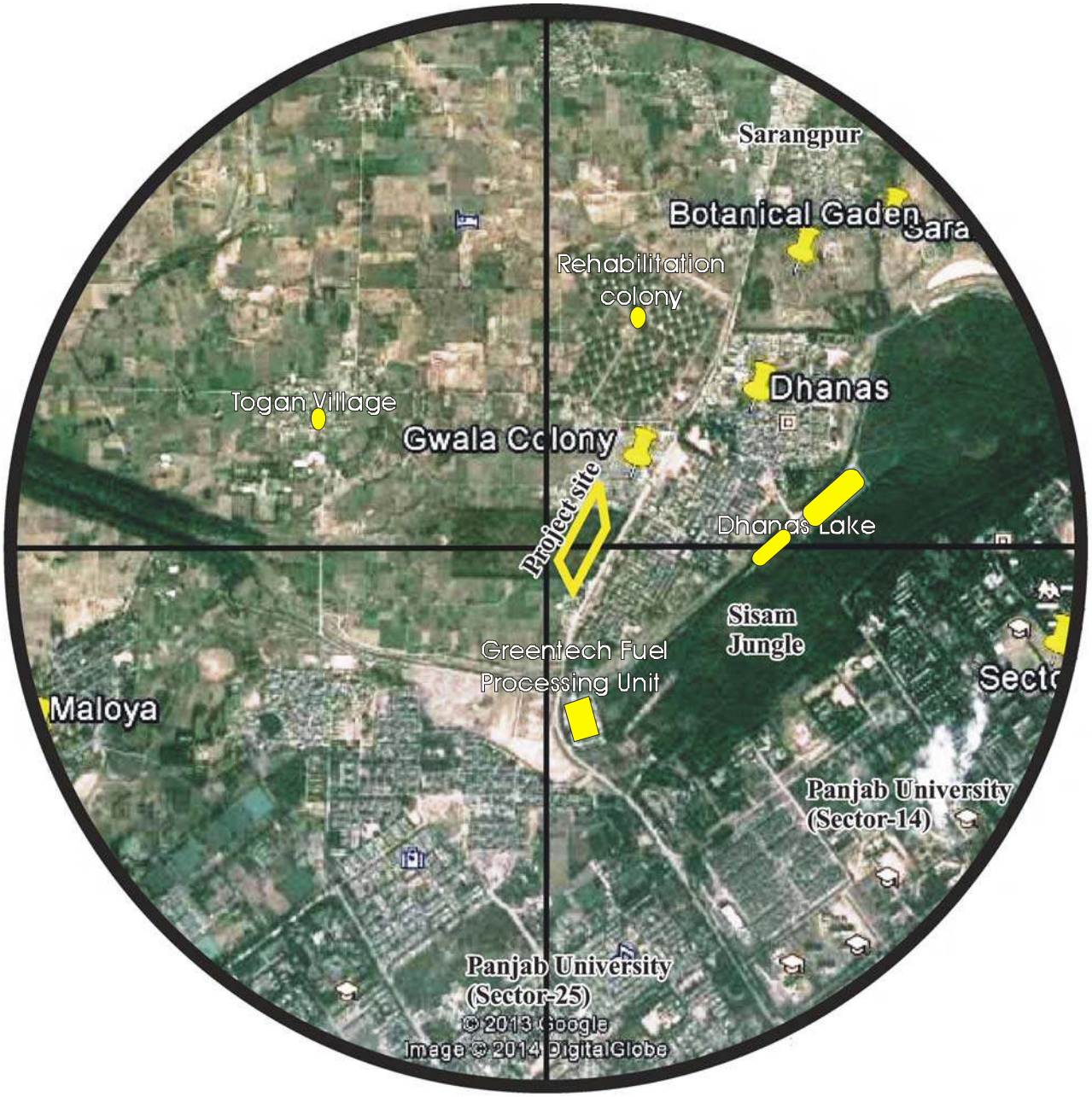

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FIG 1.2 Satellite Imagery around the proposed CAP Complex (5 km) showing the Surroundings

Dumping areas for Municipal Solid Waste adjoining the site on the left (NW of Project Site)

Tubewell and Agricultural land of the village at far end (WWN of Project Site)

Marble vendors along the road infront (Towards North East of Project Site)

Extended Dakshin Marg Road & the Milk Colony of Dhanas village across the road (SE) in front of CAP complex

Pic. 1.2 Surrounding features of the proposed site

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

The major project requirements in terms of resources and infrastructures facilities are as below:

A. LANDUSE AND AREA STATEMENT FOR THE PROJECT

The salient features of the land use are:

- Total plot area of the project is 52.93 acre (214198.3 sqm.) out of which 80% (171343.9 sqm) is allotted for housing complex. The remaining 20% of the area is earmarked for institutional area (15%), commercial (2.5%) and religious area (2.5%).
- The areas earmarked as per approved Layout Plan are as under (Table 1.1)

Table 1.1
Landuse for the proposed residential complex for Chandigarh Armed Police

Sr. No	Land use	Area (sq m)	% of total area
1.	Plot Area	214198.30	100.00
2.	Covered Area of buildings at ground floor	30705.00	14.33
3.	Open Areas	183493.30	85.67
a.	Landscape area & green strip (shelter trees around the periphery)	62294.00	29.08
b.	Water bodies	10709.91	5.00
c.	Lawns & playground and landscape area	45570.41	21.27
d.	Parking slots (marked parking)	15591.23	7.27
e.	Peripheral Roads & driveway parking (open)	24754.56	11.55
f.	Internal roads	19312.28	9.02
g.	STP Area	5260.91	2.47

- **Floor Area Ratio (FAR)**

Builtup area of houses / plot area for residences = 168425.66 sqm./155839.0896 sqm.
=1.08(achieved) against permissible FAR 1.5

It is proposed to provide about 1656 dwelling units to house about 8300 persons. The complex will have 74 blocks comprising 4 types of housing block stands. All the blocks will be having 6 storeys and a stilt i.e. S+6 storeyed.

B. WATER REQUIREMENT AND SUPPLY

Average water requirement for the proposed project (including the domestic use) will be 129 Kld during construction phase and 1328 Kld during the operation phase.

Water supply both, during construction and operation phase**,** will be maintained and operated by Public Health department Chandigarh Administration by operating three tubewells though unoperational at present. A copy of letter to PH Department and approved Layouts from Public Health Department are attached as Annexure-XIV.
Two underground water tanks of sizes (80 x 40 x 10+2 feet and 56 x 30 x 10+2 feet) have been proposed in the campus. Water conservation practices and rainwater harvesting plan will be implemented (as per guidelines) to conserve the resources.

C. POWER REQUIREMENT AND SUPPLY

The calculated power load of ~ 4700 KW, will be provided by Electricity Department, Chandigarh the copy of the letter from Electricity Operation Circle is attached in Annexure-XII). During construction phase power failure requirement will be met through installation of silent generators of 500 KVA capacities each, temporarily. However during operation phase a provision of 8 silent generators of capacity 500 KVA each will be provided. A separate electrical room/ substation building will be constructed as per requirements. All fire and safety measures will be taken as per NBC 2005 code.

D. INTERNAL ROAD NETWORK AND VEHICLE PARKING

The Layout plan of the proposed site has developed an internal road network in such a manner that it will not only cater to individual tower building but all the clusters of Type of Houses adequately wide roads (24 ft and 16ft) for two way traffic and to meet the fire regulations inside the complex. Open spaces with pedestrian movement paths, about 8 ft wide have been planned. There are two entry points to the housing complex. Main entry to the complex is from the main road, Dakshin marg. As per the requirement, it is proposed to provide total equivalent car space (ECS) for 2255 against 2174 vehicles.

E. ROAD CONNECTIVITY

The project area lies on the extended Dakshin Marg of Chandigarh to village Dhanas. It is well connected to the road network to all the sectors of the city, Means of transport like taxis, buses, cars and two wheelers are gradually increasing on this road because of continual improvement and development taking place in and around the project area. Main State Highway to Punjab is about 5 km from site. Most of the marble traders have come out of Chandigarh at Dhanas in the neighbourhood of the complex.

F. SEWAGE TREATMENT PLANT (STP) FACILITY

A sewage treatment plant has been proposed (1.00 mld) in the complex. **During operation** phase domestic sewage generated will be treated in this proposed Sewage Treatment Plant, though municipal sewage treatment plant of Chandigarh is operational in village Dhanas.

During the construction phase major source for water pollution will be sewage from labour camp and makeshift office at site. Manpower at the construction site comprising of technical

staff, clerical/ supervisor, skilled and unskilled workers would be about 300 persons. (at peak time) The average domestic water requirement will be 30 lpcd. Thus total water requirement works out to be 9000 l/day. It is assumed that about 80% of the water required will be generated as sewage. Total quantum of sewage generated in peak situation is expected to be about 7200 l/ day which will be treated in septic tank and its discharge be connected to the existing sewerage drain in the area.

G. COMMON SOLID WASTE DISPOSAL FACILITY

During operation phase waste generated is to the tune of 4500Kg/day, out of which 60% is biodegradable, 35% is Non biodegrdable while 5% is hazardous which includes medical waste also These will be collected, stored and disposed off as per SHW and MC norms. Solid waste collection and disposal infrastructure of Chandigarh, Green Tech Fuel Processing Plant exists at village Daddu Majra which is 0.5 km from the project site (Undertaking enclosed as Annexure-XXII)

Details of the Solid Waste Generated (Operational Phase)

From the houses	: 1656 x 5 x 0.45= 3726 kg/ day
Servant Room	: 120 x 2 x 0.45 = 108 kg/ day
Visitors	: 165 x 0.15 = 24.75 kg/ day
Dispensary waste	: 150 x 0.15 = 22.5 kg/ day
School waste	: 3000 x 0.15 = 450 kg/ day
Community Centre	: 800 x 0.15 = 120 kg/ day
Shopping Centre	: 100 x 0.15 = 15 kg/ day
Temple/ Gurudwara	: 100 x 0.15 = 15 kg/ day
	Total = 4481.25 kg/day (say 4500 kg/day)
60% is Biodegradable	= 2700.00 kg/ day
35% is Non biodegradable	= 1575 kg/day
5% is hazardous, biomedical, e- waste	= 225 kg/day

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

None of the project activities will result in adverse impact on existing facilities adjacent to the proposed project. There is no open space for recreation purpose within 500m hence no impacts anticipated. Because of influx of more residents however adequate facilities like

open space, parks, parking, community centre, mandir, a school, shopping complex are provided for the residents inside the premises.

EXISTING LANDUSE OF STUDY AREA

The project site has already been earmarked in the Chandigarh Draft Master Plan-2031.The proposed site is a barren land with wild grass, bushes & trees (Pic.1.3). There will be minimal tree felling inside the site

Land use pattern in the study area is classified into residential, agricultural, forest areas as detailed in Fig: 1.3.About 39% is the area under human settlements, 44% is the agricultural land, 2% comprises water bodies and 3% is the forest cover. There will be no major disturbance to local ecology.

Pic 1.3 Tree line along boundary wall and dry bushes/ shrubs inside of the proposed site

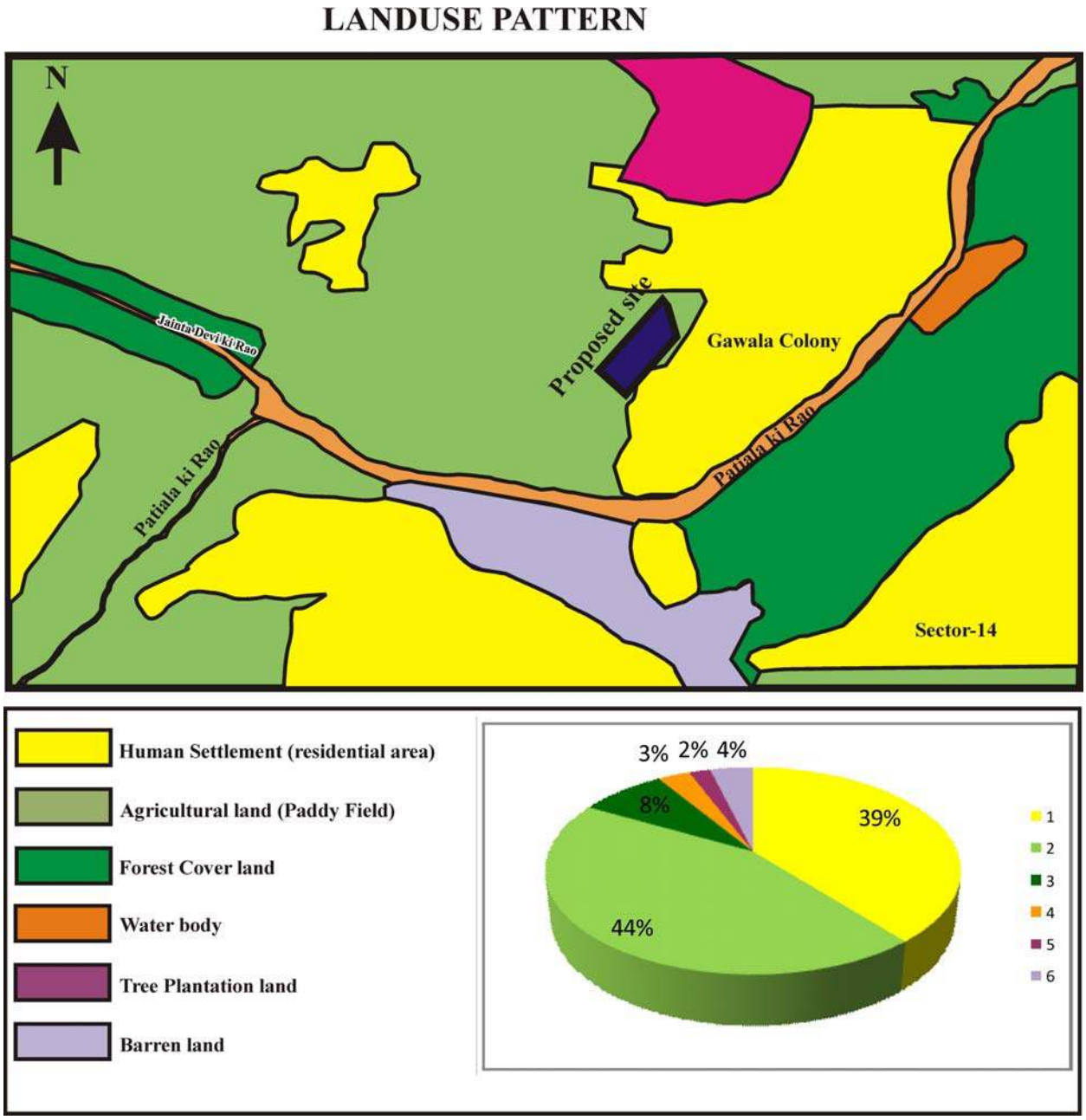


Fig 1.3 Landuse Pattern around the Site in the study area

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

The topography in and around the proposed site is almost plain with slope of 5 m from NE to SW & will be leveled at the start of the project. The digging of the site before construction would not result in any significant effect on soil erosion or silt run off even during the rainy season. The average elevation of the land surface in the proposed project site is about 98.27 m

above msl (refer Contour Plan Annexure-XIII). The project requires extensive excavation and removal of soil. Most of the top soil and excavated soil will be reused within the site itself which would avoid any use of soil from outside. Also, methods as per norms will be followed for the construction, which will reduce stress on soil environment of the site.

During the operation phase, carefully designed landscaped areas and plantation will be maintained. This will protect the top soil within the project site.

A. GENERAL PHYSIOGRAPHY AND SOIL TYPES OF CHANDIGARH

Four physiographic units are encountered in Chandigarh .The Siwalik range trending NW-SE forms the northeastern boundary of Chandigarh and is exposed in a small patch on the northeastern side. Southwestern slopes of the foothills are covered with loose talus material deposited by hill torrents forming alluvial fans. These alluvial fans coalesce to form piedmont Kandi Formation running parallel to the hill ranges. The Kandi and Sirowal formations merge along south and southwest. The Sirowal Formation concealed with the main Alluvial plain towards south and southwest. The alluvial deposits belong to Quaternary age and comprise layers of fine sand and clay.

The soils in UT Chandigarh are loamy sand at surface and calcareous sandy loam in subsurface layers. The hard clay forms pan at depth varying between 20 and 30 m. In northern parts the soil is sandy to sandy loam where as it is loamy to silt loam in southern parts. The soils are light yellowish brown to pale brown in color, calcareous and normally having kankar. The soils of the flood plains along the seasonal rivulets (choes) are coarse textured, stratified, well to excessively drained, have irregular distribution of organic carbon with depth, and are variable in texture. The dominant soils are as shown in Fig. 1.4

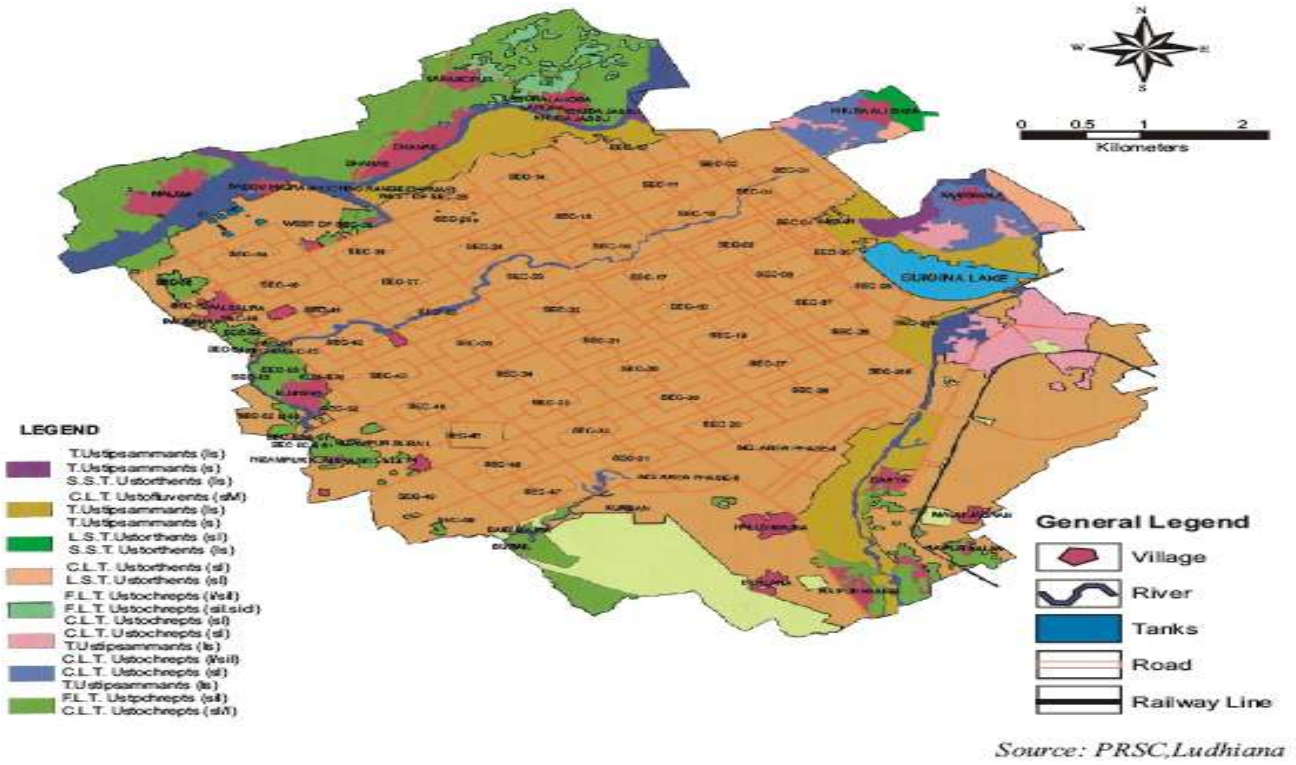


FIG. 1.4 Major Soil Types of Chandigarh

B. SOIL QUALITY

Three locations within the study area of the proposed project were identified for collection of the soil samples (Table 1.2, Pic.1.4, Fig. 1.5). The samples were analyzed for assessment of its quality and texture by following the AOAC & BIS methods. The results of the soil quality are compiled in Table 1.3 while reports annexed in Appendix -1.

Table: 1.2

Soil Sampling Locations

Code	Location
S1	From proposed project site of CAP Complex Dhanas
S2	From School of Village Mullanpur Garibdas
S3	From the Agriculture field of Village Maloya

(a) (b)

Pic. 1.4 Collecting soil samples from (a) S1 (Project site) (b) S2 (School at Mullanpur)

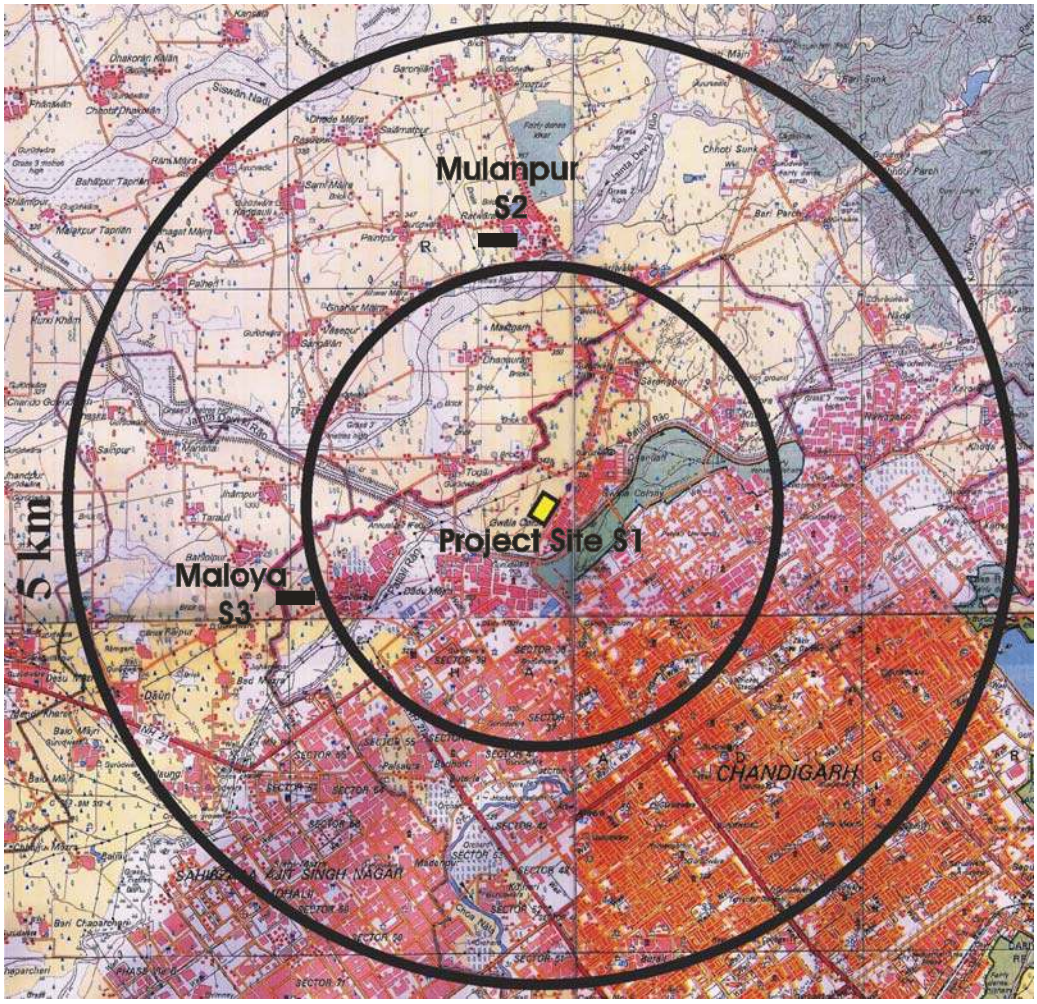


Fig. 1.5 Soil Sampling Locations

Table: 1.3
Soil Quality of the Region

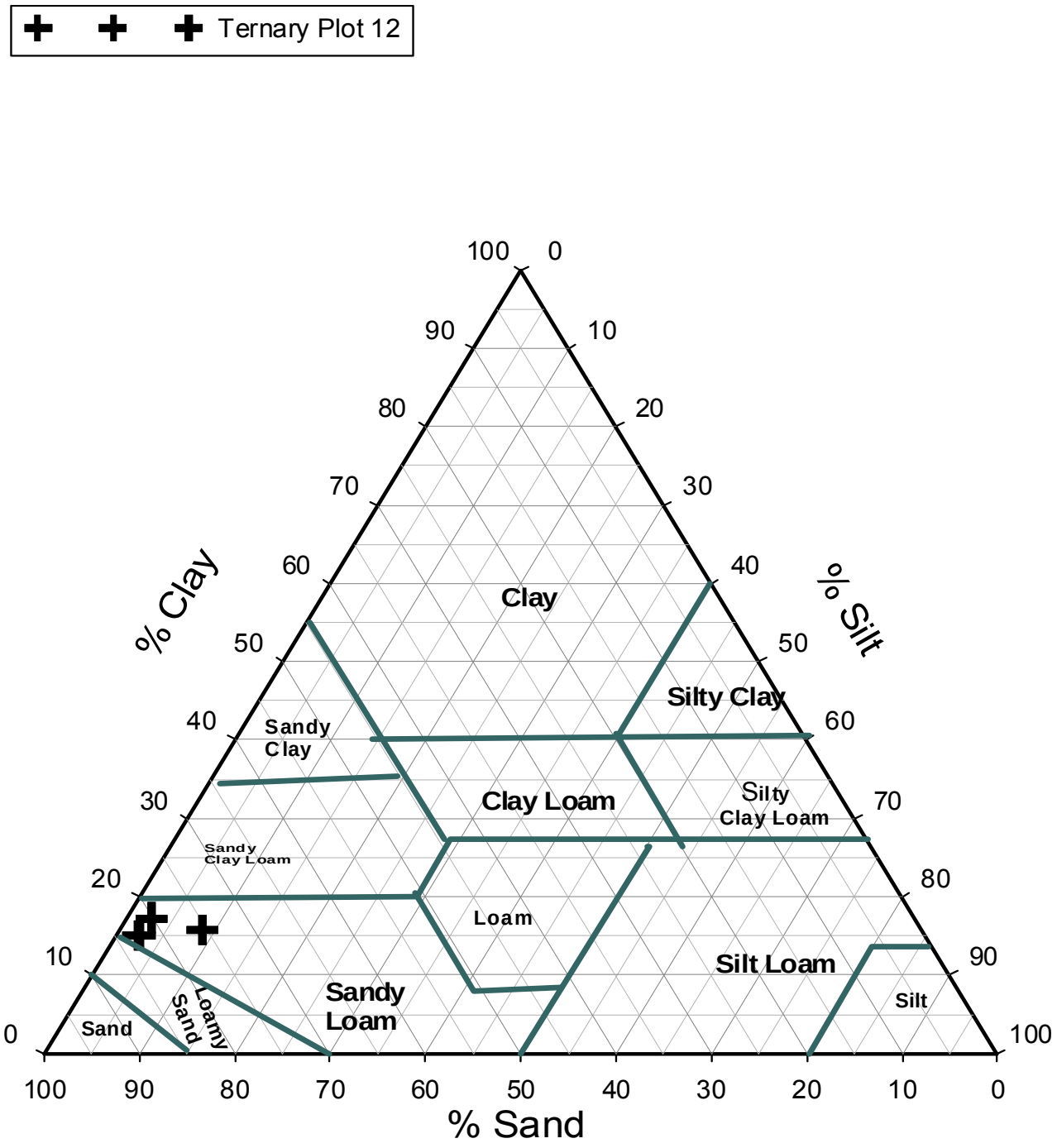
Sr. no.	Parameters	S1 (W-11J1214)	S2 (W-11J1314)	S3 (W-11J1414)
1.	pH (1% Solution)	6.92	6.84	6.88
2.	Conductivity (µmhos/cm) (1% Solution)	82	132	90
3.	Organic matter (% by mass)	0.8	0.09	0.72
4.	Nitrogen as N (% by mass)	0.6	0.12	0.64
5.	Phosphorus as P (% by mass)	0.54	0.08	0.5
6.	Potassium as K (% by mass)	0.5	0.10	0.48
7.	Sulphate as SO_4 (% by mass)	0.004	0.006	0.005
8.	Chloride as Cl (% by mass)	0.002	0.003	0.002
9	Colour	Light Brown	Light Brown	Dark Brown
10	Cu (mg/kg)	0.12	0.13	0.14
11	Zn (mg/kg)	1.28	1.35	1.41
12	Clay %	2.45	2.58	8.75
12	Sand %	82.52	80.22	75.50
13	Silt %	15.01	17.28	15.75

Source ITC Study

From the table above, the pH of 1% soil extracts was observed to vary from 6.8 to 6.9, indicating nearly neutral nature of the soils conducive of plant growth. pH is an important parameter indicative of alkaline or acidic nature of soil. It greatly affects the microbial population as well as solubility of metal ions and regulates nutrient availability.

The conductance was found to be low indicating low salt content. It varied from 82 to132, µmhos/cm. The nitrogen varied from 0.1 to 0.6 % in the samples collected. The chloride are in the range of 0.002-0.003%.

Organic matter present in the soil influences its physical and chemical properties and is responsible for stability of soil aggregates. Organic matter was found to range from 0.09 to 0.8 %.. The soils were found predominantly of sandy to sandy loam type (Fig 1.6).



Texture Analysis of soil in the Project Area.

Fig. 1.6

C. SEISMIC STABILITY

Chandigarh lies in Zone-IV of Seismic Map of India (Fig 1.7a). It is extremely vulnerable to earthquakes. Most earthquakes in this region are shallow though a few earthquakes of intermediate depth have been recorded in Haryana. The alluvial cover of the Indo-Gangetic plain makes even distant earthquake felt here quite strongly. Fig 1.7b shows GSHAP hazardous map for Chandigarh and Haryana. This region often feels deep-seated earthquakes that are centered on the Pakistan-Afghanistan Border and in the Hindukush mountains in Afghanistan.

The seismicity in and surrounding areas are mainly associated with the active movements along several faults and thrusts planes and also along the major lineaments. The Himalayan Frontal Fault (HFF), the Main Boundary Thrust (MBT), the Krol, the Giri, Jutogh and Nahan thrusts lies in the surrounding areas. Besides these there are few small localized active fault systems i.e. Kaurik Fault along which 1975 Kangra earthquake were triggered and leads to massive destructions. Due to its activeness, Chandigarh suffers mild earthquakes every year with biggest being during the Kangra Earthquake of 1905. There were record of occurrence of two more big earthquakes, but they were not nearly as powerful as of 1905. The area is also vulnerable to possible future presumed major earthquakes in the Central Himalayas or Northwest Himalaya. Number of important structures and monuments of this moderately populated city could be prone to damage due to an earthquake of considerable high magnitude (>7).

Numerous traces of active faults in the Himalayan foothill zone along the HFF around Chandigarh, in Pinjore Dun, along the piedmont zone of the Lower Siwalik hill front and within the Lower Tertiary hill range reveal the pattern of thrust and strike-slip faulting, striking parallel to the principal structural trend (NNW-SSE) of the organic belt. (Fig. 1.8a & b) These active faults are the manifestation of north-dipping imbricated thrust faults branching out from the major fault systems like the Main Boundary Fault (MBF) and Himalayan Frontal Fault (HFF), probably merging down northward into a décollement. The Taksal Fault, striking NNW-SSE, shows prominent right-lateral movement marked by lateral offset of streams and younger Quaternary terraces and occupies a narrow deep linear valley along the fault trace. Right stepping along this fault has resulted in formation of a small pull-apart basin. Fault scarplets facing ENE and WSW are the manifestation of dip-slip movement.

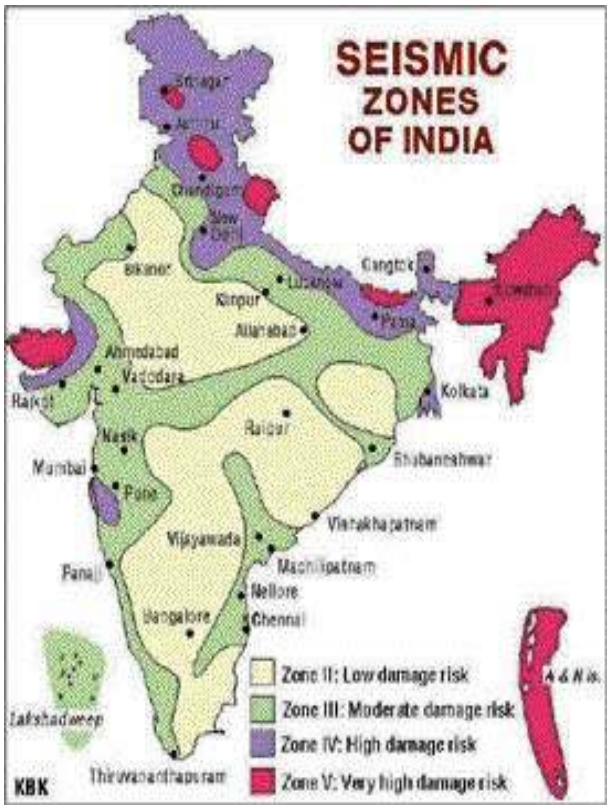


Fig.1.7a Seismic Zoning Map of India

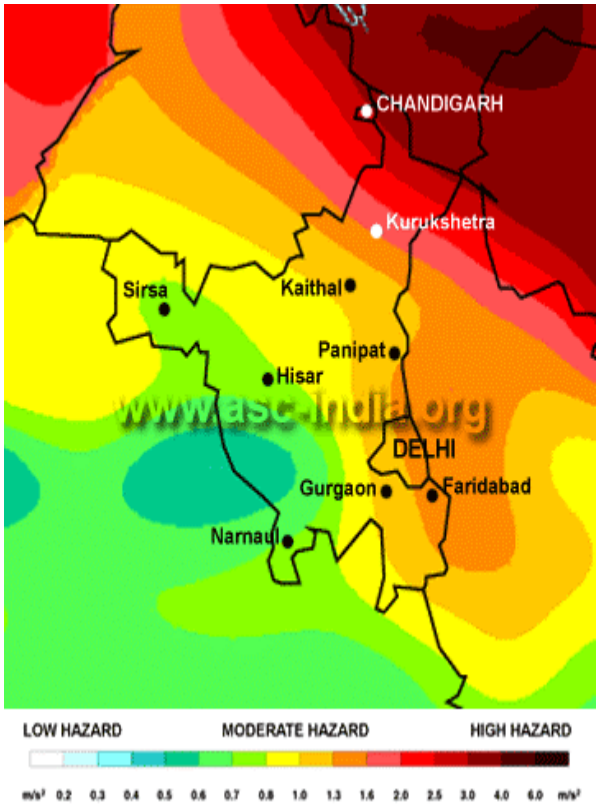


Fig 1.7b GSHAP hazardous map for Chandigarh and Haryana

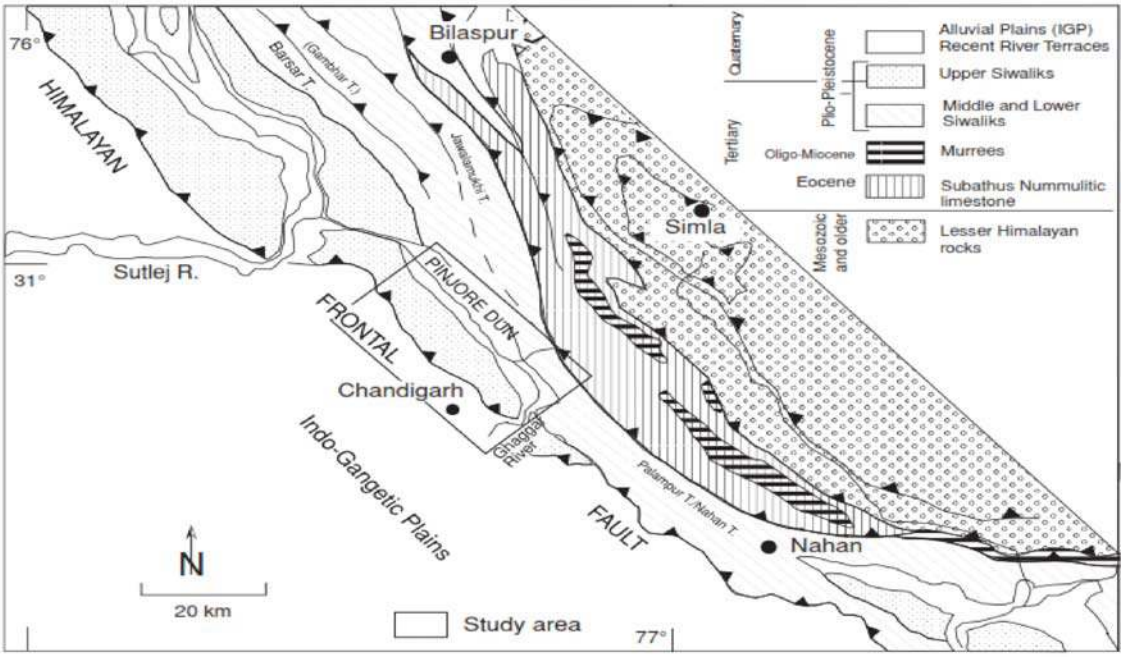


Fig. 1.8a The Faults in and around the study area

Fig 1.8b (CORONA satellite photo of the study area around Chandigarh along Himalayan foothill zone. The photo shows thickly populated city of Chanidgarh located in the Indo-Gangetic Plain. Black dotted line represents the Himalayan Frontal Thrust (HFT), which marks the boundary between the Upper Siwalik Hill Range and the Indo-Gangetic Plain. Active fault traces are marked by white arrows).

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

A. DRAINAGE SYSTEM OF CHANDIGARH

UT of Chandigarh falls in the Ghaggar Basin. There are two major streams, Sukhna choe and Patiala ki Rao that originate from Siwalik Hill Ranges and forms the natural drainage of the city. The Sukhna Choe flows north to south drains the eastern part and joins the Ghaggar River. The Sukhna Choe has been dammed in northeast side of the city, which has given rise to an artificial lake, Sukhna lake, covering an area of about 1.62 sq. km. The Sukhna lake is about 6.4 km from the project site The other important stream is Patiala ki Rao, which flows northeast to southwest and drains the northern parts of the city. Both these streams are ephemeral in nature and carry high flows during monsoon. The N-Choe flows through the Leisure Valley and drains major parts of the city. It flows from northeast to southeast direction and traverses north central part of the city. Another Choe Choi nala originates from Sector 31 and drains southern most part of the city. Fig. 1.9 shows drainage system in Chandigarh including project area at Dhanas,while Fig. 1.10 illustrates the detailed drainage system , water bodies and forest cover in the study area on the Toposheet

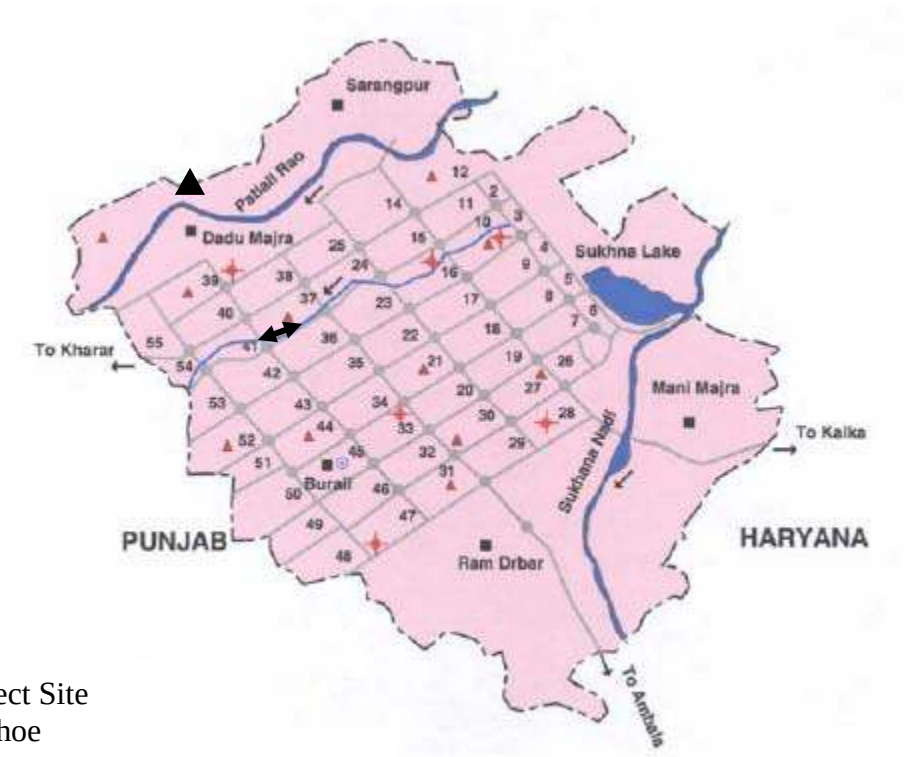


Fig. 1.9 Drainage system of Chandigarh (reproduced from CGWB, Chandigarh)

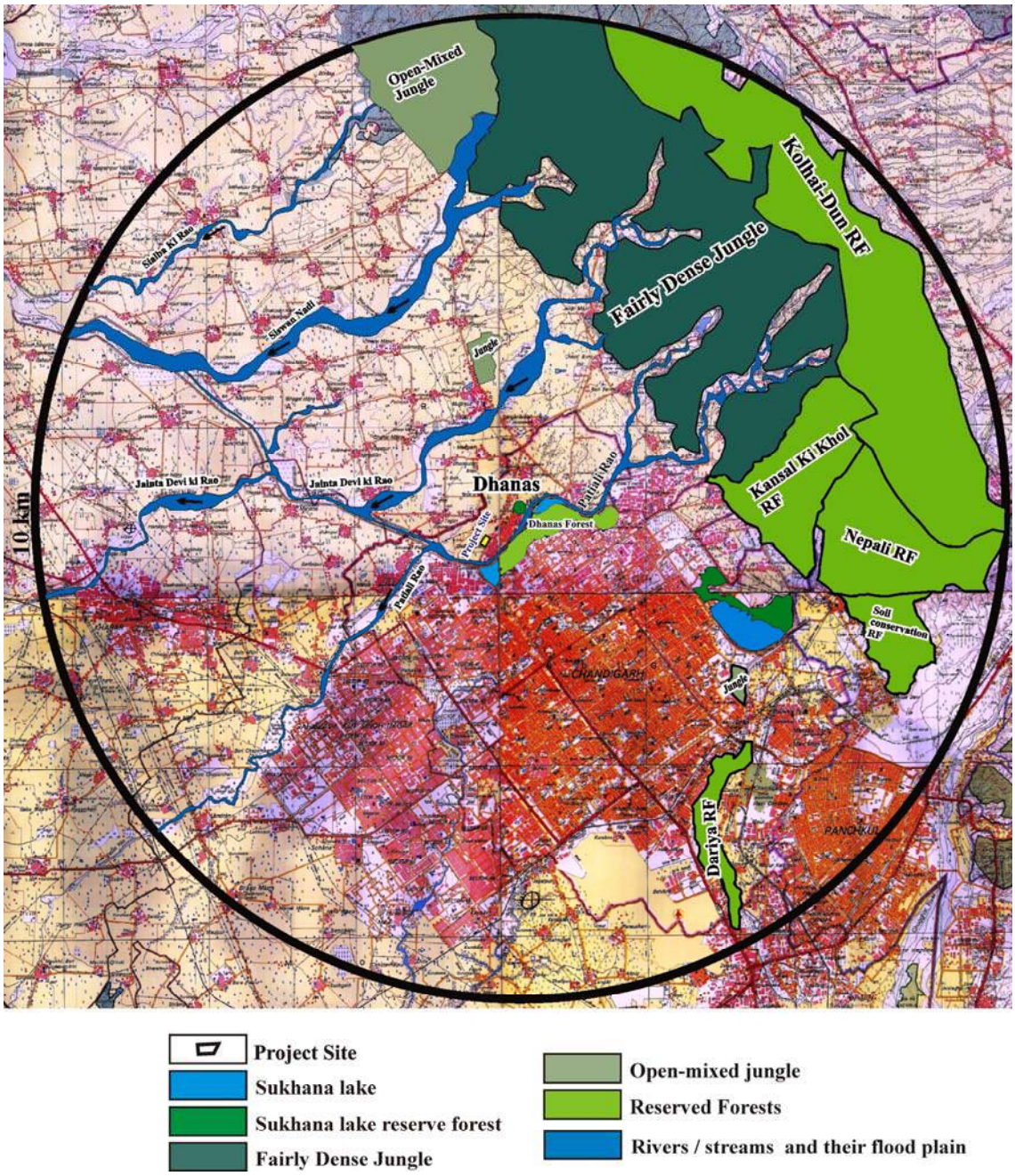


Fig. 1.10 Drainage Pattern / Water Bodies of the Study area

Recently lake has been created at Dhanas, which is about 0.5 km from the site, where all people enjoy their evening time. The Patiala ki Rao, flows about 0.5 km away from the site. Besides these there are small ponds existing in the villages of Khudda Jassu, Khudda Alisher, Dhanas and Sarangpur. These ponds are integral part of villages. The water works commissioned by Chandigarh Administration at Sector 39, that caters water supply to Tricity is situated about 4 km away from the site.(It drains from Kajauli Water works which further receives water from Bhakhra Mainline is at a distance of 27.5 km from Chandigarh).

The proposed project does not involve any alteration of natural drainage system nor will the project activity have any impact on these man- made lakes or canal systems.

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

During construction activity, it is expected that no fill materials will be transported from outside for filling or reclamation. Approximately 400000 m^3 of earthwork is expected to be involved onsite. The excavated earth will be reused inside premises. The extra excavated earth during construction period will be sold in market.

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

A. WATER SUPPLY

Average water requirement for the proposed project, for construction and domestic purpose will 129 Kld, during the construction phase, which will be met from PH Deptt. Chandigarh Administration

B. WASTE HANDLING

Waste water

Temporary septic tanks followed by soak pits or portable STPs will be installed for treatment of sewerage during construction phase**.**

Solid Waste

The generation of waste is probable during construction. Waste is generated at different stages of construction processes Waste relates to excessive cement mix or concrete left after work is over, rejection caused due to change in design or wrong workmanship etc. Estimated waste generation during construction is 40-60 Kg per sq. m.

Concrete appears in two forms in the waste. Structural elements of building have reinforced concrete, while foundations have mass non-reinforced concrete. Excavation of earth generates muck which will be used inside premises.

Other wastes include top soil, clay, sand and gravel. These are normally reused as filler at the same site after completion of excavation work.

Besides, miscellaneous materials that arise as waste include glass, plastic material and general refuse, scrap metal, cardboard, plastics and sewage wastes from the construction workers housing. These will be disposed as per facilities available with the administration.

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

There is no low lying area or wetlands in and around the proposed site. The topography in and around the site is mostly plain. As mentioned at S.No 1.5, Sukhna Lake & wetland is about 6.4km away from project site while Dhanas Lake is about 0.5 km away.

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

No health hazard waste will be generated during construction. Construction waste will be bulky heavy & non hazardous and unsuitable for disposal by incineration or composting. Unutilized solid waste generated during construction will be disposed as per Chandigarh administration norms. Also good construction practices that will ensure minimum environmental impacts of waste effluents will be adopted like construction debris will be collected and stored at earmarked place for reuse immediately, no accumulation shall be allowed.

SECTION 2 - WATER ENVIRONMENT

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

A. WATER REQUIREMENTS AND SUPPLY

Average water requirement for the proposed project (including the domestic use) will be 129 Kld during construction phase and 1328 Kld during the operation phase.

- Water supply both, during construction and operation phase**,** will be maintained and operated by Public Health department, Chandigarh Administration by operating three tubewells though unoperational at present (Approved Water Supply Layout Plan attached as Annexure-XIV), while the water calculations are shown in Table 2.1.
- Water conservation practices and rain water harvesting plan as per the guidelines, will be implemented to conserve the resources (Approved Rainwater Harvesting / Storm drainage is attached as Annexure-XI).
- Two underground water tanks of sizes (80 x 40 x 10+2 feet and 56 x 30 x 10+2 feet) have been proposed in the campus.
- Water will be reserved for fire fighting purpose.

B. WATER BREAK UP

Construction Phase

- Total water requirement during the construction phase (for concrete curing Mortar mixing and curing for block work, mortar mixing and curing for plastering, floor finishes, roof works/, and sprinkling for dust suppression 1,08,000 Kl
- Total water requirement during the construction phase for domestic purpose for 300 workers at peak construction 81 Kl
- Construction period 3 yrs (2 yrs for residential)
- No. of working days/ year 300
- Total no. of working days 900
- Average water consumption per day (for construction) 120 Kl
- Average water required per day (for domestic) @30lpcd 9 Kl
- Total Water demand /day 129 Kl
- Waste water generated per day @ 80% of the water consumption 7.2 Kl

Operation Phase

The freshwater requirement for the proposed project is 1328 KLD, which will be sourced from PH department MC, Chandigarh. The fresh water will be utilized for domestic requirement. Waste water generated from the site will be treated in its own STP, treated water will be reused for green area development, flushing while the excess treated water will be used for other miscellaneous purposes or disposed off to sewer as per administration norms

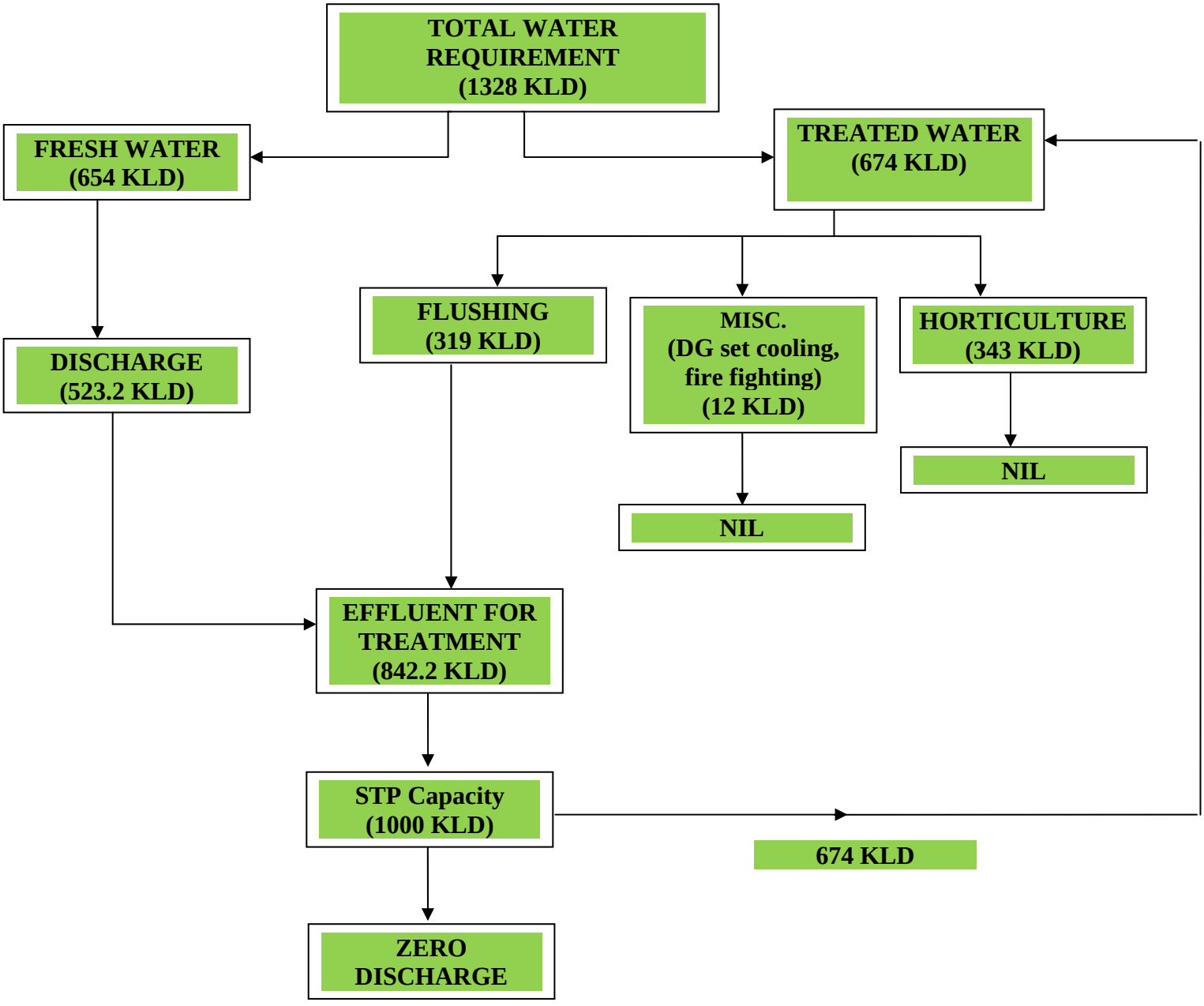
Table 2.1
Water Requirement Calculation

S.No.	Particulars	Expected Population	Water Consumption base (lpcd)	Total Water (kld)
1	All type of houses	1656@5persons/house =8280	135	1117.8
2	School	3000	45	135.0
3	Dispensary	30 bed	340	10.20
4	Visitors	100	45	4.50
5	Community centre	800	45	36.0
6	Shopping centre	100	45	4.5
7	Temple and Gurudwara			~20

Total water requirement	1328
Total fresh water requirement	654
Water requirement for green area development	343
Total waste water generation	842
Treated water recovered from STP	674

Water balance diagram is as below

WATER BALANCE DIAGRAM



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

As mentioned at s. no 2.1 that water supplied will be by Chandigarh Administration. (The Water supply layout plan from Public Health Chandigarh for supply of water is enclosed as Annexure-XIV).

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

The quality of water required will be as per IS: 10500-2012 (BIS Specification for drinking water). In order to assess the quality of ground water, if to be used for drinking purposes in absence of municipal source, study of ground water in the area was conducted.

A. GROUND WATER QUALITY OF THE STUDY AREA

.Ground waters in the form of tube wells (installed by administration) is an important source of water in the study area. Ground water samples were collected from the locations (Table 2.2, Pic. 2.1, Fig. 2.1) from the tube wells in different villages in the study area and analyzed for assessment of physical, chemical and microbiological parameters like pH, TDS, turbidity, alkalinity, phosphate, total hardness, chlorides, calcium, magnesium, sulphate, *Coliform* and *E-Coli* etc. Physical parameters like pH, TDS, Conductance were determined at site while chemical analysis was carried out in the laboratory, ITC, Panchkula (Test Reports attached at Appendix-1)

Table 2.2

Ground Water Sampling Locations

Sample No	**Location**
G1	Project site, supplied through Tubewell.
G2	Tubewell in Botanical Garden, Sarangpur
G3	Tubewell at Village Maloya
G4	Tubewell 3 at Dhanas
G5	Tap water from Jujhar Nagar supplied through tubewell

Results of analysis are summarized in Table 2.3 and are compared with that of Indian Standard for Drinking Water IS: 10500:2012 (Table 2.4)

G3 G4

Pic. 2. 1 Showing Collection of Ground Water Samples (G3, G4)

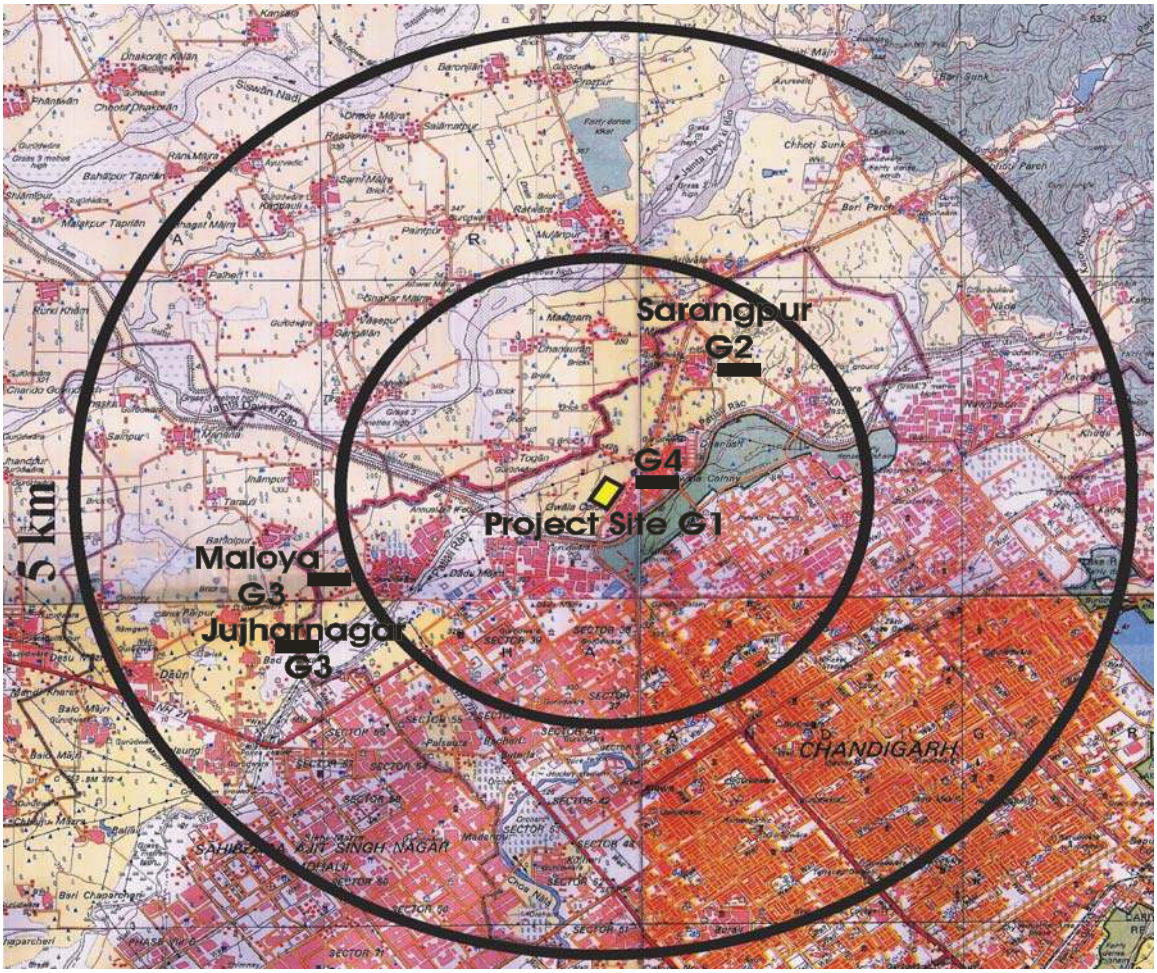


Fig. 2.1 Ground Water Sampling Locations

Table 2.3

Chemical Composition of Ground Water Samples

S. No	Parameters	G1 (W-11J0914)	G2 (W-11J1014)	G3 (W-11J1114)	G4 (W-22J2114)	G5 (W-22J2214)
1.	Colour (True Colour Units)	<5	<5	<5	<5	<5
2.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3.	pH Value	7.31	8.04	7.40	7.96	7.81
4.	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5.	Turbidity (NTU)	<1.0	<1.0	<1.0	<1.0	<1.0
6.	Total dissolved solids (mg/l)	378	384	380	334	336
7.	Aluminium as Al (mg/l)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
8.	Total ammonia as N (mg/l)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
9.	Anionic Detergents as MBAS (mg/l)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
10.	Barium as BA (mg/l)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
11.	Boron as B (mg/l)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
12.	Calcium as Ca (mg/l)	99	63	80	70	59
13.	Chloride as Cl (mg/l)	5	15	6	15	10
14.	Copper as Cu (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
15.	Fluoride as F (mg/l)	0.1	0.1	0.1	0.1	0.1
16.	Residual Free Chlorine (mg/l)	NA	NA	NA	NA	NA
17.	Iron as Fe (mg/l)	0.04	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
18.	Magnesium as Mg (mg/l)	4	43	7	15	10
19.	Manganese as Mn (mg/l)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
20.	Mineral Oil (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
21.	Nitrate as NO_3 (mg/l)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
22.	Phenolic Compounds as C_6H_5OH (mg/l)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
23.	Selenium as Se (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
24.	Silver as Ag (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
25.	Sulphate as SO_4	10	8	7	ND (1.0)	2
26.	Sulphide as H_2S (mg/l)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
27.	Total Alkalinity as HCO_3 (mg/l)	327	282	306	284	286

28.	Total Hardness as $CaCO_3$(mg/l)	264	334	229	237	187
29.	Zinc as Zn (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
30.	Cadmium as Cd (mg/l)	ND (0.003)	ND (0.003)	ND (0.003)	ND (0.003)	ND (0.003)
31.	Cyanide as CN (mg/l)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)
32.	Lead as Pb (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
33.	Mercury as Hg (mg/l)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
34.	Nickel as Ni (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
35.	Total Arsenic as As (mg/l)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)
36.	Total Chromium as Cr6+ (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
37.	*E. Coli* / 100 ml	Absent	Absent	Absent	Absent	Absent
38.	*Total Coliform MPN* / 100 ml	Absent	Absent	Absent	Absent	Absent

NA- Not Applicable ND- Not Detectable, figures in brackets indicate method detection limit.,

Table 2.4
Drinking Water Specification: IS: 10500-2012

Sr. No	**Parameters**	**Requirement (Acceptable Limit) (IS: 10500-2012)**	**Permissible Limit in Absence of Alternate Source (IS: 10500-2012)**
1.	Colour (True Colour Units)	5 Max.	15 Max.
2.	Odour	Agreeable	Agreeable
3.	pH Value	6.5 to 8.5	No relaxation
4.	Taste	Agreeable	Agreeable
5.	Turbidity (NTU)	1 Max	5 Max.
6.	Total dissolved solids (mg/l)	500 Max.	2000 Max.
7.	Aluminium as Al (mg/l)	0.03 Max.	0.2 Max.
8.	Total ammonia as N (mg/l)	0.5 max.	No relaxation
9.	Anionic Detergents as MBAS (mg/l)	0.2 Max.	1.0 Max.
10.	Barium as Ba (mg/l)	0.7 max.	No relaxation
11.	Boron as B (mg/l)	0.5 max	1 max.
12.	Calcium as Ca (mg/l)	75 max.	200 max.
13.	Chloride as Cl (mg/l)	250 max	1000 max
14.	Copper as Cu (mg/l)	0.05 max	1.5 max.
15.	Fluoride as F (mg/l)	1.0 max.	1.5 max.

16.	Residual Free Chlorine (mg/l)	0.2 min.	1 min.
17.	Iron as Fe (mg/l)	0.3 max.	No relaxation
18.	Magnesium as Mg (mg/l)	30 max.	100 max.
19.	Manganese as Mn (mg/l)	0.1 max.	0.3 max.
20.	Mineral Oil (mg/l)	0.5 max.	No relaxation
21.	Nitrate as NO_3 (mg/l)	45 max.	No relaxation
22.	Phenolic Compounds as C_6H_5OH (mg/l)	0.001 max.	0.002 max.
23.	Selenium as Se (mg/l)	0.01 max	No relaxation
24.	Silver as Ag (mg/l)	0.1 max.	No relaxation
25.	Sulphate as SO_4	200 max.	400 max.
26.	Sulphide as H_2S (mg/l)	0.05 max	No relaxation
27.	Total Alkalinity as HCO_3 (mg/l)	200 max.	600 max.
28.	Total Hardness as $CaCO_3$(mg/l)	200 max.	600 max.
29.	Zinc as Zn (mg/l)	5 max.	15 max.
30.	Cadmium as Cd (mg/l)	0.003 max.	No relaxation
31.	Cyanide as CN (mg/l)	0.05 max.	No relaxation
32.	Lead as Pb (mg/l)	0.01 max.	No relaxation
33.	Mercury as Hg (mg/l)	0.001 max.	No relaxation
34.	Nickel as Ni (mg/l)	0.02 max.	No relaxation
35.	Total Arsenic as As (mg/l)	0.01 max.	0.05 max.
36.	Total Chromium as Cr6+ (mg/l)	0.05 max.	No relaxation
37.	*E. Coli* / 100 ml	Absent	No relaxation
38.	*Total Coliform MPN* / 100 ml	Absent	No relaxation

CONCLUSION

Data from the Table 2.3 reveals that the pH values of ground waters varied from 7.31 to 8.04, the hardness (as $CaCO_3$) ranges from 187 to 334 mg/l, the total dissolved solids range from 334 to 384 mg/l. The concentration of all the parameters fall within the permissible limits as specified for drinking water standard IS: 10500: 2012 (Table 2.4). The water is free from toxic elements & pesticide residues. Thus water as such can be used for drinking purposes in absence of better alternate source. However, it is advisable not to consume this water without boiling or disinfection. Water as such is suitable for other purposes like construction, irrigation, bathing and recreation works etc.

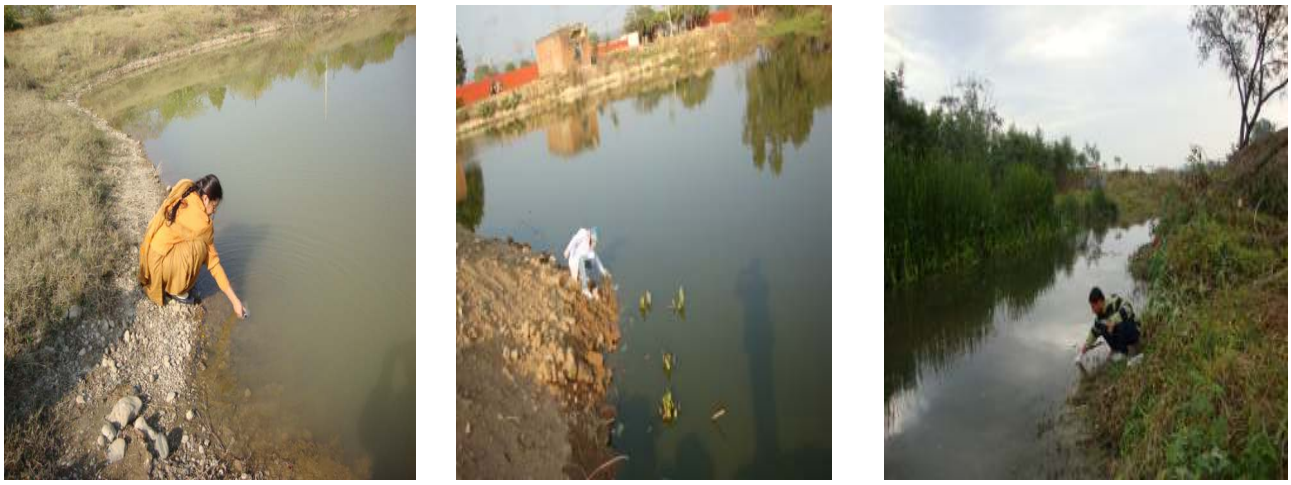
B. SURFACE WATER QUALITY

Surface water comprises of waters from river, nadi, nallah, ponds, etc. Regional Drainage pattern of Chandigarh and that of the study area is elaborated in Section 1.5. Surface water samples W1 – W6 were taken from locations of the study area (as shown in the Table-2.5, Pic 2.2 & Fig. 2.2).

Table: 2.5

Surface Water Sampling Locations

Sample Code	**Location**
W1	Dhanas Lake
W2	Patiala ki Rao
W3	Pond Water Mullanpur Garibdas
W4	Sukhna lake
W5	N-Choe in sector 42
W6	Sukhna lake (Near Regulator End)



W1 W3 W5

Pic.2.2 Showing collection of Surface water samples (W1, W3, W5)

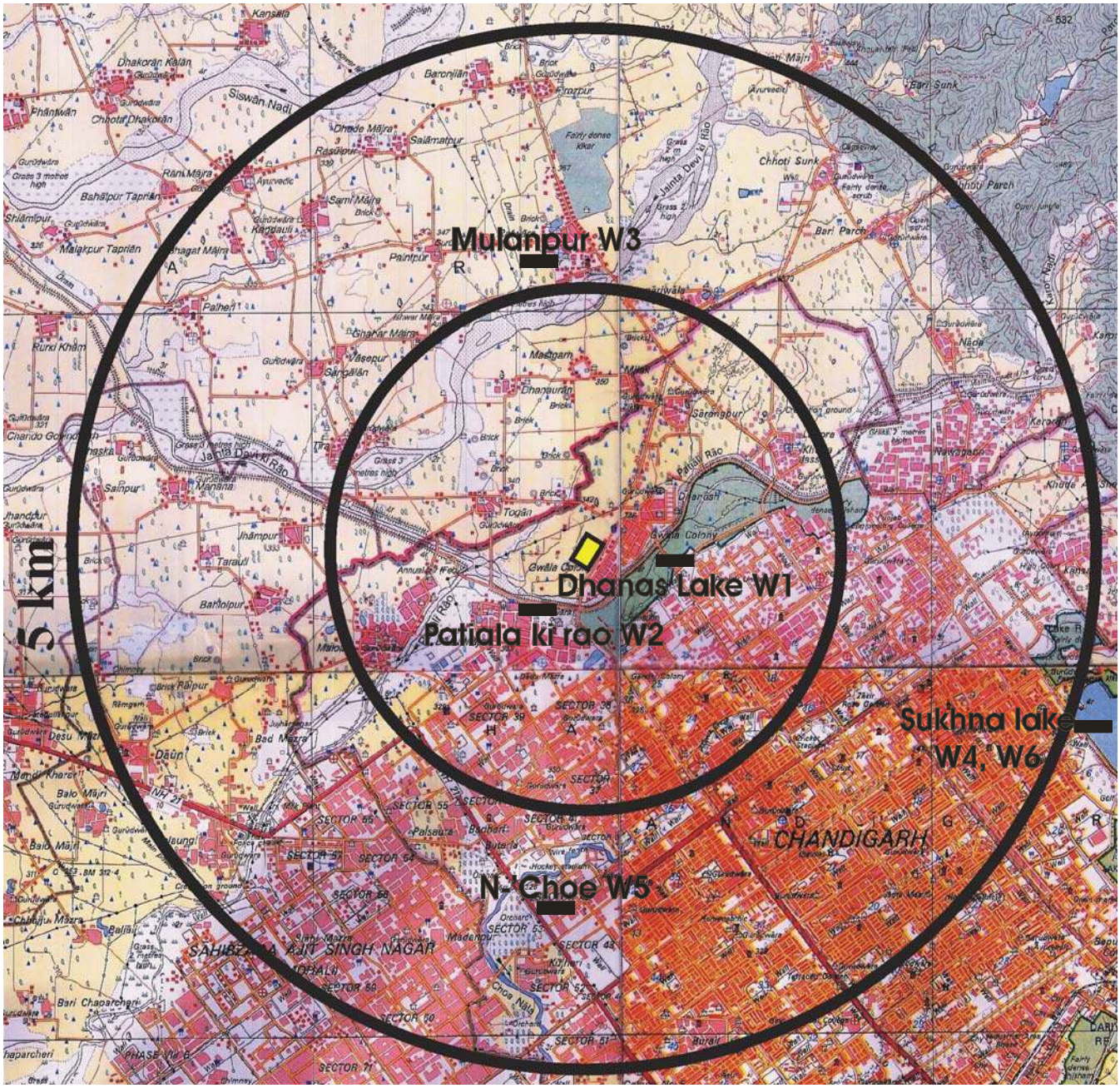


Fig. 2.2 Surface water Sampling Locations

The results obtained from the analysis of the collected surface waters are summarized in Table 2.6 below and test reports annexed in Appendix-1

Table 2.6
Chemical composition of surface water samples of the study area

Sr. No	Parameters	W1(W-11J0514)	W2 (W-11J0614)	W3 (W-11J0714)	W4 (W-11J0814)	W5(W-22J1914)	W6(W-22J2014)
1.	Colour (True Colour Units)	<5	300	<5	<5	<5	<5
2.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3.	pH Value	7.69	6.68	7.21	7.18	7.41	7.52
4.	Taste	*	*	*	Agreeable	Agreeable	Agreeable
5.	Turbidity (NTU)	20	220	120	< 1.0	<1.0	< 1.0
6.	Total dissolved solids (mg/l)	224	710	658	316	332	308
7.	Aluminium as Al (mg/l)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
8.	Total ammonia as N (mg/l)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
9.	Anionic Detergents as MBAS (mg/l)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
10.	Barium as Ba(mg/l)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
11.	Boron as B (mg/l)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
12.	Calcium as Ca (mg/l)	44	112	63	40	60	37
13.	Chloride as Cl (mg/l)	5	40	55	15	25	15
14.	Copper as Cu (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
15.	Fluoride as F (mg/l)	0.1	1.2	0.4	0.2	0.1	0.2
16.	Residual Free Chlorine (mg/l)	NA	NA	NA	NA	NA	NA
17.	Iron as Fe (mg/l)	0.86	1.42	1.14	0.14	ND (0.01)	0.09
18.	Magnesium as Mg (mg/l)	12	35	43	20	15	18
19.	Manganese as Mn (mg/l)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
20.	Mineral Oil (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
21.	Nitrate as NO_3 (mg/l)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
22.	Phenolic Compounds as C_6H_5OH (mg/l)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
23.	Selenium as Se (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
24.	Silver as Ag (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)

25.	Sulphate as SO_4	8	16	12	2	18	2
26.	Sulphide as H_2S (mg/l)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
27.	Total Alkalinity as HCO_3 (mg/l)	159	342	488	188	281	177
28.	Total Hardness as $CaCO_3$(mg/l)	158	424	337	182	212	167
29.	Zinc as Zn (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
30.	Cadmium as Cd (mg/l)	ND (0.003)	ND (0.003)	ND (0.003)	ND (0.003)	ND (0.003)	ND (0.003)
31.	Cyanide as CN (mg/l)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)
32.	Lead as Pb (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
33.	Mercury as Hg (mg/l)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
34.	Nickel as Ni (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
35.	Total Arsenic as As (mg/l)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)	N.D (0.01)
36.	Total Chromium as Cr6+ (mg/l)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
37.	*E. Coli* / 100 ml	Present	Present	Present	Absent	Absent	Absent
38.	*Total Coliform MPN* / 100 ml	240	1600	500	Absent	Absent	Absent

**Not performed, NA- Not Applicable ND- Not Detectable, figures in brackets indicate method detection limit.,*

CONCLUSION

The CAP complex site is located in under developed area, in a village, having moderate rural and semi urban population. The newly constructed rehabilitation colony situated in the vicinity of the site, houses the slum dwellers of colonies of Chandigarh. Though administration has made and making efforts for providing infrastructure and facilities, the sewage generated from the human settlements, agricultural runoff, dumping area run off, etc reaches the Patiala ki Rao through its various inlets thus, affecting surface water quality of the area.

The pH values of surface waters was observed to vary from 6.68 to 7.52, the hardness (as $CaCO_3$) ranges from 158 to 424 mg/l, the total dissolved solids from 224 to 710 mg/l with maximum 710 in Patiala ki Rao, colour was observed maximum in W2, as 300 Hazen Units, water alkalinity (as HCO_3) ranges from 159 to 488 mg/l with maximum in pond water of Mullanpur. All the water samples also showed the presence of the microbiological contamination.

The trace elements content were found to be well below the detection limit. Thus surface water quality in the region is not in conformance with IS: 10500-2012 standard (Table -2.4) However, the water can be used for irrigation or other purposes as per tolerance limits for inland surface water quality, (Table 2.7) below.

Table 2.7

Tolerance Limits for Inland Surface Water Quality

S. No.	Parameter	Designated Use Class of Indian Waters				
		A	B	C	D	E
1.	pH	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5
2.	Dissolved Oxygen mg/l	6	5	4	4	-
3.	Biochemical Oxygen Demand (3days at 27ºC), mg/l	2	3	3	-	-
4.	Total coliform organisms MPN/100 ml. Max	50	500	5000	-	-
5.	Conductivity at 25º C	-	-	-	1000	-
6.	Colour Hazen units	10	300	300	-	-
7.	Calcium as Ca mg/l	-	-	-	-	-
8.	Magnesium as Mg mg/l	100	-	-	-	-
9.	Copper as Cu mg/l	1.5	-	1.5	-	-
10.	Iron mg/l	0.3	-	50	-	-
11	Manganese mg/l	0.5	-	-	-	-
12.	Chloride (as Cl), mg/l max	250	600	-	-	600
13.	Sulphate mg/l	400	-	400	-	1000
14.	Nitrate mg/l	20	-	50	-	-
15.	Arsenic mg/l	0.05	0.2	0.2	-	-
16.	Cyanide mg/l	0.05	0.05	0.05	-	-
17.	Lead mg/l	0.1	-	0.1	-	-
18.	Zinc mg/l	1.5	-	1.5	-	-
19.	Total Hardness($CaCO_3$) mg/l	300	-		-	300
20.	Total Dissolved solids, mg/l	500	-	1500	-	2100

Source: Official Website of Central Pollution Control Board

A: **Drinking Water Source without conventional treatment but after disinfections;**
B: **Outdoor bathing organized**
C: **Drinking Water Source with conventional treatment followed by disinfections;**
D: **Propagation of wildlife and fisheries**
E: **Irrigation, industrial cooling, controlled waste disposal.**

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

During operational phase a total of 1328 Kld of water is required. Out of which 654 kld of fresh water and 674 kld is recycled treated water. Total waste water generation will be 842 kld which includes 80% of sewege generation from domestic uses and 100% of flushing uses. Total capacity of STP will be 1000 kld Treated water recovery from STP will be 674 kld out of which 319 kld will be used in flushing of toilets, 343 kld for green area development/ plantation and excess 12 kld treated water will be used for DG cooling / fire fighting etc.

Details of dual plumbing: There will be dual plumbing system for use of water with different water quality from Municipal supply and treated water which will result in optimal use of water thus saving water. Installation of dual plumbing for using recycled water will save the potable water from Municipal Supply or ground water. There will be two pipe lines one supplying freshwater for drinking, cooking etc. And other for supply of recycled water for flushing, landscape irrigation etc. This will result in saving of fresh water demand and life of existing sewerage will be improved. Dual plumbing plan has been attached as Annexure- XV.
The water balance diagram is shown below in Fig. 2.3

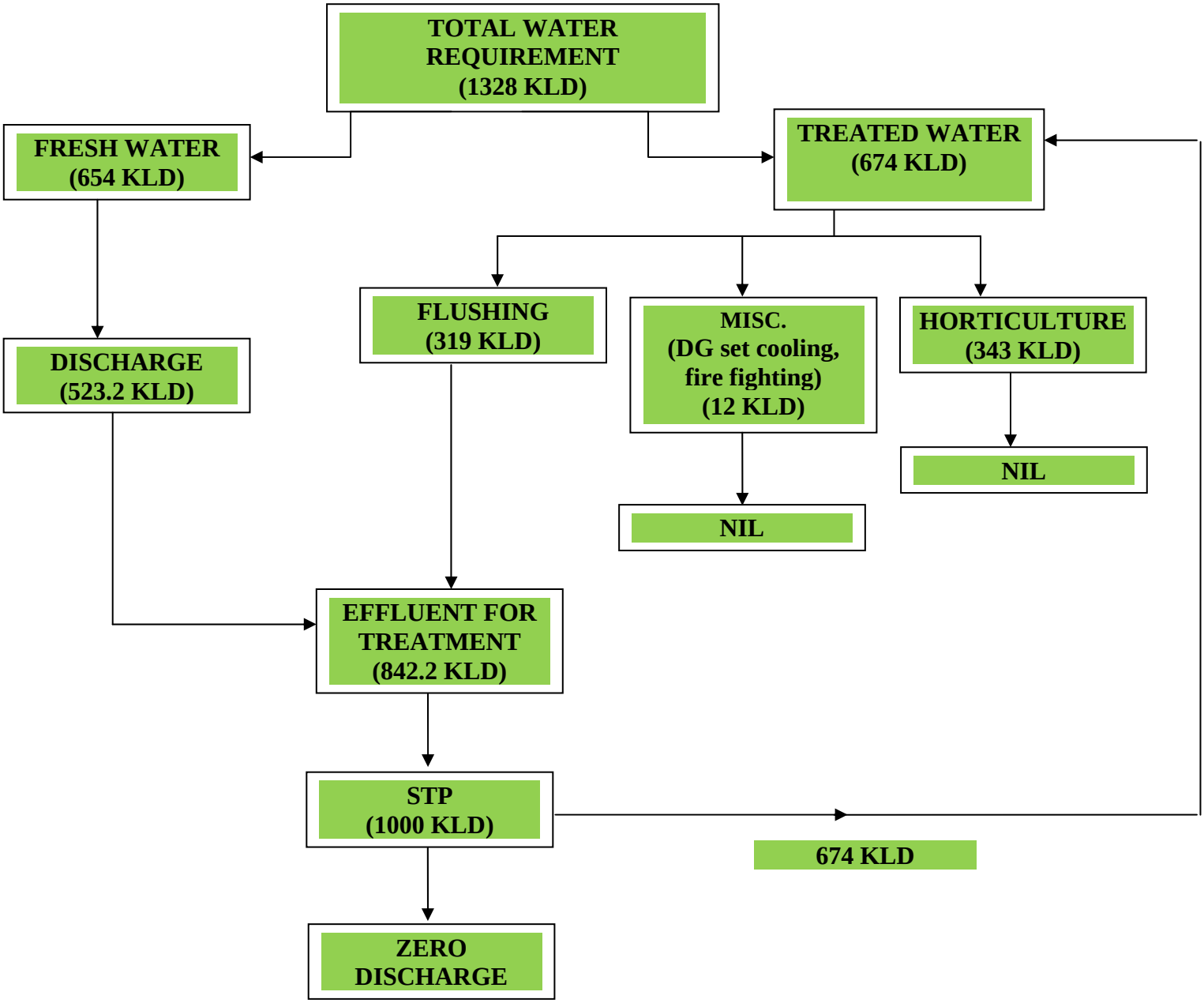


Fig. 2.3 Water balance diagram

Following measures will be taken to minimize usage in the operation phase:

- Rainwater harvesting for optimum utilization of rainwater to recharge the ground water level to be adopted. (Annexure-XI)
- Well designed storm water network (Annexure-XI) to collect the rain water from the site area and divert to the proposed rainwater harvesting pits for recharging the ground water.
- Ground water quality to be monitored periodically.

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

Water supply both, during construction and operation phase**,** will be maintained and operated by Public Health department, Chandigarh Administration by operating three tubewells though unoperational at present. There will be no diversion of water from the other users.

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

During operation 842 Kld of waste water will be generated which will be treated in the proposed sewage treatment plant (1.0 MLD). The expected characteristics of the sewage are as below in Table 2.8

Table 2.8

Expected Characteristics of Domestic Sewage

S.No.	Parameters	Inlet	Outlet*
1	Colour	Turbid	-
2.	pH	5.5-6.5	5.5-9.0
3.	Oil and Grease (mg/l)	15-30	< 10
4.	Total Suspended Solids(mg/l)	180-260	< 100
5.	Total Dissolved Solids (mg/l)	650-900	Not Specified
6	BOD, 3 days at 27^0C (mg/l)	150-250	< 30
7.	COD (mg/l)	275-450	< 250

**EPA-1986, PCLS/02/2010*

Well laid down approved Sewage drainage plan for the project (Annexure-XV) has been proposed as per specifications. Entire sewage and the wastewater from the proposed CAP complex, after treatment will be used for flushing, landscaping and other miscellaneous purposes like fire fighting, DG cooling inside the premises (refer water balance diagram Fig. 2.3). Thus the impacts due to the disposal of untreated sewage will be totally mitigated.

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

The project will adopt appropriate methods on the proposed site for harvesting of rainwater. According to guidelines of Chandigarh Administration and as per requirements. Approved Rainwater Harvesting Layout Plan attached as (Annexure-XI)

A. POTENTIAL OF RAINWATER HARVESTING

The availability of water from roof top may be assessed by applying the following equation

Water available for harvesting = A x Rf x Rc (in cubic m) where,

A = Roof Top area (in sq. m),

Rf = Rain fall (in m),

Rc = Runoff coefficient (allows for the slope of the roof and water loss through wind, evaporation and ability of roofing material to hold onto water.

Runoff co-efficient for different types of catchments is as follows:

Type of catchment	**Runoff coefficient**
Roof top	0.75-0.85
Paved area	0.50-0.75
Bare ground	0.10-0.20
Green area	0.05-0.10

Rainwater Harvesting Calculations:

S.No.	Description of area	Area considered (sqm)	Harvesting factor/ collection efficiency per area	Max. intensity of rainfall mm/hr	Total volume of rain water available cub.m /hour.
1	Water available from Terraces of type of houses /buildings / and other roof top surfaces	30705	0.80	20	492
2	Paved surfaces , roads and other built up area	55937.02	0.65	20	727.18
3	Lawns, garden and landscaping	121305.65	0.20	20	485.22
	Grand Total	**207947.67**			**1704.4**

Calculations: the roof top rainwater collected is channeled through 4 no. of trenches of size (6x3x2.4 meters) having 2 recharge wells each i.e. 8 rainwater harvesting pits, 4 no. trenches (3x3x2.4 mtr) with 1 recharge well each i.e. 4 rainwater harvesting pits. Therefore for rooftop rainwater harvesting 12 no. recharge wells have been proposed.

In addition, 40 recharge wells to be added to, along storm water drains for roads, paved area surface and other green belt area. A total of 52 recharge wells required for the total plot area.

The storm water drains carrying the surface run off from the plot area will be directed towards these recharge pits. There will be a provision of sedimentation tanks where any silt or floating materials carried away by the flowing water will be settled down before the water enters the recharge wells.

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

The proposed project would in no way affect the run off characteristics of the area. Instead run off from building areas during rains will be utilized for harvesting and recharge of ground water. Appropriate water conservation measures will be adopted in regular activities.

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

The proposed project will not impact the ground water quality and quantity significantly in long term during the operation phase. The water supply will be maintained and operated by Public Health department, Chandigarh Administration to meet the daily water requirement of the proposed project. The rainwater harvesting infrastructure will recharge the ground water, However buildings, parking lots and other built up facilities would decrease the natural infiltration rate of rainwater.

A. GROUND WATER SCENARIO OF CHANDIGARH

The Union Territory of Chandigarh is occupied by semi consolidated formations of upper Siwalik system of middle Miocene age that are exposed in north eastern fringe whereas the rest of the Territory is occupied by Indo-Gangetic plain comprising alluvium of Pleistocene age. The piedmont deposits are followed by alluvial plain comprised of clay, silt and sand. The formations have been deposited by the drainage system originating in the Siwaliks. Coarser sediments occur along the Sukhna Choe and Patiala ki Rao whereas relatively finer sediments, thus restricting the aquifer disposition laterally, underlie the area between these two streams (Fig.1.10).

Based on the exploratory drilling carried out by Central Ground Water Board down to a depth of 450 mbgl, they had concluded that fair to good aquifer horizons occur in most part of Chandigarh except in south-western parts near sectors 37 to 41. An aquifer, 20 meters thick, occurring at a depth of 160 mbgl, comprising medium to coarse sand, occurs in almost all of Chandigarh except around sector 38. Along Sukhna Choe, three prominent sand beds occur

(inter-bedded with clay beds) within a depth of about 100 m. The upper sand beds are about 15 m thick and occur 8 m below land surface. Middle sand bed is about 18 m thick and occurs at depths varying from 21 to 38 mbgl. The deeper sand bed occurs at depth varying from 39 to 76 mbgl and is about 27m thick. These beds are more persistent in the downstream direction of Sukhna Choe along the Patiala-ki-Rao nala a single thick sand bed has been observed. This thick bed is inter-layered with clay lenses in northeast and southwest directions of the nala. Lithological sequence encountered during drilling does not show any conformity in aquifer geometry in the area. The sub-surface formations are basically composed of pebbles, gravels and fine to coarse-grained sand with fair proportion of Kankar throughout. In the southern part of the area compact/cemented, poorly permeable silt beds exist below 250 mbgl. Fig 2.4 below shows the ground water level of Chandigarh.

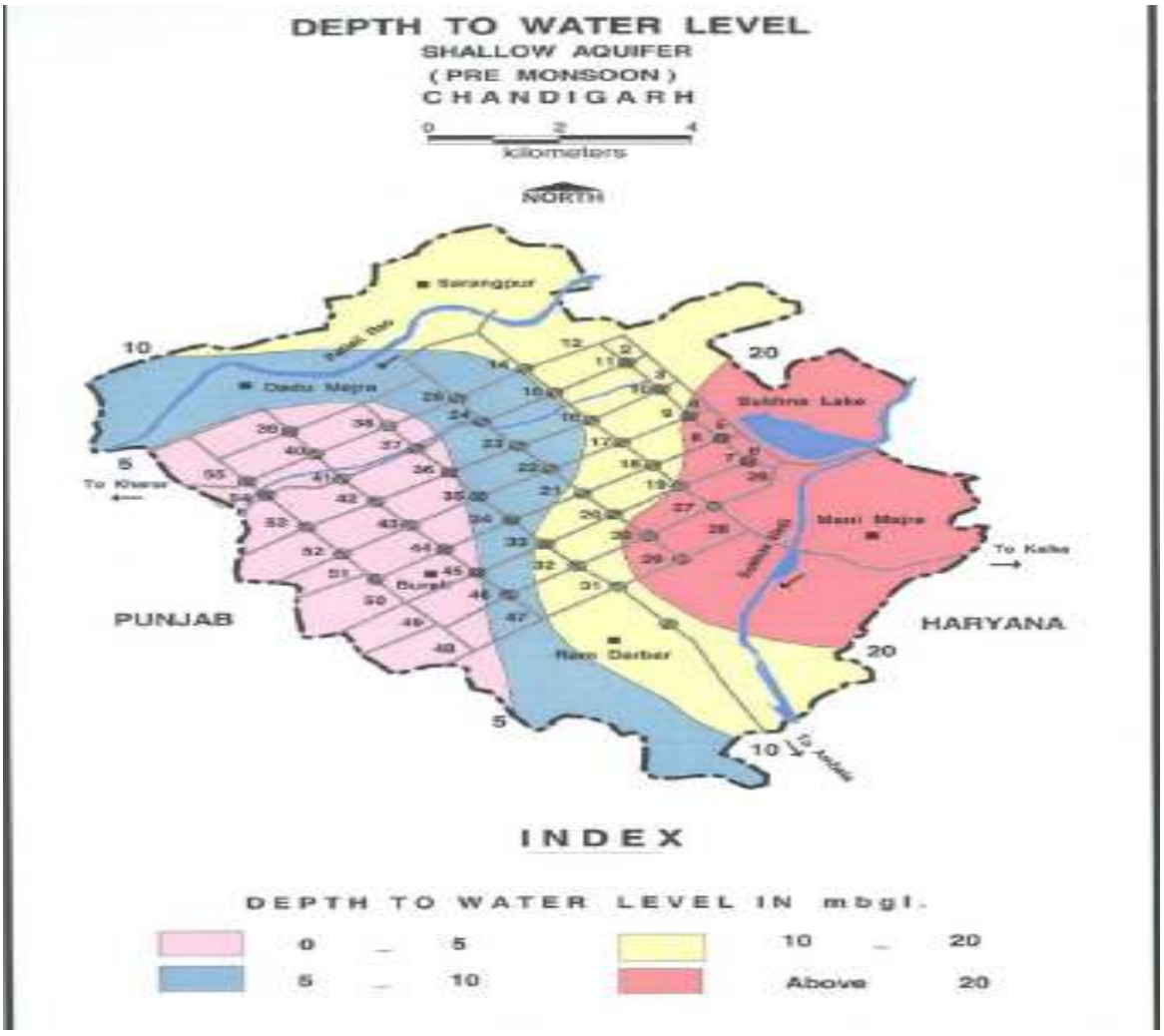


Fig. 2.4 Ground Water Levels of Chandigarh (reproduced from CGWB publication)

In Chandigarh private tubewells have been banned. Groundwater for drinking is supplied by MC tubewells where water is pumped from deep aquifers below 100 m. Since water will not

be abstracted from the ground for the project which could deteriorate the ground water. The project is proposing to implement the rain water harvesting for ground water recharge. Groundwater samples were collected, analyzed and results compared to IS: 10500-2012. Most of the parameters are observed to be within the limits prescribed by this standard. Since no wastewater from the housing complex will be discharged on the land, no impact on ground water quality is envisaged.

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

During construction period, in rainy season, water quality is likely to be affected due to the construction work and loosening of top soil. It is likely to increase the suspended solids in the run-off during heavy precipitation. In order to reduce the impact on water quality, temporary sedimentation tanks will be constructed for the settlement of the suspended matter. It is envisaged that the monsoon period will be avoided for cutting and filling of earthwork. Additionally, following measures will be taken to avoid the surface water pollution.

- Soil binding and fast growing vegetation and grass would be grown around the construction site before commencement of construction site activity to reduce soil erosion.
- Appropriate sanitation facilities to be provided for the construction workers to reduce impact on surface water quality.
- There is no likely hood of ground water contamination as no waste will be discharged to ground water bodies during construction.
- The construction solid /hazardous waste will be reused or disposed as per facilities with Chandigarh Administration. It will be ensured that there is no migration of toxic leachate to ground water.

Secondly, during construction phase, activities may also result in pondage of water in the dug-out areas of site which have potential for creation of mosquitoes breeding and spreading of water borne diseases. The most important construction aspects are the impediment of temporary drainage by blocked silt traps or the ponding of water within foundation works. Other mosquito breeding sites may be created through the use of uncovered water tanks. The project will give careful attention to the design and maintenance of earthworks and drainage systems during construction to avoid the creation of significant habitat areas for mosquito larvae. The use of larvicides may be required to prevent mosquito breeding in silt traps.

2.11 How is the storm water from within the site managed? (State the provisions made to avoid flooding of the area, details of the drainage facilities provided along with a site layout indication contour levels)

All along the internal road network, storm water drains would be provided to collect water during rains. (Approved Storm water Layout plan attached as Annexure-XI). They would be adequately sized to prevent over flooding of the site. The storm water collection system is designed in such a manner so that clean storm water from garden, parking areas, roadways and lawns is used for recharging of ground water. The excess run off will be directed towards the nearest storm water drain.

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

Water will be required for construction purposes during period of construction, which is expected to be about 36 months (2 yrs for residential). Water supply during constructionwill be maintained and operated by Public Health department, Chandigarh Administration.

Impact on water quality during construction phase may be due to sewage from labour camps and makeshift office. It is expected that at any given time during the construction phase, the peak manpower strength on construction site comprising of technical staff, clerical/supervisor, skilled and unskilled workers would be about 300 persons. The average domestic water requirements would be about 30 lpcd. It is assumed 80% of the water required will be generated as sewage. Thus, total quantum of sewage generated in peak situation is expected to about 7200 l/day. The generated sewage would pass through a septic tank / portable STP and its discharge would be connected to the existing sewage lines in the project area. These measures will avoid any unsanitary conditions around the project site.

2.13 What on-site facilities are provided for the collection, treatment & safe disposal of sewage?

The project will provide an internal network of drainage system within the proposed residential CAP complex for the collection and treatment of sewage in the STP to be developed. The Sewage Layout Plant is attached as Annexure-XV. STP of capacity (1mld) has been proposed for 842 Kld discharge. The schematic details of the Sewage Treatment Plant to treat the discharge is shown in Annexure-XIX & Table 2.9. The treated water will be reused in flushing and gardening purposes inside the premises. No water will be discharged outside in municipal drains.

Table 2.9
Details of Sewage Treatment Plant

S. No.	Components of STP	Dimensions (m)	Volume (m^3)
1.	Screen & Grit Chamber	1.2 x 0.60 x 0.5	0.360
2.	Oil & Grease Removal Chamber	2 x 2 x 1.5	6.00
3.	Equalization Tank (2 nos)	10 x 10 x 5	500.0
4.	Aeration Tank (2 nos)	10 x 10 x 5	500.0
5.	Clarifier (2 nos)	12m, Ht 5m	565.0
6.	Sludge Sump	3 x 2 x 2	12
7.	Sludge Drying Beds (2 nos.)	10 x 5 x 1.5 (each)	75.0 (each)
8.	Treated Effluent Tanks (2 nos.)	10 x 10 x 5	500.0 (each)
9.	Pressure Sand Filter	24 cubic m/h	-
10.	Activated Carbon Filter	24 cubic m/h	-
11.	UV Light Exposure	20 minutes/min.	-

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

Provision of dual plumbing system will be provided for treated water for use in flushing of toilets and fresh water consumption as illustrated in Annexure-XV. The impacts that may occur due to the disposal of untreated sewage will be mitigated as a result of STP in the complex.
The total water requirement of the project will be 1328 kld, out of which fresh water is 654 kld. The waste water generated will be 843 kld, treated water recovered from STP will be 674 kld, out of which the approx. 319 kld will be used for flushing/ dual plumbing while 343 kld for horticultural proposes. 12 kld excess treated water will be used for other purposes like DG cooling, for fire safety.
There will be a dual plumbing system for use of water with different water quality namely municipal supply water/ ground water and recycled water which will result in optimal use of water thus savings on the high quality water. Installation of dual plumbing for using recycled water which will save the potable water from municipal supply or ground water. There will be two pipe lines, one supplying freshwater for drinking, cooking etc. and other for supply of recycled water for flushing, landscape irrigation etc.

SECTION 3- VEGETATION

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

The project will not have any threat to the biodiversity. Most of the species are indigenous and naturalized. The study area is covered by roadside plantations, private and public garden plantation, on the farm boundaries, done by educational institutions. On the contrary as a consequence of urbanization in the area, much of the naturally existing vegetation has been cleared and already been converted to residential, commercial area by the developers.

A. REGIONAL FLORA OF CHANDIGARH

i) Forest area:

Chandigarh has 3245 hectares under forest. Forest areas are mostly around Sukhna Lake, Sukhna Choe and Patiala ki Rao. Near village Kansal on the outskirts of Chandigarh towards the hills is a Reserve Forest and Nepli forest (shown in Fig 1.10). The details of forest land are shown in (Table 3.1)

Table 3.1
Total Forest Cover of Chandigarh

S.No.	Name of Forests	Area in hectares
1	Sukhna Wildlife Sanctuary	2610.99
2	Lake Reserve forests	105.57
3	Sukhna Choe reserve forests	387.12
4	Patiala ki Rao forests	136.19
5	Forest area at Brick kiln Manimajra	5.53

Source Official website of Chandigarh Administration

Ministry of Environment and Forest, Government of India recognized 228.66 Ha of Sukhna Lake as one of the National Wetlands that needed priority for conservation. It was initially spread over 230 ha but has been reduced to around 154 Ha in 2007. Over a period of time, the silted part was converted into Sukhna Lake Reserve Forest. In 1988, 2600 ha were converted into the Sukhna Wildlife Sanctuary.

B. TREES

Nature has endowed Chandigarh with beautiful surroundings: Shivalik Hills as backdrop, seasonal rivulets of Sukhna choe and Patiala ki Rao on the sides and a fertile soil. The city planners are quite conscience to give green cover to the city. The city's residential area, roads are amply dotted with trees and shrubs. Trees were planted in single, double and multiple rows symmetrical and asymmetrical-depending on the location, type and orientation of the road in

relation to the sun. There are green foliage all around Chandigarh, offset by a dash of amaltas (*Cassia fistula*) and gulmohar (*Delonix regia*). Some of the important native trees ed are Peepul (*Ficus religiosa*), mango (*Mangifera indica*), Kadamba (*Neolamarckia cadamba*), Champaka (*Michelia champaca*), Parijata (*Nyctanthes arbor-tristis*), Vakula, Jamun (*Syzygium cumini*), Kikkar and Neem (*Azadirachta indica*). The prominent flowering trees are Amaltas(*Cassia fistula*), Semul (*Bombax)*, Kachnar (*Bauhinia variegate*), Gulmohar (*Delonix regia*), Pink *(Cassias bakeriana)* and Lagerstroemia *(Lagerstroemia indica)* etc.
The Mango belt is located the Purv Marg of the city, separating the industrial area from the residential areas.

To raise plantation in and around city and to provide pollution free environment seedings are being supplied to the institutions / NGO's & public free of cost from the Nurseries at Hallomajra, Daria nursery, Kishangarh, Medicinal plants nursery at Chandigarh Botanical garden, Sarangpur.

C. BOTANICAL GARDEN

The Botanical Garden was established in 2007 near village Sarangpur, Lahora and Dhanas in 176 acres for raising and maintenance of nursery, shrubs, creation of lawns and land leveling to promote research, education ex-situ conservation and to spread awareness about our floral heritage. In addition, the garden helps to promote eco-tourism in Chandigarh. It consists of 15 botanical sections like Medicinal Plant Section, Bambusetum, Arboretum, Nutrition Garden, Cactus and Succulent section etc.

The garden has been connected with the Nature Reserve known as Patiala ki Rao forest through a causeway. Patiala ki Rao forest spreads over 350 acres of land. Tree species like Harar (*Terminalia chebula*), Bahera (*Terminalia bellirica*), Amla (*Phyllanthus emblica*), Neem *(Azadirachta indica)*, Arjun, Maulsari, Bael (*Aegle marmelos*), Kathal (*Artocarpus heterophyllus*), Sandal wood (*Santalum album*), Kachnar (*Bauhinia variegate*), Camphor, Lasura, Gular (*Ficus racemosa*), Rudraksha (*Elaeocarpus ganitrus*), Jamun (*Syzygium cumini*), Guggal (*Commiphora wightii*), putranjeeva *(Putranjiva roxburghii)* etc. have been planted.

From the above it is seems that the Lake reserved forest is more than 6 km from the project site while the Patiala ki Rao Reserved forest about 1 Km from the project site. Copy of the letter for issuance of non applicability of Forest Act on the land for the CAP complex is enclosed as Annexure -IV. There will be no threat on the biodiversity due to the proposed project.

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

Presently many native trees, shrubs, herbs, wild dried bushes and thorny plants are present on site. The CP Division 6, Chandigarh surveyed the plot and enumerated the girth wise details of plants. A total of 3728 number of plants fall in the area (detailed survey report along with CD attached as Annexure-IX vide memo no. CP6/2015/1535 dated 12.03.2015). It is opined that only those trees which fall in the alignment of the blocks and the internal roads will be identified and necessary action for their removal will be taken through Executive engineer, Div. No. 2, UT Chandigarh well before the execution of work at site. As per preliminary study of the tree details of the survey plan approx. 787 small & medium trees will remain undisturbed whereas 2941 (small & medium) trees will be felled.

However, loss of trees will be compensated by compensatory afforestation which will be carried out by Horticulture Deptt. UT, Chandigarh according to the prevailing norms (letter attached as Annexure-IXa). A compensatory plantation of 14705 trees will be undertaken at site suggested by the Chandigarh administration. The lawns and improvement in the existing green belt will enhance the aesthetic value. Hence the impact on the terrestrial ecology is not envisaged and the surrounding environment will remain the same. Moreover the forest department has declared that the plot area does not fall under any forest land.

a)

b)

Pic 3.1 Showing Vegetation in the Plot a) dried bushes b) peepal tree

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

Due care will be taken to protect site features. It is proposed to develop landscape and green area in approx. 29.08% and water body in 5% of total plot area in the complex. The implementation for development of green belt is of immense importance, as it not only acts as

a pollution sink for dust emissions, gaseous pollutants and noise pollution but also enhances the visual appearance of the developed site.

The species to be grown on the site will be fast growing native species, in consultation with Horticulture department, Chandigarh having broad leaf base so that a permanent green belt is created in a short period. The effective plantation will also stabilize the soil and reduce and nuisance during windstorm and improve the local ecology of the site. Tree plantation will be carried out on periphery also.

Besides this, the visual aesthetics of the proposed site will be enhanced by developing parks / playgrounds/lawns with local ornamental plants in the open spaces to blend it with the existing environment of Chandigarh. There will be turfs near the building blocks which will add to the scenic beauty of the area.

The proposed project layout plan showing green belt / landscaping is attached as Annexure-XVI.

SECTION 4- FAUNA

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

There are no major faunal community or movement paths at the project site. No significant adverse impact on the fauna in the surrounding area is anticipated due to construction activities.

A. Fauna in the Study Area

Commonly found domestic animals in association with man in the study area are cow, buffalo, goat, dog, cat, horse, poultry, etc. Lower life forms such as ants, spider, butterfly, bee, wasp, termites are also observed in the area. There are no endangered / protected species found in the area.

Common frogs and toads like Indian Bull Frog *(H. tigerina),* Skipping Frog *(Rana cyanoplyctos),* Paddy-Field Frog *(Rana limnocharis)*, Common Indian Toad *(Bufo melanostictus*.

Reptiles: Common Krait (*Bingarus caeruleus),* spectacled Indian Cobra*.* Lizards found in the area are Girgit (*Catotes versicolor),* House Lizard / Chipkali *(Hemidectylus flaviviridis).*

Avi-Fauna: The common birds inhabiting in the area are patridges (black & grey), pigeons, doves, house sparrow (*Passeridae*), crow (*Corvus*), *Eudvnahys soolopacea* (koel), *Columba liviaamelin* (kabutar), *Milvus migrans* (cheel), *Coracias benghlensi* (neelkanth), *Corvus macror* (kauwa) and *Pavo crislatus* (mor).

Live stock: is asset of the most population of Dhanas. Each house in Milk Colony Dhanas, invariably keeps cattle for milk as well as for other purposes (cattle were seen inside the residential areas) as in Pic. 4.1

Pic. 4.1 Cattle sitting in open & inside compounds of houses

B. REGIONAL FAUNA OF CHANDIGARH

Sukhna wildlife sanctuary is about 6.4 km away from the site. It has following population:

- **Mammals**: The mammals that are found on the Sukhna Wildlife Sanctuary include: Sambar (*Rusa unicolor*), Panogolin or ant eater (*Manis*), Chital or spotted deer (*Axis axis*), jackal (*Canis aureus*), wild boar (*Sus scrofa*), small Indian civet (*Viverricula indica*), porcupine (*Hystricomorph Hystricidae*), jungle cat (*Felis chaus*), rhesus monkey (*Macaca mulatta*), hanuman langur (*Semnopithecus*), common Mongoose (*Herpestidae*), Indiana har, squirrel (*Sciuridae*), common rat (*Rattus*) etc.
- **Birds**: There are over 150 different types of birds found in the Sanctuary. It also includes all kinds of aquatic birds. Major birds found here are common myna (*Acridotheres tristis*), bee-eater (*Meropidae*), hill myna (*Gracula religiosa*), bulbul (*Pycnonotidae*), jungli crow (*Corvus macrorhynchos*), tree pie, black drongo (*Dicrurus macrocercus*), grebes (*Podicipedidae*), ducks (*Anas platyrhynchos*), swan (*Cygnus*), geese (*Branta Canadensis*), hawks (*Buteo jamaicensis*), coots (*Fulica*), plovers (*Charadrius melodus*), jacanas (*Jacanidae*), doves (*Columbidae*), parrots (*Psittaciformes*), barn owls (*Tyto alba*), rollers (*Coraciidae*), woodpeckers (*Picidae*), barbets (*Megalaima haemacephala*), hornbill (*Bucerotidae*), hoopoes (*Upupa epops*), swifts (*Apodidae*), kingfisher (*Alcedines*), golden oriole (*Oriolus oriolus*), nightjars (*Caprimulgidae*), cuckoos (*Cuculidae*), grey partridge (*Perdix perdix),* red jungle fowl (*Gallus gallus*) and peacock *(Pavo*).

  The aviary park/ bird sanctuary of Chandigarh is situated in sector-21 Chandigarh is about 5 km from the project site.
- **Reptiles**: Common variety of reptiles found in the Sukhna wildlife sanctuary are turtle (*Testudinidae*), Russell, viper (*Viperidae*), common krait (*Bungarus caeruleus*), rat snake (*Elaphe obsolete*), cobra (*Ophiophagus Hannah*), common monitor gho (*Varanus*) and Indian python (*Python molurus*).
- **Insects**: Insect species like moths, butterflies, honey-bees can be found the Sukhna wildlife sanctuary.
- **Aquatic Life /Fisheries:** Sukhna lake is the main water source for fisheries in Chandigarh. The Fisheries Department has set up Fish-seed farm just off Sukhna lake produces 6.5 lakh fish seeds annually. These fish are stocked in Sukhna lake and in village ponds and ponds formed by check dams built by the Forest Department
- **Aquatic Birds** Many exotic birds like Siberian duck, Stark and Craves flock the water bodies during winter months. Pic. 4.2 shows some of the migratory bird species swimming in the Dhanas and at Sukhna Lakes. The lake has been declared as a protected National Wetland by GOI.

  Patiala ki Rao flowing near to the project site does not inhabit any aquatic life (as informed by the local people).

Source: field survey & official website of Chandigarh

Certified maps of Chandigarh from National Board of Wildlife, Chandigarh. authenticating distance of Sukhna Wildlife Sanctuary and bird sanctuary in Chandigarh from the project site is enclosed as Annexure- V along with application for NOC from National Board of wildlife, New Delhi.

a. **b.**

Pic. 4.2 Migratory birds swimming in a) Dhanas Lake b) Sukhna lake

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

The project will not have any direct or indirect impacts on the avifauna of the area

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

In absence of any major fauna in and around the project site, no measures such as corridors, fish ladders etc. are required.

SECTION 5- AIR ENVIRONMENT

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

The impact on ambient air quality due to vehicular emissions in the complex will be very less as the complex will not result in generation of any large volume of traffic. Considering the nature of activities that will result in project, low level of vehicular movement within the complex, low threshold value, air pollution is not expected to be of major concern.

A. BACKGROUND AIR QUALITY LEVELS

The objective of the baseline air quality study is to assess the existing air quality of the area for conformity to standards of the ambient air quality of CPCB during the operation. Various sources of air pollution in the region are construction activities going on in the area, dust arising from unpaved village roads, emissions from brick kilns around, vehicular movements, domestic fuel burning and other general human activities. The air quality in the area was assessed through a network of ambient air monitoring locations.

i) Selection of Sampling Locations:

The ambient air quality was monitored in the study area from 31st December,2013 to 31 March,-2014, through a scientifically designed ambient air quality monitoring network considering the following;

- One station was kept at the centre and the others in various directions.
- Locations with mixed residential and commercial development
- Location near schools and other sensitive areas.
- Locations where the baseline ambient air quality are established such that it can be resurveyed in the future to monitor changes in the ambient environment.

ii) The following frequency has been adopted for the sampling:

The 24- hours monitoring were carried out at each location twice a week for four consecutive weeks during the study period. The pre-calibrated fine particulate samplers and respirable dust samplers were used for sampling. Methodologies adopted for sampling (24 hr continuously for particulate matter and 8- hourly monitoring in three shifts for SO_2, NO_2, (1 hourly for CO). Table 5.1, Fig 5.1 & Pic. 5.1 gives the details of locations of each monitoring station and their distances with reference to the project site.

The parameters selected for analyzing ambient air quality status were sulphur dioxide (SO_2), oxides of nitrogen as nitrogen dioxide (NO_2), particulate matter (PM_{10}), particulate matter ($PM_{2.5}$), carbon monoxide (CO). The particulate matter (PM_{10}) and particulate matter ($PM_{2.5}$) were determined by the gravimetric methods. SO_2 and NO_2 were measured colorimetrically,

CO by GC methods as per APHA (Air), & Emission Regulations (III) of CPCB.

Table: 5.1

Ambient Air Quality Monitoring Locations

Code	Location	Aerial distance from project site approx (km)	Direction w.r.t. site
AAQ1	At the proposed project site	0	---
AAQ2	Vill. Mullanpur garibdas	4.0	N
AAQ3	Vill. Maloya	2.5	W
AAQ4	Botanical garden, Sarrangpur	3.0	NE
AAQ5	Vill. Dadoo majra	1.5	S

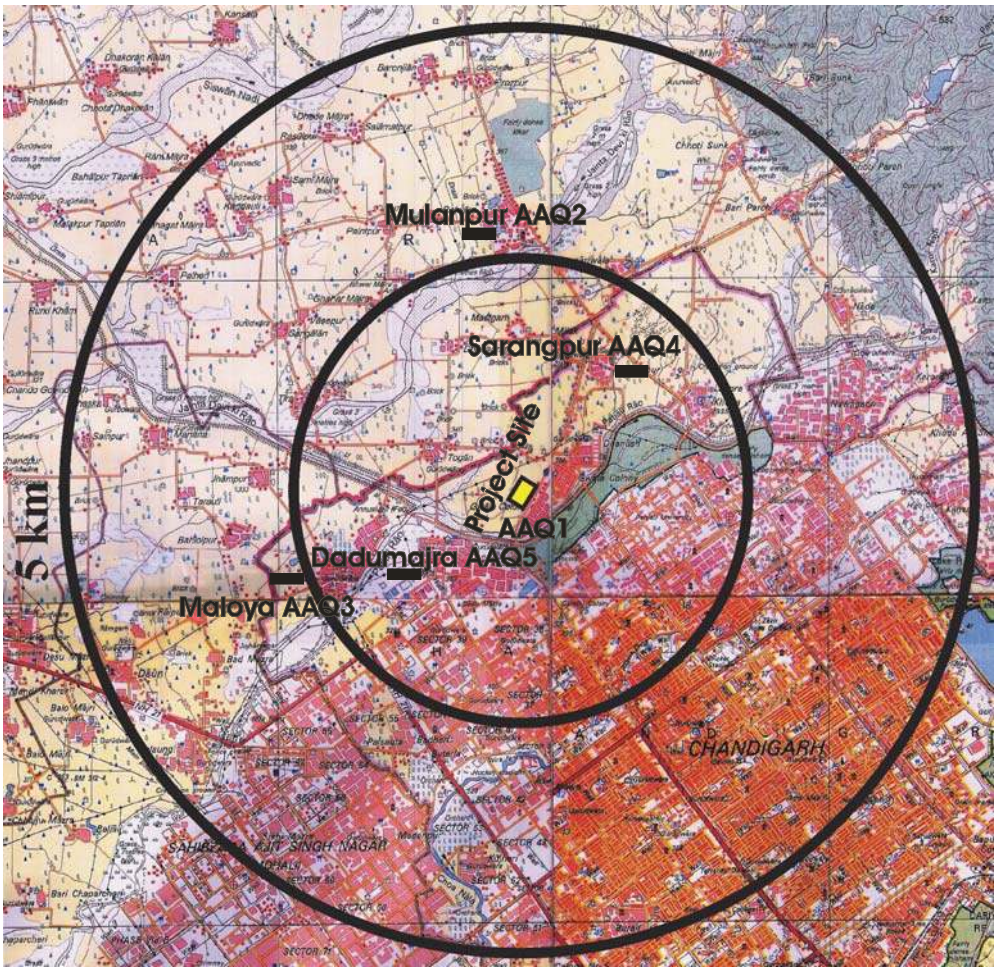


Fig 5.1 Ambient Air Quality Monitoring Locations

a)

b)

Pic 5.1 Setting Up Samplers for Ambient Air Monitoring a) (AAQ1) b) (AAQ4)

The results of analysis at each of the locations is compiled in Tables 5.2-5.8 while test reports are attached in Appendix-1. Various statistical parameters like average, maximum, minimum and 98th percentile values have been computed for the results obtained.

Table 5.2 Results of AAQ monitoring at PROJECT SITE, AAQ1 for winter 2014

Sno.	Parameters	Minimum	Maximum	Average	98%tile	NAAQS Std.
1	$PM_{10,}$ µg/m^3	88	104	93.13	100.92	100
2	$PM_{2.5,}$ µg/m^3	39	58	52.26	58	60
3	$SO_{2,}$ µg/m^3	26	33	27.71	30	80
4	$NO_{2,}$ µg/m^3	27	34	30.17	34	80
5	CO, mg/m^3	0.5	1.2	1.9	1.1	4

Table 5.3 Results of AAQ monitoring at VILLAGE: MULLANPUR, AAQ2 for winter 2014

Sno.	Parameters	Minimum	Maximum	Average	98%tile	NAAQS Std.
1	$PM_{10,}$ µg/m^3	78	112	94.70	111.08	100
2	$PM_{2.5,}$ µg/m^3	40	65	51.125	64.54	60
3	$SO_{2,}$ µg/m^3	26	30	27.22	30	80
4	$NO_{2,}$ µg/m^3	27	34	29.75	34	80
5	CO, mg/m^3	0.6	1.2	0.9	1.2	4

Table 5.4 Results of AAQ monitoring at VILLAGE: MALLOYA, AAQ3 for winter 2014

Sno.	Parameters	Minimum	Maximum	Average	98%tile	NAAQS Std.
1	$PM_{10,}$ µg/m^3	74	96	86.66	95.08	100
2	$PM_{2.5,}$ µg/m^3	27	94	47.70	76.06	60
3	$SO_{2,}$ µg/m^3	26	29	26.93	29	80
4	$NO_{2,}$ µg/m^3	26	33	29.22	32	80
5	CO, mg/m^3	0.5	1.1	0.8	1.1	4

Table 5.5 Results of AAQ monitoring at BOTANICAL GARDEN SARANGPUR, AAQ4 for winter 2014

Sno.	Parameters	Minimum	Maximum	Average	98%tile	NAAQS Std.
1	$PM_{10,}$ µg/m^3	63	80	70.78	79.56	100
2	$PM_{2.5,}$ µg/m^3	35	46	41	45.56	60
3	$SO_{2,}$ µg/m^3	BDL	BDL	BDL	BDL	80
4	$NO_{2,}$ µg/m^3	26	30	27.39	30	80
5	CO, mg/m^3	0.5	1.2	1.8	1.1	4

Table 5.6 Results of AAQ monitoring at VILLAGE: DADOO MAJRA, AAQ5 for winter 2014

Sno.	Parameters	Minimum	Maximum	Average	98%tile	NAAQS Std.
1	$PM_{10,}$ µg/m^3	68	95	85.71	95	100
2	$PM_{2.5,}$ µg/m^3	36	52	46.28	52	60
3	$SO_{2,}$ µg/m^3	26	28	26.90	28	80
4	$NO_{2,}$ µg/m^3	28	34	20.42	33.6	80
5	CO, mg/m^3	0.6	1.2	0.8	1.16	4

The observations based on perusal of the above results (Tables 5.2-5.8) are compiled below:

PM_{10}: PM_{10} values ranged from 63 to 112-µg/m^3. The maximum value for PM_{10} is observed at the AAQ 2 site, Mullanpur village as 112-µg/m^3 while a minimum of 63 µg/m^3 was obtained at Botanical Garden, Sarangpur, AAQ4. The 24 hours applicable limit as specified by CPCB is 100-µg/m^3 for residential, rural and other areas, The higher values are attributed to the excessive traffic movements and construction activities near to the sampling locations as construction activities are going on in the area.

$PM_{2.5}$: The maximum value for $PM_{2.5}$ is observed at the AAQ3 site, Malloya as 94-µg/m^3- The 24 hours applicable limit specified by CPCB is 60-µg/m^3 for residential, rural and other areas, The higher value is again attributed to higher traffic , winds and construction activities around the area.

SO_2 : SO_2 concentration ranged from BDL to 33-µg/m^3, with maximum value of 33- µg/m^3 at Project Site, AAQ1. Considering the meteorology at the site, SO_2 pollution is of mixed origin (traffic, domestic & fuel burning), but the trend shows relatively lower i.e. below detection limits concentrations at all the locations when compared to the standard limit of 80-µg/m^3 for residential, rural and other areas.

NO_2: The concentration of oxides of nitrogen determined as NO_2 is ranged from 26 to 34-µg/m^3. The level in all the stations shows very low concentration of NO_2. The standard limit is 80-µg/m^3 for residential, rural and other areas.

CO: The CO levels at all the stations varied from 0.5 to 1.2 mg/m^3, which are within the standard value of 4 mg/m^3, prescribed for CO for 1- hourly monitoring,

Thus air quality is quite good in the area, higher levels of particulate matter in the ambient air is due to excessive traffic and construction going on in the area. There are number of operating brick kilns around the project site which add to the particulate matter in air.

5.2 What are the impacts on generation of dust, smoke, odorous fumes or other hazardous gases? Give details in relation to all the meteorological parameters.

The meteorological data recorded during the study period is useful for interpretation of the baseline information as well as for input prediction models for air quality dispersion. The meteorological factors decide the dispersion of the air pollutants. Movement of air pollutant is dependent on the wind speed, direction and temperature. Humidity also affects the dispersion of pollutants.

On-site monitoring was undertaken for various meteorological variables in order to generate the site specific data. A weather monitoring station (WMS) was installed at site to record the meteorological parameters like wind speed, wind direction, temperature and relative humidity continuously on 4-hourly basis (Pic. 5.2). The micro meteorological data obtained from the

installed weather monitoring station for the month of January- March 2014, is attached as Enslosure-1.

Secondary information on the climatic condition of the area was obtained from the observations recorded in the official website Indian Meteorological Department (IMD, Chandigarh discussed below).

Pic. 5.2 Showing the wind monitoring station set up at the project site

A. REGIONAL CLIMATE

- Chandigarh has a humid subtropical climate: very hot summers, mild winters, unreliable rainfall and great variation in temperature. Climatologically the complete year is categorized under following seasons:
- **Summer**: It is almost dry period . The temperatures in summers (from April to June) generally remain between 35 °C to 40 °C. It rises to a maximum of 45 °C.
- **Monsoon**: During monsoon (from July to mid-September), Chandigarh receives moderate to heavy rainfall and sometimes heavy to very heavy rainfall (generally during the month of August or September). Usually, the rain bearing monsoon winds blow from south-west/south-east.
- **Autumn**: In autumn (from Mid-September to Mid-November), the temperature rises to a maximum of 36 °C. Temperatures usually remain between 16° to 27°. The minimum temperature is around 11 °C.
- **Winter**: Winters (mid November to March) are mild but sometimes get quite chilly. Average temperatures in the winter remain at (max) 7 °C to 15 °C and (min) 0 °C to 8 °C. Rain usually comes from the west during winters and it is usually a persistent rain for 2–3 days with sometimes hail-storms.

B. RAINFALL The average annual rainfall of Chandigarh is 1110.7 mm. The city also receives occasional winter rains from the Western Disturbance originating over the Mediterranean Sea. The average rainfall data for 2008-2012, with mean annual rainfall of 1010.4 mm is shown below in Table 5.7

Table 5.7
Rainfall Data (in mm) of Chandigarh

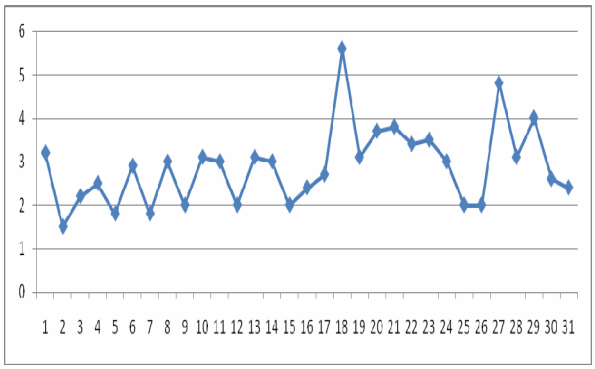
Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct.	Nov	Dec.	Total
2008	13.1	2.2	0.0	33.2	49.8	376.2	182.6	291.0	263.2	11.2	2.0	00	1224.5
2009	7.0	19.0	19.6	11.6	31.2	37.8	202.2	192.9	326.0	11.2	14.7	0.7	873.9
2010	8.8	16.0	0.0	3.7	8.2	166.2	373.4	242.2	340.1	13.6	0.7	41.1	1214.0
2011	4.5	17.3	11.2	2.3	52.7	210.2	201.6	180.7	169.4	0.0	0.0	10.9	860.8
2012	35.7	7.9	2.9	57.2	3.0	4.1	268.5	283.0	203.4	3.3	0.2	9.8	879.0

Source: website of IMD, Chandigarh

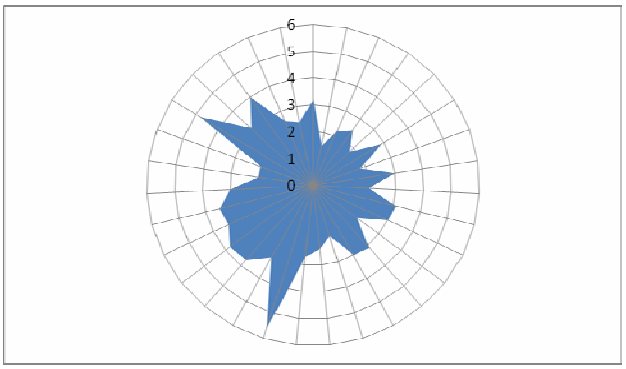
C. WIND SPEED AND DIRECTION MEASUREMENTS

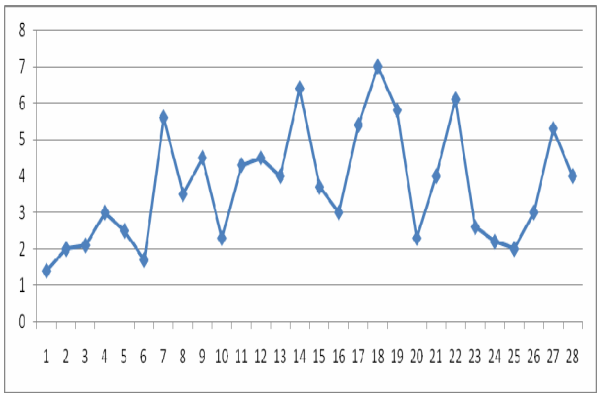
The wind directions in this region are very well known and laid out. The wind direction in Chandigarh is from northwest during winters and southeast during summers.

Figs 5.2 - 5.6 show the presentation based on the meteorological data obtained from the installed weather monitoring station in the winter -2014, (Enclosure-1). It is observed that the predominant wind direction is northwest during the monitored period.

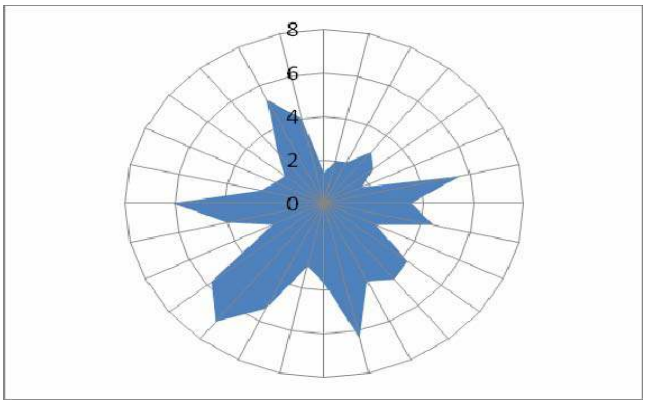


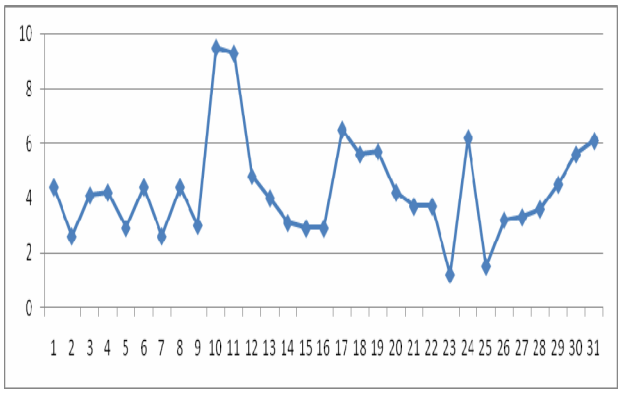
(a) January





(b) February





(c) March

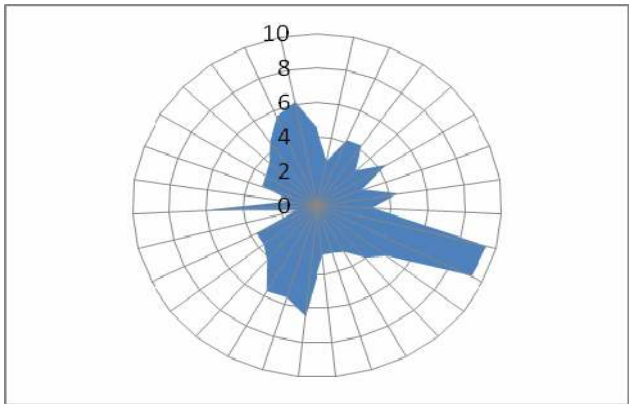
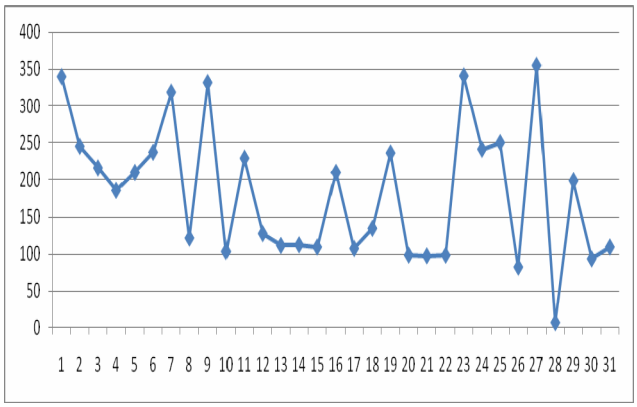
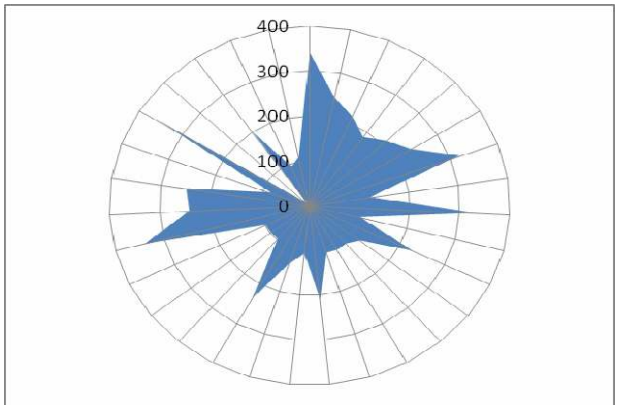


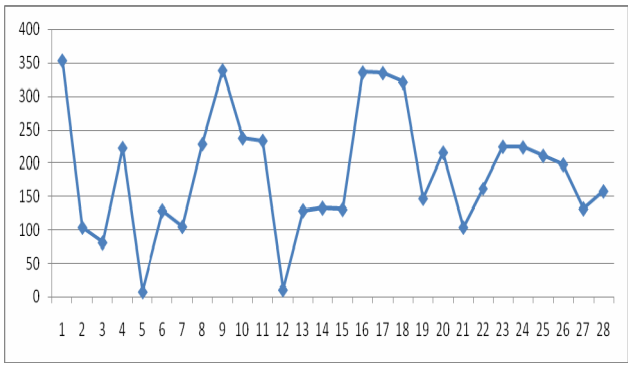
Fig. 5.2 Trend in variation in Wind Speed

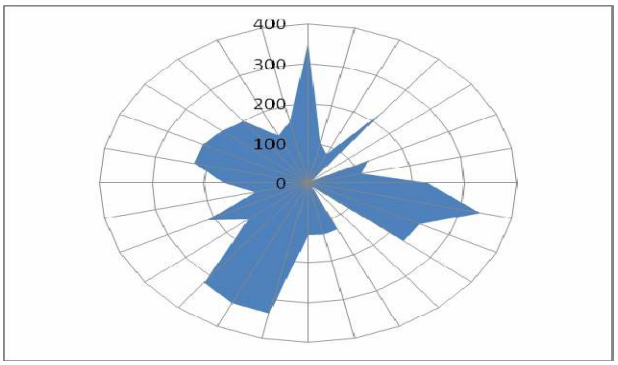
Fig.5.3 Wind Rose for the wind speed



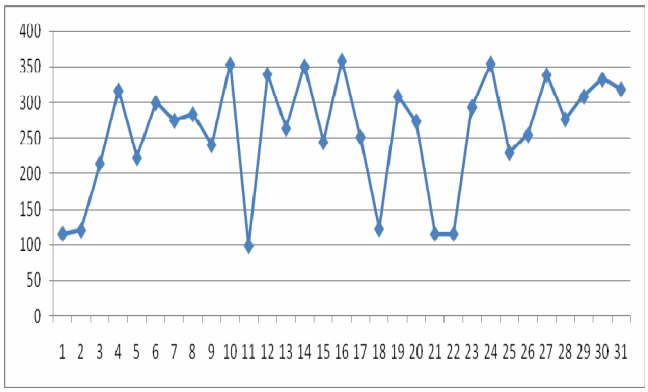


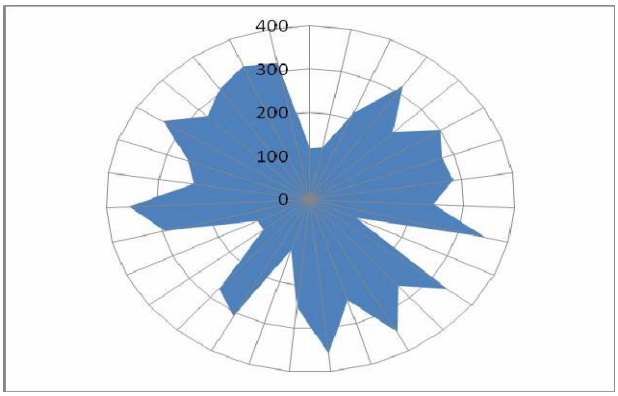
(a) January





(b) February





(c) March

Fig. 5.4 Trend in variation in direction of Wind

Fig.5.5 Wind rose of the wind direction

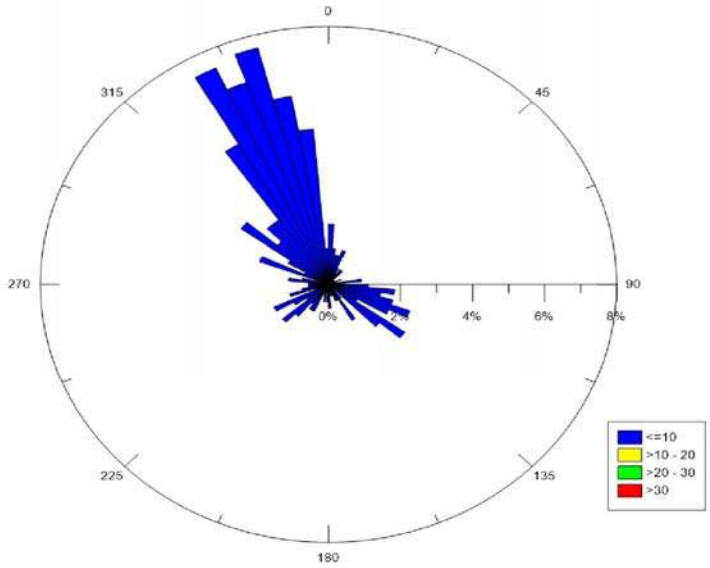
(Dhanas)
(CAP Complex)

Measurements Period : from 01/01/2014 to 31/03/2014

WindRose ver.4.19-6.12

Mean Wind Speed (at 20m height)	**3.9 m/s**
Mean Turbulence Intensity (at 20m/s)	**11.0 %**
Max. 10min Average Wind Speed	**3.1 m/s**
Maximum Gust	**9.5 m/s**
Uncertainty of Wind Speed measurement	**0.2 m/s**
shape factor (k)	**2.28**
Total number of valid data	**542**
Missing data	**0 (0.0%)**
Calc. Mean Wind Speed at 20m height	**4.0 m/s**

Best Sector	**NNW 65.00 %**



Wind-Rose

Fig.5.6 Wind rose Diagram for the monitored period at the project site

D. TEMPERATURE AND HUMIDITY MEASUREMENTS

Temperature & % Relative humidity were measured at the project site, CAP Complex, Dhanas for three months from January, 2014 to March, 2014. Data were recorded continuously on 4 hourly basis (Enclosure-1). The maximum, minimum and average values are summarized below in Table 5.8

Table: 5.8
Summary of Meteorological data generated at site, CAP complex

Month	Temperature (°C)		Avg. relative humidity (%)
	Max	Min	
January-2014	24.22	6.5	78.45
February-2014	25.14	7.71	73.74
March-2014	32.67	9.81	61.71

Source ITC Study

The temperature was observed to range between 6.5 to 24.22 °C with an average 15.36 in January, between 7.71 to 25.14 °C with an average of 16.45°C in February and between 9.81 to 32.67° C with an average of 21.24 °C in March. The corresponding percentage average relative humidity values were observed as 78.45, 73.74 and 61.71.

E. IMPACTS ON AIR QUALITY

The potential ambient air quality impacts arising from the proposed project would occur mainly during project construction phase. Particulate Matter (PM) comprising PM $_{2.5}$ & PM_{10} would be the predominant pollutants generated from construction activities. The gaseous emissions such as SO_2, NOx and CO would be generated from the construction equipments and vehicles.

The ambient air quality monitoring results show that the PM_{10}, and $_{2.5}$ concentrations at most of the locations within study area of the proposed project site are well within the standards prescribed for the residential areas except at one station, Mullanpur (Table 5.2-5.6). However, appropriate mitigation measures will be employed during the construction stage to reduce any incremental rise in pollution level to an acceptable limit.

Impacts of construction activities on air quality are a cause for concern mainly in the dry months due to settling of dust particles. The main sources of emission during the construction period are the movement of equipments at site and dust emitted during the leveling, grading, earthworks, foundation works and other construction related activities. The dust emitted during the above mentioned activities depend upon the type of soil being excavated and the ambient humidity levels. The impact is likely to be for short duration and confined locally to the construction site itself, to be negligible outside the project boundaries. The composition of dust

in this kind of operation is however mostly coarse particles, inorganic and non-toxic in nature. These are not expected to travel long distance before settling.

Exhaust emissions from vehicles and equipment deployed during the construction phase also result in marginal increase in the levels of SO_2, NOx, SPM, CO and unburnt hydrocarbons. It may, therefore, be deduced that construction activities may cause changes in the PM levels locally. The impact will, however, be reversible, marginal and temporary in nature.

All necessary measures will be taken to limit emissions within norms of CPCB.

- The transportation vehicles will be suitably covered to prevent dust emissions or dispersion form the trucks, Overloading of vehicles will be avoided. The vehicles will be PUC certified eco-friendly.

- Environmentally compliant DG sets, with proper stack height, will only be used.

The impact of such activities would be temporary and restricted to the construction phase. Proper upkeep and maintenance of vehicles, sprinkling of water on roads at construction site, providing sufficient vegetation etc. are some of the proposed measures that would greatly reduce the impact on the air quality during the construction phase of the project.

Other diffused source of gaseous emissions from the construction site would be if the labour uses fuel wood for cooking and heating during winters. The construction contractor will ensure that such practice is not adopted by the labors and they are provided with LPG cylinders for cooking in their labour camps.

F. AIR QUALITY MODELING

General

Air quality models simulate the physical and chemical processes occurring in the atmosphere to estimate the atmospheric pollutant concentration. Air quality models predict the dispersion and dilution processes if the pollutants in the atmosphere using the prevailing metrological conditions, emissions to determine the ambient air concentrations. Respirable particulate matter (PM_{10}) and Fine particulate matter ($PM_{2.5}$) have been found to associate with increased mortality and asthma.

The experimental and computational methodology involved in evaluation of performance of the air quality model. Fig.5.7 represents an outline of steps used for air quality modeling study which are used during the study.

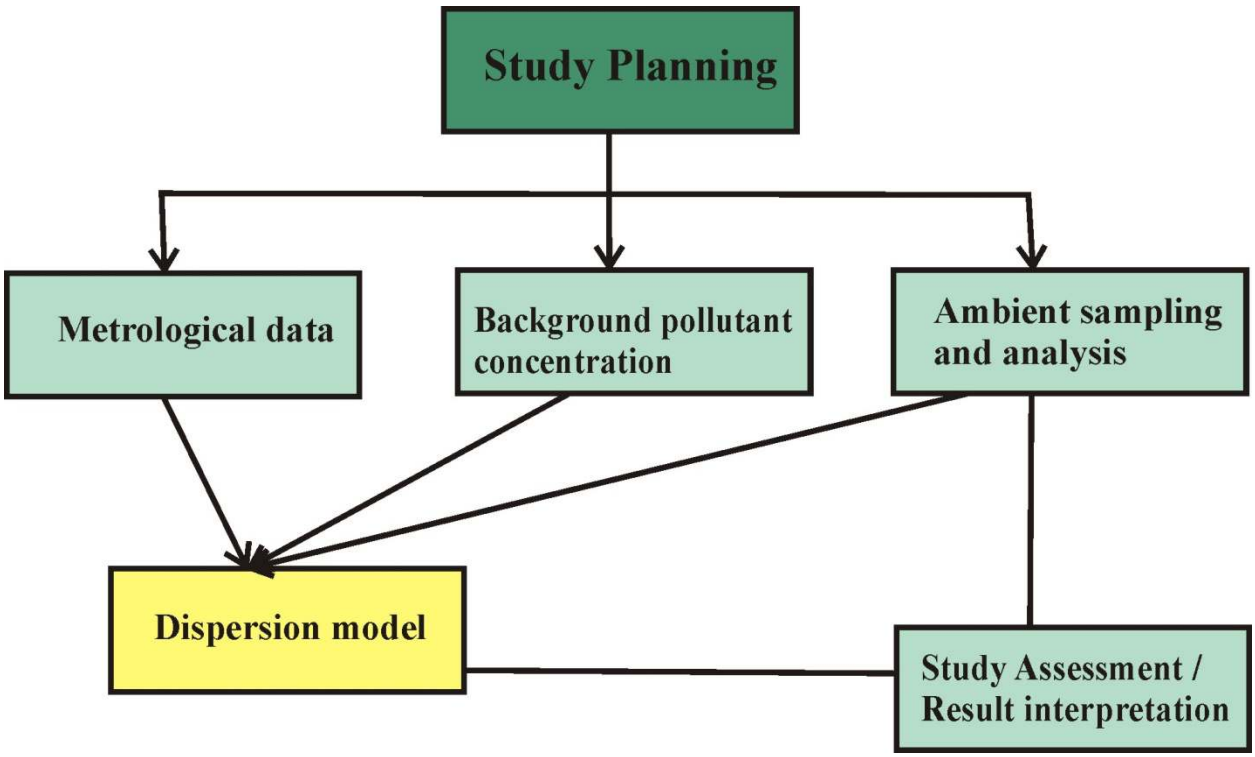


Fig.5.7. Framework for Air-Quality Modeling Study (AQMs)

Air quality models (AQMs) are computerized representations of the atmospheric processes responsible for air pollution, including ozone formation. The models simulate the atmosphere in varying degree of detail by mathematically representing emissions; initial and boundary concentrations of chemical species; the chemical reactions of the emitted species and of their products; and the local meteorology such as sunlight, wind, and temperature. In this way, an understanding of the atmosphere's chemistry and meteorology is combined with estimates of source emissions to predict possible control strategy effects. AQMs are also an important tool in gaining understanding about the behavior of various compounds in the atmosphere, such as the reactivity of VOCs. Models can also be designed to optimize the costs of control strategy implementation. These models are essential to evaluating control strategies aimed at reducing pollution to meet air quality goals.

Atmospheric dispersion modeling is the simulation of how air pollutants disperse in the ambient atmosphere. It is performed with computer programs that solve the mathematical equations and algorithms which simulate the pollutant dispersion. Such models are important to governmental agencies tasked with protecting and managing the ambient air quality. The models are typically employed to determine whether existing or proposed new industrial facilities are or will be in compliance with the National Ambient Air Quality Standards (NAAQS). The results of dispersion modeling, using worst case accidental release source terms and meteorological conditions, can provide an estimate of location impacted areas, ambient concentrations, and be used to determine protective actions appropriate in the event a release

occurs. Appropriate protective actions may include evacuation or shelter-in-place for persons in the downwind direction.

The study was divided into two major parts: air quality modeling and ambient sampling. Air quality modeling uses various dispersion models to predict the hourly concentration of pollutant in the site. Such models require input data such as meteorological parameters (wind speed, ambient temperature and wind direction), length and width of the study site, angle between the site and wind direction and background concentration of pollutants. The background concentration of pollutants PM_{10}, $PM_{2.5}$, CO and SO_2, and NO_2 play a vital role in air quality modeling.

Software Used

PoLogCem, a PC user-friendly software, is used for pollution modeling under environmental constraints. This work presents a computer aided modeling and pollution control tool (called PoLogCem), with the following functionalities:

(a) The achievement for representatives' mathematical models for the environmental pollution process

(b) The monitoring of the production process with pollution influence

(c) The searching for the optimal solutions for production planning, which minimize pollution effects.

The following set of variables of the ambient air monitoring data was considered for the prediction of the impact at the project site: [Barometric Pressure], [Temperature], [Relative Humidity], [particulate matter] [NOx, SO_2 and CO Concentration], Average ambient temperature during monitoring period was taken to the 24.3°C.

At 2500 m (2.5Km) out of the proposed site was considered the background concentrations in suspension [$\mu g/m^3$].The Air Dispersion Model generated through the PoLogCem of the studied area are shown in given figure below Fig. 5.8 below:

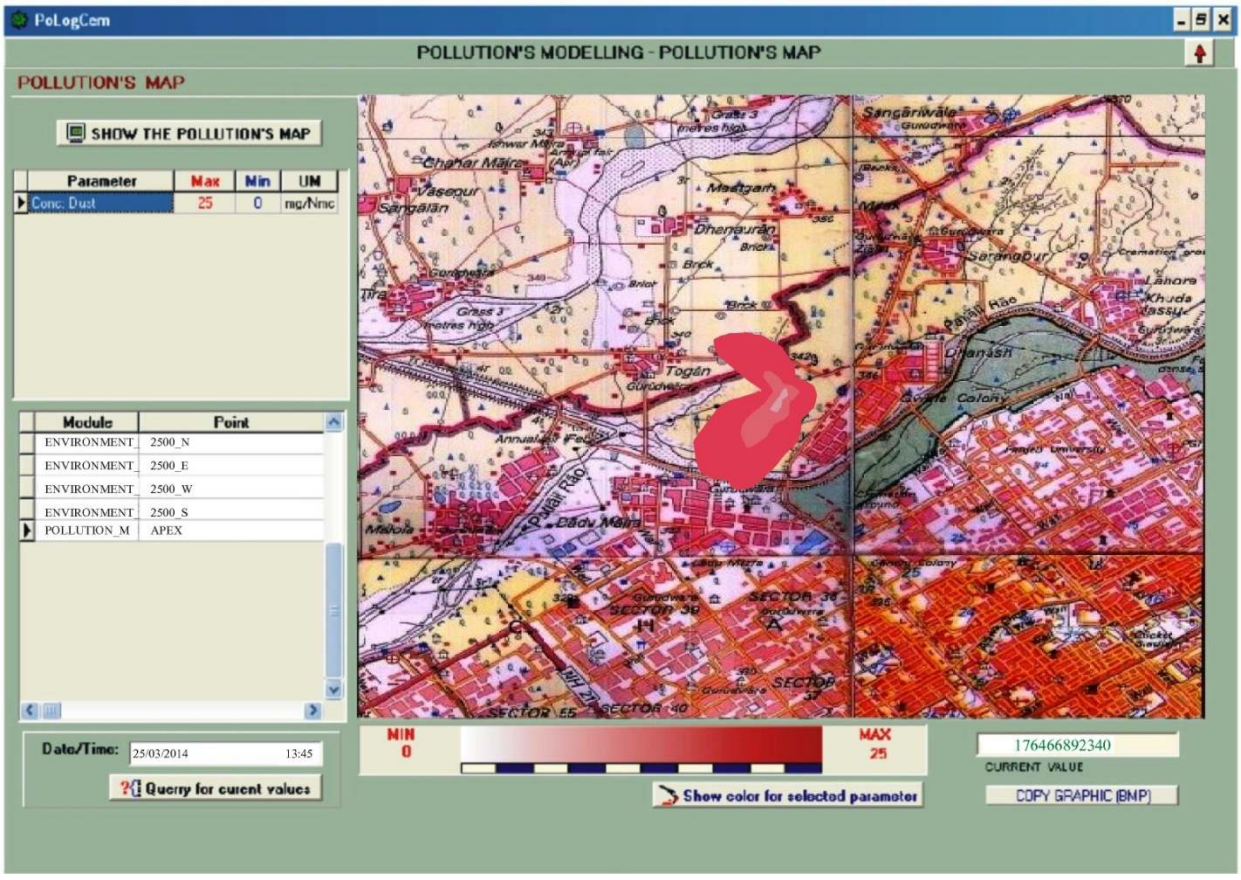


Fig.5.8 Map showing the pollution levels due to the proposed CAP Complex

The figure above shows the concentrations in suspension is very low within the normal range and do not affecting the adjacent area of proposed site. Since, the concentration level is very less and also the wind speed the ambient air quality parameters are within the standards of the Central Pollution Control Board (CPCB). It also shows the pollution level in month of January that the dust concentration variable from min to max. The wind speed of the area is higher towards the south-west direction as a result the suspension particles will be transported to SW direction but to very less distant due to low concentration and speed of wind (4.7 km / hr to 20.1 km / hr max.).

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

The Layout of the proposed site has developed an internal road network not only to individual buildings but also integrate the whole CAP complex. Roads & Traffic circulation plan and Parking layout plan are attached as Annexures-XVII & XVIII.

There are two entry points to the housing complex has been worked out keeping in view the movement of vehicles and road network around the site. Main entry to the complex is planned from the main road Dakshin Marg. Adequately wide roads to cater two way traffic and to meet the fire regulations have been planned inside the complex. It is proposed to provide total equivalent car space (ECS) of 2174, as detailed in Table 5.11 in following pages.

Transportation infrastructure in and around the project site

Transportation includes everything starting from auto rickshaw to the cars, taxis, buses etc. The project is well connected to the road network to the other parts of the city. The project site is easily accessible through main road. The baseline traffic study in the study area was carried to assess the traffic flow. An observation point in front of the gate of the proposed CAP complex on the main road, Dakshin Marg was selected for recording the traffic movements and traffic volume survey for 24 hours from both ways. Tables -5.9 & 5.10 shows the summarized data of the amount of the various types of vehicles during the survey.

Table: 5.9
Traffic density from Chandigarh to Dhanas

S.No.	Date of Study	Time Duration Hrs	Type of Vehicle				
			LMV	HMV	Two Wheeler	Three Wheeler	Others
1.	10.01.2014	09.00 – 10.00	89	2	82	32	122
2.	10.01.2014	10.00 – 11.00	94	4	90	52	4
3.	10.01.2014	11.00 – 12.00	86	16	68	40	3
4.	10.01.2014	12.00 – 13.00	52	18	52	22	6
5.	10.01.2014	13.00 – 14.00	86	24	64	43	6
6.	10.01.2014	14.00 – 15.00	62	16	42	30	10
7.	10.01.2014	15.00 – 16.00	50	6	84	38	5
8.	10.01.2014	16.00 – 17.00	82	8	106	50	22
9.	10.01.2014	17.00 – 18.00	192	6	188	36	30
10.	10.01.2014	18.00 – 19.00	142	10	196	42	25
11.	10.01.2014	19.00 – 20.00	28	2	186	10	6
12.	10.01.2014	20.00 – 21.00	10	2	28	3	8
13.	10.01.2014	21.00 – 22.00	2	1	10	3	2
14.	10.01.2014	22.00 – 23.00	3	0	2	2	0
15.	10.01.2014	23.00 – 00.00	2	0	0	2	0
16.	11.01.2014	00.00 – 01.00	0	0	0	0	0
17.	11.01.2014	01.00 – 02.00	0	2	0	0	0
18.	11.01.2014	02.00 – 03.00	2	0	0	0	0
19.	11.01.2014	03.00 – 04.00	3	2	2	2	0
20.	11.01.2014	04.00 – 05.00	2	3	4	8	5
21.	11.01.2014	05.00 – 06.00	8	4	12	10	25
22.	11.01.2014	06.00 – 07.00	10	3	66	35	28
23.	11.01.2014	07.00 – 08.00	22	18	92	40	130
24.	11.01.2014	08.00 – 09.00	36	10	192	42	134

Source: ITC Study

Categories:

LMV: Car & Jeep, HMV:Trucks, Bus, Tractors etc., Two Wheeler :Motor Bike, Scooter etc.,
Three Wheeler:Auto Rickshaw (Passenger & Goods Carrying Tempoo), Other:Cycle, Rickshaw, Bullock Cart, Tanga etc

Table 5.10
Traffic density from Dhanas to Chandigarh

S.No.	Date of Study	Time Duration Hrs	Type of Vehicle				
			LMV	HMV	Two Wheeler	Three Wheeler	Others
1.	10.01.2014	09.00 – 10.00	98	5	170	53	96
2.	10.01.2014	10.00 – 11.00	86	10	112	50	65
3.	10.01.2014	11.00 – 12.00	80	18	104	46	17
4.	10.01.2014	12.00 – 13.00	64	10	96	42	12
5.	10.01.2014	13.00 – 14.00	128	19	78	38	6
6.	10.01.2014	14.00 – 15.00	112	8	62	42	10
7.	10.01.2014	15.00 – 16.00	66	10	74	58	3
8.	10.01.2014	16.00 – 17.00	72	12	96	72	8
9.	10.01.2014	17.00 – 18.00	96	6	118	110	7
10.	10.01.2014	18.00 – 19.00	140	14	146	82	2
11.	10.01.2014	19.00 – 20.00	122	10	132	58	3
12.	10.01.2014	20.00 – 21.00	50	5	60	32	2
13.	10.01.2014	21.00 – 22.00	62	3	25	22	2
14.	10.01.2014	22.00 – 23.00	8	0	10	5	0
15.	10.01.2014	23.00 – 00.00	10	2	2	4	0
16.	11.01.2014	00.00 – 01.00	2	0	0	2	0
17.	11.01.2014	01.00 – 02.00	0	0	0	0	0
18.	11.01.2014	02.00 – 03.00	0	3	0	0	0
19.	11.01.2014	03.00 – 04.00	5	5	0	0	0
20.	11.01.2014	04.00 – 05.00	6	8	0	5	4
21.	11.01.2014	05.00 – 06.00	10	4	2	28	12
22.	11.01.2014	06.00 – 07.00	18	6	25	36	23
23.	11.01.2014	07.00 – 08.00	40	18	68	56	112
24.	11.01.2014	08.00 – 09.00	46	26	180	62	120

Source: ITC Study

Categories:

LMV	:	Car & Jeep
HMV	:	Trucks, Bus, Tractors etc.
Two Wheeler	:	Motor Bike, Scooter etc.
Three Wheeler	:	Auto Rickshaw (Passenger & Goods Carrying Tempoo)
Other	:	Cycle, Rickshaw, Bullock Cart, Tanga etc.

From the above it is evident that the traffic density on the road is high, it being a main road, extension of Dakshin Marg. All types of vehicles ply on the road. The road infront leads to capital city of Chandigarh from Punjab. Continual growth of residential complexes e.g. Rehabilitation complex for EWS, Omaxe, DLF, commercialization of the area because of declaration of New Chandigarh are the factors contributing for higher traffic.

During construction phase, there will be slight increase in heavy traffic movement near intersection of Dadoomajra, Dhanas & Sector 38-West. About 10 trucks will be plying per day to and from the project for transportation of construction material. However, considering that the road width is good there will not be any traffic congestion on roads near site.
Further, the following arrangement would be made to ease the situation

- Drivers of trucks /heavy vehicles will be instructed to give way to passenger buses, cars, etc.
- Transport of construction materials and machinery will be carried out during lean traffic period of the day or during night.
- Well-maintained environmentally compliant trucks/ vehicles will be used so that exhaust smoke does not contribute noxious gases or unburned hydrocarbons to atmosphere.

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

The layout plan of the proposed complex has developed an internal road network not only cater to individual cluster buildings but integrate the whole CAP complex in an interesting composition of build masses and open spaces with a pedestrian dominated movement in the complex. Main entry to the complex is from the main Dakshin marg. Adequately wide roads according to specifications to cater to two way traffic and to meet the fire regulations are planned inside the complex. Guided traffic ways, wide roads inside project area have been created for easy vehicular movement. Detailed calculation and the traffic circulation plan is given in Table 5.11 & Annexure-XVII while Parking Layout Plan is attached as Annexure-XVIII.

Table 5.11
Parking Details

Required parking as per Chandigarh Administration Laws Extra 20 % of 1656 (for visitors)	1 ECS x 1272 + 1.25 ECS x 264 + 2 ECS x 96 + 2 ECS x 24 = 1842 ECS = 331.2 ECS		
Total Required Parking	2174 ECS		
Parking details as follows:			
Type of Parking	**Total Area (in sq.m.)**	**% plot area**	**Total no of ECS**
Total stilt Parking (@30 sq.m. per ECS)	19247.79	8.98	641.6
Total Open parking slots around blocks (@25 sq.m. per ECS)	15591.23	7.27	623.6
Road / Driveway parking at the peripheral (@25 sq.m. per ECS)	24750.0	11.55	990
TOTAL PARKING PROVIDED	59589.02	27. 82	**2255 against required 2174**
Parking provided as per norms of Ministry of Urban Development, GOI dated 16.09.2009 and 23.05.2012.			

The required ECS in proposed project is 2174.There will be provision of sufficient space for parking of two wheelers also. Following measures will be adopted for smooth traffic movement.

- Guided traffic ways within project site.
- Speed humps will be installed for speed restriction inside the campus.

5.5 Will there be significant increase in traffic noise & vibrations? Give details of the sources and the measures proposed for mitigation of the above.

The proposed project will not result in generation of any large volume of traffic. Measures will be taken to mitigate any effect due to this which includes heavy vehicular movements to be restricted during daytime only and adequate parking facility will be provided during the construction phase. Vehicular movement will be regulated inside the site; no vehicle will be parked along the main road outside the premises.

Ambient Noise Levels

The physical description of sound concerns its loudness. The noise in general is a sound which is composed of many frequency components are various loudness distributed over the audible frequency range. The impact of noise sources on surrounding depends on the characteristics of the noise sources (instantaneous, intermittent or continuous). The impacts of noise depend mainly on the characteristic of the noise generating sources, topography and atmospheric conditions.

Calibrated noise meter was used for monitoring ambient noise levels in the study area at five locations given in Table 5.12 and Fig. 5.9. The main sources of noise around the proposed site were vehicular movement, construction activities and the noise generated through the daily activities of the people / villagers. Hourly noise levels were measured for day and night times. The average of the observations of the equivalent noise levels for day and night at each location are given in Table 5.13, (Noise levels monitoring reports attached in Appendix-1)

Table: 5.12

Noise monitoring locations

Code	Location/ Type
N1	At proposed project site (residential)
N2	Market Mulanpur garibdas)
N3	At Village Maloya (Residential /rural)
N4	At Botanical garden , Sarangpur
N5	At Sukhna Lake

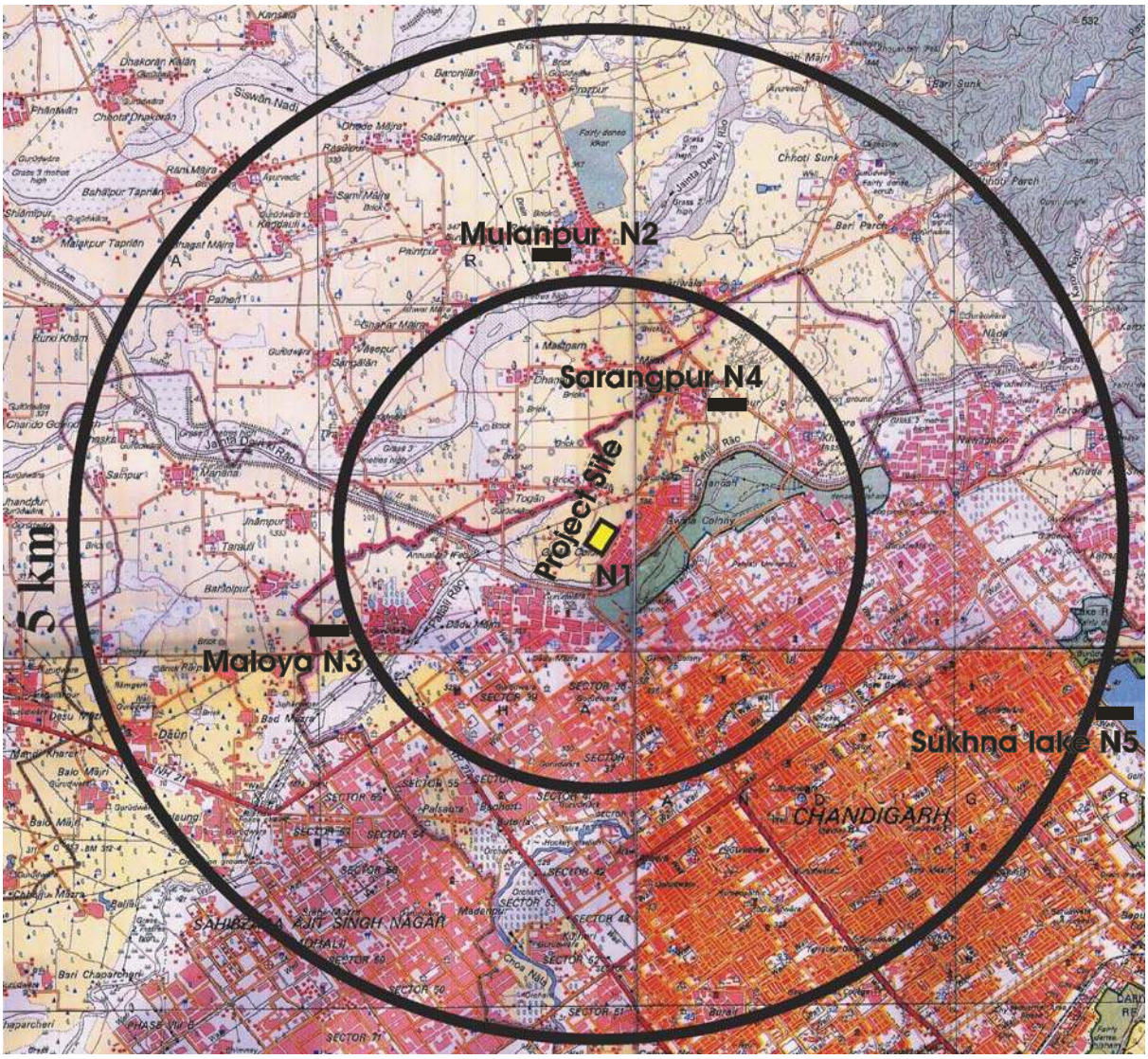


Fig. 5.9 Noise Monitoring Locations

Table: 5.13
Noise quality in the study area (Leq in dBA)

Code	Average day time	Average night time
N1	54.5	43.1
N2	58.0	42.4
N3	50.5	39.0
N4	54.2	38.2
N5	44.1	35.6

From the above data, it can be inferred that the average daytime noise levels varied from 44.1 to 58.0 dBA. Whereas the night time levels varied from 35.6 to 43.1 dBA, the values for day & night times were well within permissible limits specified by the Central Pollution Control Board (CPCB) for industrial, commercial & residential areas (Table 5.14). The lowest noise level was observed at the Sukhna Lake during the night time (35.6 dBA.) while the highest of 58.0 dBA at N2 in Mullanpur market.

TABLE: 5.14
National Ambient Noise Standards

Category of zones	Limits In dB(A) Leq*	
	Day time	Night time
Industrial	75	70
Commercial	65	55
Residential	55	45
Silence Zone**	50	40

Source: Central Pollution Control Board (PCLS/02/2010)

Note:
1. Day time shall mean from 6.00 a. m. to 10.00 p.m.
2. Night time shall mean from 10.00 p.m.to 6.00 a.m.
3. **Silence zone is defined as an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.
4. Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.

* dB (A) Leq denotes the time weighted average of the level of the sound in decibels on Scale A which is relatable to human hearing.

"A" in dB(A) Leq, denotes the frequency weighting in the measurements of noise and corresponds to frequency response characteristics of the human ear.
Leq: It is an energy mean of the noise level over a specified period.

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

A. IMPACT OF DG SET ON NOISE LEVELS DURING OPERATION PHASE

Since most of the time electricity will be available from the Chandigarh administration. However, in case of power failure 8 X 500 KVA silent DGs have been proposed, with proper acoustic enclosure and suitable exhaust muffler. The DG set room will be isolated from the outside environment with proper acoustic arrangement to control the noise generated from the rooms.

The impact of noise generated at source has been predicted by the use of equation and certain assumptions. For an approximate estimation of dispersion of noise in the surroundings from the source point, a standard mathematical model for sound wave propagation is used. The equation for sound wave propagation is as follows:

Noise (Receptor) = Noise (source) – 20 Log [Distance (Receptor)/ distance (Source)]

For prediction, flat terrain and environmental attenuation factors are not considered so as to formulate the worst case scenario.

With control measures, the total noise at 1m distance from the DG set room will be about 75 dB(A) . This will reduce further and at about 50 m distance, the noise would be about 50-52 dB(A). So, the location of the DG set room will be in such a way that the noise level has minimum impact on the residents of the complex.

The effect of high noise on operating personnel in DG and pump room will be considered and appropriate mitigation measures adopted.

Continuous exposure to high noise levels above 90 dB(A) affects the hearing capacity of the workers / operators and hence would be avoided. To prevent these effects, it has been recommended by Occupational Safety and Health Administration (OSHAS) that the exposure period of affected persons be limited.

B. IMPACTS OF DG SET ON AMBIENT AIR QUALITY DURING OPERATION PHASE

Air emissions comprising PM, NOx, SO_2 and CO will be from the operation of 5 DG sets if used as the standby power source

- HSD will be used as fuel for DG set with 0.25 % Sulphur content and specific gravity of 0.85 gm/cc
- The calorific value of HSD will be 10800 cal/ gm with negligible ash content.
- The DG set will have four stroke engine with gross heat rate of 2000 kcal/ Kwh
- The HSD consumption would be about 45 litres/ hr

The calculations for estimation of emission rates are as below:

Sulphur Dioxide

HSD Consumption Rate : 45 l/ hr
Sulphur Content : 0.25%
HSD Density : 0.85 kg/ltr.

Emission rate = 45 ltr/ hr x 0.85 kg/ ltr x 0.25/100 x 64/32 = 0.191 kg/hr= 0.053 g/s

Oxides of Nitrogen

For calculation of oxides of Nitrogen emission rate, the emission limit of 710 ppm (1455.5 mg/Nm^3) is considered. The rate of emission NOx is given below:

Emission rate = 1455.5 mg/ Nm^3 x 0.190 Nm^3/s x 1/1000= 0.27 g/s

Based on these low level of emission rates from the stacks of DG sets, it can be inferred that the area in and around the proposed project site is unlikely to be significantly affected due to the proposed project activities.

C. IMPACTS ON NOISE LEVELS DURING CONSTRUCTION PHASE

The ambient daytime and nighttime noise levels measured in the study area in the range from 44.1 to 58.0 dBA and 35.0 to 42.4 dB(A) respectively well within the permissible levels of National ambient noise levels of CPCB.

Noise will be generated during construction by various construction machinery and equipments which of course would be intermittent and of short duration. More trucks and vehicles will be required to transport construction material and machinery to and from the site. Heavy construction traffic for loading and unloading, fabrication and handling of equipment and construction materials are likely to cause an increase in the ambient noise levels from the site, the areas near to the complex are likely to be affected more. It is usually observed that the machinery produces noise levels in the range 68-92 dB (at a distance of 7.5 km) (Table 5.15) from the noise source and decreases with increase in distance.

Table 5.15

Noise level due to operation of various construction Machinery and equipments

Equipment	Noise Level dB(A)
Earth Moving Equipment	
Compactors	70-72
Front End loaders	72-82
Backhoes	72-92
Tractors	76-90
Scrappers, graders	82-90
Pavers	86-88
Truck	84-90
Material Handling	
Concrete mixers	75-85
Movable cranes	75-86
Concrete pumps	81-88
Cranes (derrick)	86-88
Stationary Equipment	
Pumps	68-70
Generators	85-90
Compressors	75-85
Other Equipment	
Vibrators	69-81
Saws	74-81

Source: US Environmental Protection Agency, Noise from Construction Machinery & Equipment Operations

Also it is a known fact that there is reduction in noise levels as sound passes through construction material. (Table 5.16)

Table 5.16
Reduction in Noise Level when Sound Waves Pass Through
Common Construction Materials

Material	Thickness of Construction Material (mm)	Decrease in Noise Level dB(A)
Light concrete	100	38
	150	39
Dense concrete	100	40
Concrete block	150	36
Brick	100	33
Granite	100	40

Source: US Environmental Protection Agency, Noise from Construction Machinery & Equipment Operations

Thus, the walls of various houses will attenuate noise by at least 30 dB(A).
In addition, there is noise attenuation of (approx 10 dBA) due to the following other factors:

- Air absorption
- Rain
- Atmospheric In-homogeneities
- Vegetal Cover

In view of the above facts no increase in noise levels is anticipated during project construction phase which has adverse impact on humans or faunal species or birds. Further to minimize these potential impacts, major construction activities would be scheduled during normal daylight working hours and would be implemented consistent with the applicable standards. The construction contractor will use equipments that are adopted to operate with appropriate noise muffling devices resulting in the least possible noise.

Overall the impact of noise generated on the environment is likely to be insignificant, reversible and localized in nature and mainly confined to the daytime.

SECTION 6- AESTHETICS

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

The adjoining lands to the proposed project site are commercial area, mainly marble market, waste dumping grounds and agricultural land (Pic 1.2). Infront across the main road is residential area of Milk Colony Dhanas, located within 1 km radius of the project site, the characteristics of this part of the project area are essentially semi-urban. The residential complex of Chandigarh Armed Police will enhance the aesthetics of the area. In no way, the proposed construction will result in any obstruction of the view, scenic amenity or landscapes.

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

The proposed project site is an uneven plot of land and does not involve activity of any other type. The construction activities of the proposed project would not have an adverse effect on the land use activities and will not be encroached during the construction of the project. The proposed new construction will be developed with well defined buildings byelaws of Chandigarh administration to form integrated part of the surroundings

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

The project will strictly follow the buildings regulations and norms, of Chandigarh administration and BIS building code. All norms on ground coverage, FAR, Height, fire safety requirements, structural design and other parameters will be strictly followed.

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

There are no anthropological or archaeological sites in the vicinity of the project site in the study area. There are local mandirs, gurudwaras in the area. Temple Jayanti Devi, situated in village Jayanti Majri is 8-10 km away from site.

Otherwise, Chandigarh city was planned in the foothills of Shivalik by Swiss architect P. Jeanneert and Le Corbusier. It hosts largest Le Corbusier open hand sculpture that the city is open to give and open to receive, The Capital Complex which has High Court, Assembly Hall, Secretariat forms the historical monuments Besides these, Rose Garden, Rock Garden. Leisure Valley forms heritage of Chandigarh. These all are situated, near to Sukhna lake, 10 km away from the site.

Recently Le Corbusier Centre has been set up by the Chandigarh administration, at the old sector 19 office of the city's architect, Le Corbusier.(The Swiss -French architect used the office while conceptualizing the city almost six decades ago.) Govt. Museum and Art Gallery in Sector -10 host many artifacts and records and Stone inception, dated (1597 AD).

SECTION 7- SOCIO ECONOMIC ASPECTS

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

The salient features of the demographic and socio economic profile is described below:

A. CHANDIGARH VILLAGES (OVERVIEW)

Chandigarh was planned as a city surrounded by rural belt in its periphery to nourish it. Its residential sectors are based on the concept of self sufficient neighborhoods each having schools, shops for daily needs, community centres and neighborhood parks. About 73% peripheral area has gone to Punjab, 24% to Haryana, remaining 3% is with Chandigarh. The rural area with Chandigarh has been reduced considerably as large no. of development, both planned and unplanned, has taken up in periphery, for new residential, institutional and other developments which includes establishment of the IT park, Rehabilitation colonies for unauthorized settlement, Sarangpur institutional area, Botanical Garden, Milkmen colony Dhanas, dumping ground for solid waste etc. are a few of them.

The Union Territory of Chandigarh has 23 villages categorized as Sectoral and Non sectoral villages. With the creation of the Municipal Corporation of Chandigarh in July 1994, nine villages have been brought under the MCC while the rest are still rural and governed by elected Gram Panchayats. Khuda ali sher, Khuda Jassu, Khuda Lahora, Sarangpur, Dhanas are the non sectoral villages around the project site. Though all the villages will not be affected directly, however project activities will have sustained indirect impact on socio economics of these villages. A brief status of the villages in surroundings is as given below (Table 7.1)

Table 7.1
A brief status of the villages in surrounding area

	Khuda Jassu	**Sarangpur**	**Dhanas**	**Khudaalisher**	**Lahora**
Situation (Distance from CHD Bus stand km	4	5	6	5	2
Total Area (Acre)	482	673	723	564	776
Acquired Area Acre	357	485	225	208	252
Unacquired Area (Acre)	125	188	498	356	524
Panchayat land (Acre)	8	7	-	7	22
Total Population(2011 Census)	2919	3468	7094	6831	6096
Male	1778	2020	4258	3740	3644
Female	1141	1448	2836	3091	2452

Source: Website of Rural development and panchayat department Chandigarh administration

B. POPULATION

The population distribution is correlated with the physiographic divisions. The study area is quite populated, because of availability of sound roads, good employment opportunities at Chandigarh and nearby industrial estates of H.P. and Punjab. The area has plenty of amenities like electricity, drinking water, educational facilities, etc. People of the area are physically well built, active, generous, hospitable and highly humorous. They are a blend of Punjab and Haryana, speak Hindi, Punjabi and English as common languages. As being near to Punjab, Punjabi is mostly the spoken language. The dress of folks is traditional for men and Salwar-Kameej for the women**.**

i) Demographic Profile

Total population of Chandigarh as per 2011 census is 1,055,450 of which 580,663 and 474,787 respectively are males and females Table 7.2 shows demographic profile of Chandigarh as per 2011 census.

Table 7.2
Demographic Profile of Chandigarh, 2011

Description	2011	2001
Approximate Population	10.55 Lacs	9.01 Lacs
Actual Population	1,055,450	900,635
Male	580,663	506,938
Female	474,787	393,697
Population Growth	17.19%	40.33%
Percantage of total Population	0.09%	0.09%
Sex Ratio	818	773
Child Sex Ratio	880	819
Density/km2	9,258	7,900
Density/mi2	23,988	20,469
Area km2	114	114
Area mi2	44	44
Total Child Population (0-6 Age)	119,434	115,613
Male Population (0-6 Age)	63,536	62,664
Female Population (0-6 Age)	55,898	52,949

Literacy	86.05 %	81.94 %
Male Literacy	89.99 %	88.42 %
Female Literacy	64.81 %	75.37 %
Total Literate	805,438	643,245
Male Literate	465,346	382,686
Female Literate	340,092	260,559

Source: Census of India 2011

ii) **Chandigarh Rural Population 2011**

The total population of Chandigarh state, around 2.75 % (Table 7.3) lives in the villages of rural areas. Total population of rural areas of Chandigarh is 28991, where 17150 are males and 11814 are females respectively. The population growth rate recorded for this decade (2001-2011) was 2.75%

Table 7.3
Comparison of demographic profiles of Rural and Urban areas

Description	Rural	Urban
Population (%)	2.75 %	97.25 %
Total Population	28,991	1,026,459
Male Population	17,150	563,513
Female Population	11,841	462,946
Population Growth	-68.53 %	26.96 %
Sex Ratio	690	822
Child Sex Ratio (0-6)	871	880
Child Population (0-6)	4,270	115,164
Child Percentage (0-6)	14.73 %	11.22 %
Literates	19,961	785,477
Average Literacy	80.75 %	86.19 %
Male Literacy	85.77 %	90.11 %
Female Literacy	47.55 %	65.32 %

Source: Census 2011

C. EDUCATIONAL STATUS

The census definition considers a person to be literate who can read and write with understanding in any language. Literacy rate in Chandigarh has seen upward trend and is

86.05 % as per 2011 population census (Table 7.2). Of that, male literacy stands at 89.99 % while female literacy is at 64.81 % in actual numbers, total literates in Chandigarh stands at 805438 of which males were 465346 are female were 340092. From the tables above it is obvious literacy levels in males and females in villages are a lesser as compared to that in urban Chandigarh.

Every village in the study area possesses primary school, secondary, senior secondary schools; Students go to Chandigarh for graduate/post-graduate courses, for colleges, medical institutes, engineering or other vocational training. World famous Panjab University in the vicinity of the project site. There is also Adult Literacy Centre in villages. Pic. 7.1 show the Govt. senior secondary School in village Mullanpur, and at Maloya, in the study area.

a. **b.**

PIC.7.1 Showing Govt. Senior Secondary School, a) Mullanpur, b) Maloya

D. OCCUPATIONAL PROFILE OF THE AREA

The employment pattern of the area is an indicator of number of persons employed in various sectors. Majority of educated population is employed in govt. jobs at Chandigarh and other educational institutions; the balance population is engaged in petty business like shops, repair shops, photography and other mercantile. The villages are multifunctional urban village consisting of large number of dairies, kabari shops, repair shops, welder shops and grocery shops which generate secondary and tertiary activities. There are some units in the village which manufactures grill, gates, steel frames and other household items. Most of the population is engaged in some form of economically productive activity. Agriculture is one of the sources of income to some of the families. Number of cultivators and agricultural land has reduced a lot as most of the land has been acquired for development purpose. The land use pattern of the study area shows about 44% is agricultural land (Fig. 1.3).

E. LIVESTOCK

Apart from the agricultural land, livestock is asset of majority of the rural population in the study area. It is customary to rear different types of animals in each family. Every house in the study area invariably keeps a few cattle (Pic 4.1), and poultry. Milch animals are kept for milk as well as for other purposes, including as a source of manure for the fields. The livestock population of Chandigarh is tabulated below in Table 7.4

Table 7.4
Livestock population of Chandigarh

Sr. No	Name of Species	Total
1	CATTLE	6505
2	BUFFALOES	19568
	Total Bovines	26073
1	SHEEP	54
2	GOATS	655
3	HORSES & PONIES	440
4	MULES	98
5	DONKEY	-
6	CAMEL	5
7	PIGS	271
	TOTAL LIVESTOCK	27596
	DOGS	
1	Domestic	7712
2	Other (Stray)	5713
3	TOTAL DOGS	13425
	RABBITS	330
	STRAY CATTLE	1448
	POULTRY	
1	COCKS	131
2	HENS	51527
3	CHICKEN	77025
4	DUCKS/TURKEY	-
	TOTAL POULTRY	128683

Source: Official website of rural development and Panchayat Chandigarh

E. HOUSING

Generally, people in the study area have pucca houses in village and bungalows in their big farms. People, indeed, have developed a taste for good houses and the traditional stones are getting replaced by bricks corrugated sheets and marble vastly. On an average, it was observed that most of the houses were one to two storeyed with number of rooms varying from 5 to 10.

F. CONCLUSION

Implementation of the proposed project will not displace existing housing or induce substantial population growth. The project will contribute only marginally to the socio economic development of the area of the local level. The land values around the project site are likely to be increased after the operation of the project. About 8300 persons will stay in residential CAP complex and thus add marginally to the existing population of the area. Economic activity will get a boost for small shopkeepers, vendors in the project area and hence have a positive impact. There will also be a scope for generation of employment for lower working class of people during the operation of the proposed project for various needs of the residents. All these will be beneficial to the local economy.

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

The project site is located in the Master development plan of Chandigarh. The ancillary infrastructure like roads, markets, public health, amenities, conveyance facilities are almost developed. All sorts of social infrastructure like transportation facilities, water supply and sanitation facilities, communication facilities, educational institutions, hospitals, markets, banks, cultural amentias etc. already exist in Chandigarh.

Social and physical infrastructure resources base in the study area is briefly described below:

Water Supply: The Chandigarh administration has provided water supply to all villages in the study area. The proposed complex will meet its water requirement through piped water supply. There will be no use of ground water during the operational phase of the project.

Sewerage: The domestic sewage generated in the project area is discharged into the underground drains laid down by Chandigarh Administration and are linked to existing Sewage Treatment Plant in village Dhanas. The proposed project will install its own sewage network for discharge and treatment of sewage generated during the operational phase of the project.

Solid waste: Municipal solid waste collection and disposal infrastructure run by Administration exists at village Dadoomajra, in the project area. The proposed complex would also utilize the same facility according to the rules.

Power: All the villages in the study area are adequately electrified by electricity department of Chandigarh administration. Although the gap in the demand and supply fluctuates in different period of the year, the situation will improve in the near future. Electricity Department has agreed to supply the required electric load to the proposed CAP residential complex.

Health: The project area is in advantageous position in terms of healthcare infrastructure because of its nearness to Chandigarh. In the study area, medical facility is quite sufficient. There are primary sub Health Centers/ health centres in almost all the villages. PGI, world famous medical institute is hardly 5 km from the site. A new Cancer hospital has also been inaugurated at village Sarangpur.
Ayurvedic dispensaries & private nursing homes/ hospitals exist in the study area. There are also veterinary hospitals at Dhanas in the region.

Economic Aspects: The project area is witnessing a rapid growth in the economic activities. In the last 5 years many housing complexes, malls and hotels e.g. DT, Centra Malls have come up at Chandigarh. Well positioned infrastructure and demand of the project area is one of the dictating factors for the promoters to set up such type of economic centres in the area. There are many more of such malls planned in the area. With declaration of New Chandigarh towards Mullanpur in the west of the project site, many housing complexes like DLF, OMAX etc are coming up.

According to Chandigarh Master Plan-2031 "*area of land immediately adjoining Khuda Lahora and Jassu villages is reserved for developing social and physical infrastructure and to meet the residential requirements of the villages in accordance with the development plans proposed to be prepared. Development of the villages shall be regulated by the village bye laws"*

Aesthetic Aspects: The landscape concept of the project area has evolved a system of open spaces which have the potential to develop into a landscape with distinctive visual qualities, fulfilling the required ecological and recreational functions. The location and alignment of existing landscape features have been used to structure the development of the area.

Cultural Aspects: There are many cultural heritage and natural sites in the City of Chandigarh, Sukhna Lake, Rock garden, Leisure valley are some of the places in the area. The city of Chandigarh has always been a city of diverse races, cultures and faiths. People have preserved their religious and social traditions. There are local temples, gurudwaras in the study area. They celebrate festivals with great enthusiasm and traditional fervor. Their cultural and popular art are dramas, ballads and songs in which they take great delight. The age old customs of meditation, yoga and chanting of vedic mantras, are observed by the masses. The seasonal and religious festivals glorify the culture of this region.

Communication, Post and Telegraph Facilities

Post and telegraph facilities in the study area are quite efficient. There are post offices in reach of the villages. The area is well connected to the world by latest means of communication that

includes BSNL / Airtel, WLL, internet connection and other world class network of fixed line phones. Almost 100% of the population possesses mobile phones. Apart from electronic media one can also communicate with world class courier services like DHL, FED-EX or other short time couriers.

Transportation Facilities

Transport and communication facilities are considered as administrative necessity as well as public convenience. A well knit transportation system is a pre-requisite for social and economic development of any area. The project site is located on the Dakshin Marg. There is efficient & frequent bus service of CTU to the village Dhanas. Villages around the project site are well connected to each other by pucca roads. All the street pavements and roads are concretized and electrified.

Banking Facilities & Other Informative Services

For the privilege of people, there are all nationalized, private and co-operative banks in the study area. ATM facility &. Credit card facilities to the residents are catered by banks in the area.

Awareness about the Project

The information on awareness about the CAP complex was also collected from the people in the core area. In this regard the details of the responses from about 50 no of persons have been highlighted in Table 7.5

Table: 7.5

Awareness about the Project amongst Families Near to the Site in Study Area

Category	No. of	%
Aware about proposed Project	8	80
Not Aware about proposed Project	2	20
Grand Total	**10**	**100.00**

Source: Field Survey

Based on their responses, it is observed that about 80 % of the people were aware of the proposed project. About 20% of them were not aware about any such project.

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

The required land is the property Chandigarh administration for CAP complex. The project involves neither any land ousters nor any displacement of population. Hence, there will be no impact on human settlement. No prehistoric resources including any cultural property or sacred site are located in and around the proposed project site.

During the construction period, the activities may result pondage of water in the dug- out areas of the site. This has the potential for creation of mosquitoes breeding and spreading of vector borne diseases. The most important construction aspects are the impediment of temporary drainage by blocked silt traps or the ponding of water within foundation works. Other mosquito breedings sites may be created through the use of uncovered water tanks. The project will give careful attention to the design and maintenance of earthworks and drainage systems during construction to avoid the creation of significant habitat areas for mosquito larvae. The use of larvicides may be required to prevent mosquito breeding in silt traps. The project will facilitate maximum participation of the fair and equitable local force for the construction. This will not only benefit local economy and employment, but also reduce the need to build temporary shelter and supply services. However the project will still require some skilled and unskilled migrant workers. In such case, the project will provide portable toilets, washing facilities, potable water supply and LPG for cooking on site during construction. The sewage will be temporarily connected to the municipal drains.

The supply of LPG cylinders for cooking will reduce the dependency of the construction workers on the fuel wood and hence the chances of any smoke and other air pollutants.

SECTION 8- BUILDING MATERIALS

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

Construction of the project components will require the use renewable and non renewable resources including wood, gravel, sand, steel, concrete, cement and bricks. These materials will be used only during the construction period. The estimated quantities of construction materials required for project are given in Table 8.1. Materials used for construction of the building will be of non combustible nature or of low flame rating.

Fossil fuels, such as diesel fuel, gasoline and oil will be used during the construction and operation of the project for mechanical and electrical equipments.

Electricity will be used during construction to provide power to construction equipments and during operation for lighting of building and running utility equipments. Electricity consumption will be kept at a minimum when possible by adopting electricity conservation measures.

Table-8.1

Approx. Quantities of Construction Material Required for proposed residential CAP Complex

Material	Quantity	Source
Coarse /Fine aggregate (cu.ft.)	326325.36	Local authorized vendors
Wood/Timber (cft.)	750	
Cement (Tonne)	29550	
Structural Steel (Tonne)	15410	
Bricks (nos.)	37460097	
Glass	10000 sq.m	
Sand (cft.)	2122928	

It is expected that the use of these materials during construction will result in negligible adverse effects on renewable resource supply as the construction materials will be procured from the licensed material suppliers according to norms. It will be ensured that the contractors selected to construct the project will implement best management practices to conserve renewable resources.

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

Transportation and handling of materials during construction are likely to cause a temporary adverse impact on the ambient air quality. Heavy construction traffic for loading / unloading fabrication & handling of equipment and construction materials are likely to cause and increase

in the ambient noise levels too. However, the areas affected are those close to the site. At the peak of the construction, negligible increase of pollutants in ambient air and noise levels is expected to occur locally at the construction site (as discussed at section 5.1, Fig. 5.8 & section 5.6)

Appropriate measures will be taken to minimize these impacts. These are:

- Stockpiles of aggregate or spoil to be covered and water applied.
- Vehicles delivering loose and fine materials like sand and fine aggregates will be covered to reduce spills on roads.
- The height from which excavated materials are dropped to be controlled to a minimum practical height to limit fugitive dust generation from unloading.
- All dusty materials will be sprayed with water prior to any loading, unloading or transfer Operation so as to maintain the dusty materials wet.

Further to minimize potential impacts on ambient air quality and noise levels, major construction activities would be scheduled during normal daylight working hours and would be implemented consistent with the applicable standards. The construction contractor will use equipments that are adapted to operate with appropriate noise muffling devices resulting in the least possible noise. Every effort would be taken to minimize the noise levels including the mandatory use of construction equipment with operable mufflers.

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

Any construction waste generated on site like top soil, clay, sand and gravel will be re used as filler at the same site after completion of excavation work. Broken bricks and stones will be used as a sub base for the construction of internal roads within the complex.

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

The solid waste generated in the project will be non hazardous in nature consisting of biodegradable and non biodegradable matter. This will comprise of solid waste such as paper, cardboard, plastics, kitchen wastes and other general use by routine activities. The domestic solid waste from the housing complex during operation phase, expected to be generated to the tune of 4500 kg/day considering per capita of waste generation of 0.45 kg/ person /day as detailed below:

Details of the solid waste generated

From the houses	: 1656 x 5 x 0.45= 3726 kg/ day
Servant Room	: 120 x 2 x 0.45 = 108 kg/ day
Visitors	: 165 x 0.15 = 24.75 kg/ day
Dispensary waste	: 150 x 0.15= 22.5 kg/ day
School waste	: 3000 x 0.15= 450 kg/ day
Community centre	: 800 x 0.15 = 120 kg/ day
Shopping centre	: 100 x 0.15 = 15 kg/ day
Temple/Gurudwara	: 100 x 0.15 = 15 kg/ day
Total	**= 4481.24 kg/day(APPROX. 4500)**
60% is Biodegradable	= 2700 kg/ day
35% is non biodegradable	= 1575 kg/day
5% is hazardous & biomedical waste	= 225 kg/day

These will be collected, stored and disposed off as per SHW/ municipal waste norms. STP sludge, which is periodical in nature is proposed to be used for horticultural purpose only after removal of oil & grease.

During construction phase, solid waste would comprise mainly of:

- Excavated earth and top soil
- Concrete debris with bits and pieces of steel
- Packaging materials
- Wood used for shuttering purposes
- Cements bags, waste paper and packing material (cardboard) will be sold off to kabariwala.
- Insulation material for air conditioning, if any
- Unusable steel bits and pieces will be collected at site and sold to kabariwala /recyclers.
- The construction debris will be reused for filling low lying areas within the project premises.
- The excavated soil will be utilized in re-filling of foundation, internal road works, raising of site level and disposing to the vendors etc.

SECTION 9- ENERGY CONSERVATION

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

The power demand of ~4700 KW for the proposed project will be met by Electricity Department, Chandigarh. During construction phase power failure, requirement will be met through installation of silent generators of 62.5 KVA capacity temporarily. However during operation phase a provision of 8 silent DG sets of capacity 500 KVA each will be made An electrical room / substation building as per the requirement will be constructed separately in the complex. The construction of electrical substation and installation of transformers, HT panels, fire and safety measures will be as per the provision specified by the concerned authorities.

Power requirement during construction for batching plant, lighting, tools and plant equipment pumps and other will be met through the electricity from administration. The energy consumption per square foot of built up area has been calculated to be between *3 and 4* watts.

Following energy savings measures will be encouraged to conserve energy:

- Over deck insulation and application of high SRI reflective paint on the roof
- Masonry work in super structure with autoclave aerated concrete (ACC)Blocks / fly ash bricks
- Windows with reflective glass coating/ high performance double glazed unit.
- Paints with low VOCs will be used.
- Replacement of conventional pillar cock with pillar cock having infrared sensor and load flow technology.
- Use of CFLs, LED.
- Solar Water heating system
- Energy efficient solar lighting system, provision of atleast two solar lights in the compound
- Proper roof insulation and venting.

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

Electricity will be fed from Electricity Deptt. Chandigarh, during construction phase. In order to meet emergency power requirement during electricity failure, silent DGs of 500 KVA will be installed temporarily. The exhaust stacks of adequate height above the roof of the building will be provided as per the norms.

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

The project will provide heat reflected, tinted and toughened glass having properties which will make it energy saving element in the building. It will provide safety and transparency of the desired level. The glass of 4 mm and weight 12 kg / sqm will be provided with the characteristics as given in Table 9.1

Table 9.1
Spectrophotometric and Thermal Data of Glass

Light factors			UV	Solar Radiation			Solar	Shading	U Value	Ashrae value		
Transmission	% reflection		%	Transmission (%)	Reflectance (%)	Absorption (%)	Factor (SF)	coefficient (SC)	(W/SQM/K)	U value summer	U value winter	Relative heat gain (W/sqm)
	Ext	Int										
6	28	32	0.5	2	12	86	0.12	0.15	2.8	3.058	3.229	120

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

The project will provide enough day light factors in the building to permit maximum day light to interior to minimize overall energy consumption. These features will also minimize the impact of climate both in summer and in winter and as a result, the use of electricity will likely to be reduced.

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

The layout of buildings on the proposed plot has been designed in such a fashion that maximum day light could be utilized. However use of solar equipments has been proposed for use in street lighting, emergency lighting and solar hot water systems.

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

The overall design of layout of buildings has adequately taken care of shading factor into consideration and will result in significant saving in energy consumption.

9.7 Do the structures use energy-efficient space conditioning, lighting and mechanical systems? Provide technical details. Provide details of the transformers and motor efficiencies, lighting intensity and air- conditioning 0load assumptions? Are you using CFC and HCFC free chillers? Provide specifications

The proposed residential CAP complex will not provide any centralized air conditioning system.

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

The proposed project is not likely to result in altering micro climates in and around the project site. Only 14.33% of the total plot area is the covered area. Open spaces will result in easy circulation of ambient air and will not result in conditions leading to micro climatic zone. Even during winter, ground based temperature inversions will not restrict mixing heights to low levels.

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

The proposed project will follow the following U-factors related to the building envelopes

- Roof U-value (max): 0.08 Btu per hour per sq.ft. per degree F
- Max U-value of over wall assembles: 0.25 Btu per hour per sq.ft. per degree F
- Window (max): 1.1 Btu per hour per sq.ft. per degree F
- Window to wall ratio: 1.95 Btu per hour per sq.ft. per degree F

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

An emergency is said to have arisen when one is not able to cope up with the potential hazardous situation. When such an emergency evolves, chain of events affect the normal working within the area which may cause injuries, loss of life & damage to property & environment both inside and outside and a disaster is said to have occurred.

Types of emergencies

The following types of emergencies can arise in residential complex:

Fire & Explosion: Since it is a residential complex, fire can occur due to electrical spark or gas leakage from kitchen. Fire is mainly caused in a residential complex due to carelessness, short circuits and malfunctioning of gas regulator, tube and such related products.

Electrical: The electrical current can pass to the floor & metals due to inadequate insulation or accidently.
Mechanical: Mechanical fault can cause the risk & hazard which include the lifts.
Radiation: Due to use of wireless equipments there may be electromagnetic radiations.
Thermal: Thermal heat can be generated from the DG sets and the vehicles in the complex.
Chemical: Chemical use in the residential complex is limited to cleaning agents & medicines.

Natural Calamities like:
Earthquake: The project site falls under the Zone-IV of seismicity (having magnitude > 6.8 or 7.0) and extremely vulnerable to earthquakes. The main reason behind the sensitivity of the project site is the vicinity of Himalayan Frontal Fault (HFT) which is passing further north (nearly 22 km) of the project site

Flooding: The proposed project is not located in the flood prone area, there is no major natural river or drainage, however flooding can occur due to excess rain.

1. ON SITE EMERGENCY PLAN/ DISASTER MANAGEMENT PLAN

PREVENTIVE AND MITIGATORY METHODS TO PREVENT DISASTERS

A. Fires

Firefighting measures shall be adopted as per the guidelines of NBC. External yard hydrants installed around all buildings in the complex and galvanized steel fire hose boxes/ cabinet (weather proof). All external yard hydrants shall be at one meter height from finished ground level as per NBC at a distance of 45 m along the road. External fire hydrants shall be located such that no portion of any building is more than 45 m from a hydrant Fire hydrant system will be provided within the buildings. Fire escape staircases and refuge areas will be provided and the building structures will be planned as per NBC.

Fire extinguishers to be put at the in the stairs, near lift , etc..and have been provided as per NBC-2005. The Phone number of the fire services station will be displayed at various points and also near the fire extinguishers.

The complex is proposed to be provided with fire protection arrangements such as manual call points, underground water storage tanks, overhead storage tank, portable appliances, exit signs, DG sets, PA system, staircase etc. from fire safety point view.

B Earthquake: Since project is located at Seismic zone IV, Due allowance will be given in designing of civil structures which will be done as per National Building Code (NBC)-2005. At the time of designing and constructing the building due care would be taken to have earthquake resistant structures which will confirm IS:1983

C. Flooding: The flood plain of Patiala ki Rao and other one is very small, as the river is in their young stage (because of nearby origin from hills) hence the flooding chance will be negligible. However following has been provisioned in the proposed residential CAP Complex:

- Proper designing of drainage system for domestic as well as storm water.
- Rain water harvesting pits will have provision of storage for one hour peak rainfall.

D. Electrical

I) Planning stage

Safety parameters as indicated under Indian Electricity Rules 1956 and ECBC shall be compiled. The following safety measurement are considered

- Earthing system
- The earthing system shall be based on the Indian TNS system. The earthing conductors proposed to be used are copper plate for neutral and body earth..
- The design of the system shall follow the Indian Code of Practice IS: 3043-1987. The construction of electric substation and installation of transformers, LT and HT panels shall be as per the provisions specified by the concerned authorities.
- ELCB in Distribution Board.

In addition to that, following measures will be adopted:

- There will be colour coding and labeling of high voltage electrical wires.
- Sand bags / wire bucket shall be placed near the electrical control/ panel.
- Installation of electrical equipments shall be properly done like insulation, guarding and grounding.
- Properly maintained equipments and tools will be used.
- Live electrical terminals will be shielded.

II) Operational Stage

- Check each extension cord before use. Ensure that insulation is completely intact (free from cracks, tears or abrasion) and that power extension cables haven't been knotted which can cause conductor damage and increase the risk of fire.
- Do a thorough check for electrical wiring before cutting through any wall, floor or ceiling. Any time that a tool inadvertently makes contact with an unseen electrical line, the person holding that tool is likely to be shocked or electrocuted. Always size up the situation before you get started to reduce your risk of injury.
- Never modify electrical plugs. Under no circumstances should you ever file down the blades, remove the ground pin, or otherwise modify an electrical plug so that it will fit into a socket-doing so only increases the likelihood of shock, electrocution and fire.

Either have a certified electrician change the device's plug or replace outdated two-prong receptacles with grounded outlets that can accommodate a ground pin.

- All electrical cables would be underground and sophisticated modern electrical distribution system to reduce risk of fire.

Chemicals: This is a residential complex no chemical container / tanker will be allowed inside the complex.

The chemicals used may be the cleaning agent (acid/caustic) and Insecticides. Cleansing agents can be treated by water. Insecticides will be contained with specified space during sand & cotton and waste shall be sent to TSDF. The spray of insecticide shall be done by using gas mask.

Emergency response procedure

Administrative office shall also make an emergency control room say at security.

- Assembly area shall be demarked for each type of houses
- Communication system will be installed in the complex which includes intercom and public addressing system.
- Fire alarm will be installed at vulnerable place.
- The safe zones (at the time of emergency) on map shall be displayed at different locations.
- First aid facility shall be made available at control room.

In case of emergency following actions shall be taken:

- **Emergency will be declared in case of following**.

  i) Fire alarm buzzing (Fire hazard)
  ii) Vibration/ earthquake feeling (Earthquake)
  iii) Water logging in the complex above 30 cm. (Flood)
  iv) Any unusual smell or gas or suffocating feeling (Chemical leakage)
  v) Security alarm from main gate. (Security risk / Terrorism)

- On declaration of emergency communication will be made to residents for any type of emergency.
- All the resident of the affected area will be moved to safe zone.
- The control measures shall be done as per the emergency action plan for each type of hazard.
- All the members of disaster management cell will take charge of their respective duties.

- Outside help like fire tender, police ambulance will be called.
- Evacuation of the area.

E. Recovery procedure

Recovery procedure will be followed by the engineering section to restore the essential services after analyzing the type of the emergency.

2. OFFSITE EMERGENCY PLAN

If an accident take place in the complex and its effects are felt outside the complex, the situation thus created is called an offsite emergency. In this case off site emergency is not applicable.

3. Security Plan

Security plan will provide following:

- At all the gates the visitors and guest will be manually checked and asked for ID's
- All car entering will be checked thoroughly inclusive of Bonnets, Luggage hold with hand held, metal detectors, mirrors and other checking stuffs.
- CCTV will be at all important locations with a remote viewing facility and record back up with highest resolution and picture quality.
- Communication system will be proper to security staff will help them to coordinate better during emergencies.

Responsibility

Emergency Response team / Disaster Management cell

Emergency response team will be formed according to Chandigarh administration and residential complex personnel comprising of persons from the security staff of the CAP Complex, Police Control Head Quarter, Army official, nearest hospital, Engineering Incharge, Fire Department (Chandigarh) to take control of any eventuality if it happens in the complex.

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

Glass will be used only in windows and not as wall material.

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

Appropriate steps will be inbuilt in the design of the buildings to minimize the effects of air infiltration into the building.

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

All electrical equipments to be installed in the proposed complex will be based on conventional system. However energy efficient applications will be installed in the building. Compact fluorescent lamps and low voltage lighting system will only be used. As mentioned at 9.1 solar lighting , water heating system have been provisioned in the campus..

SECTION 10- ENVIRONMENT MANAGEMENT PLAN

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

The housing complex and related infrastructure development in the study area needs to be intertwined with judicious utilization of natural resources within the limits of permissible assimilative capacity of the region. The assimilative capacity of the study area is the maximum amount of pollution load that can be discharged in the environment without affecting the designated use and is governed by dilution, dispersion and removal due to natural physico-chemical and biological processes.

The section outlines the key environmental management and safeguards that will be initiated by the project proponent to manage the project key environmental concerns. Environmental Management Plan (EMP) is the mechanism to ensure that environmental considerations are integrated into the project survey and design, contract documents and project supervision and monitoring. These are tools for mitigating or offsetting the potential adverse environmental impacts resulting from various activities of the project. The environmental management plan (EMP) mainly consists of integrating potential impacts (positive or negative), environmental mitigation measures, implementation schedule and monitoring plans.

The potential environmental impacts and proposed management associated with each stage of the project development are described here. The primary objective of this proposed environmental management and monitoring program is to control environmental impacts to levels within acceptable standards and to minimize possible impact on the community and the workforce of foreseeable risks during the construction and subsequent operation phases of the project. Also it is very important to highlight here that such environmental mitigation measures shall be used in conjunction with good management practices and good engineering design, construction and operation practices.

A. ENVIRONMENTAL MANAGEMENT DURING CONSTRUCTION

The impacts during construction phase of the proposed group housing project on the environment would be basically of transient nature and are expected to reduce gradually on completion of the construction activities.

i.) Site preparation

Since the project site terrain is almost flat, some minimal leveling may be required. Vegetation on topsoil will be removed prior to commencement of bulk earthwork. During construction water supply will be maintained and operated by Public Health department, Chandigarh Administration. The prospective contractors will make provisions for water sprinkling at the construction site.

As soon as construction is over the surplus earth will be utilized to fill up low – lying areas, the rubbish will be cleared and all un-built surfaces reinstated. Appropriate vegetation in consultation with Horticulture Deptt. Chandigarh will be planted and all such areas shall be landscaped. Fuel oil will be stored in proper and designated areas.

To prevent unauthorized felling of trees surrounding the site by construction workers for their fuel needs, efforts be made by the contractor to provide fuel to the construction workers. The natural drainage will not be disturbed for the proposed construction.

a. Water Resources and Quality

Following mitigation measures will be adopted to avoid impact on water resources:

- Construction equipments requiring minimum water for cooling and operation for optimum effectiveness shall be chosen
- High pressure hose will be used for cleaning and dust suppression purposes
- Water harvesting will be practiced.

During construction period in rainy season, the water quality is likely to be affected due to the construction work and loosening of top soil which would increase the suspended solids in the run off during heavy precipitation. In order to reduce the impact on water quality, temporary sedimentation tanks will be constructed for the settlement of the suspended matter. It is envisaged that the monsoon period will be avoided for cutting and filling of earthwork. Additionally, following measures will be taken to avoid the surface water pollution:

- Soil binding and fast growing vegetation and grass would be grown around the construction site before commencement of construction activity to reduce soil erosion.
- Appropriate sanitation facilities to be provided for the construction workers to reduce impact on surface water quality.

There is no likely hood of ground water contamination as no waste will be discharged to ground water bodies during construction. The construction wastes, as far as possible, will be recycled /reused or recovered or will be disposed on according to Chandigarh MSW norms.

b. Air Quality

During construction period, there is likely hood of generation of dust and NOx emissions. This can be attributed to leveling activity, construction activity and vehicular movement. The transport vehicles using petrol or diesel will be properly maintained to minimize smoke in the exhaust. Since, there is likelihood of fugitive dust form the construction activity, water sprinkling

will be done. In addition to this following measures will be taken during the construction phase to reduce the impact on the air quality:

- Any vehicle not meeting the vehicular pollution standards will not be allowed within the construction site and for the construction activity.
- All vehicles and construction equipment with internal combustion engines in use will be maintained for effective combustion to reduce carbon particles and CO emissions.
- Water will be sprayed by high pressure water hoses during dust generating construction activities e.g. excavation, crushing / demolishing, concrete mixing, material handling etc. to suppress dust.
- Use of asbestos to be avoided as far as possible, if asbestos is used, all asbestos wastes to be collected separately and disposed off in a landfill with appropriate soil cover above the waste layer.
- Vehicles delivering loose and fine materials like sand and fine aggregates will be covered to reduce spills on roads.
- The height from which excavated materials are dropped will be controlled to a minimum practical height to limit fugitive dust generation from unloading.
- The random ambient air quality monitoring shall be done to ensure that the significant impacts are being mitigated adequately.

c. Noise levels

The noise impact on the surrounding population during the construction phase will be within the acceptable limits. High noise generating equipment, if used, will not be operated during the night to eliminate any possible discomfort to the nearby residents. Community noise levels are not likely to be affected because of the vegetation and likely attenuation due to the physical barriers as discussed elsewhere in Section 5.6

The following recommendations will be implemented.

- Provision of insulating caps and aids at exist of noise source on the machinery.
- Construction equipment generating minimum noise and vibration will be chosen.
- Vehicles and construction equipment with internal combustion engines without proper silencer will not be allowed to operate at the construction site.
- Shock absorbing techniques will be adopted to reduce impact.
- Inlet and outlet mufflers will be provided which are easy to design
- Ear muffs will be developed along the periphery of the proposed site.
- Ambient noise level monitoring will be conducted at suitable locations at periodic intervals during construction phase to conform to the stipulated standards both during day and night time. Data to be reviewed and analyzed by the project manager for adhering to any strict measure.

d. Solid / hazardous waste disposal

The hazardous materials used during the construction may include petrol, diesel, welding gas and paints. These materials will be stored and handled according to the guidelines specified under Hazardous Wastes Storage, handling and transportation rules of EPA 2008 and according to Chandigarh Administration norms.

- Diesel and other fuels will be stored in separate enclosures
- Wherever possible, hazardous raw materials to be substituted by non hazardous materials, e.g. cleaning solvents can be replaced with film free biodegradable cleaners, usage of non-chlorinated strippers instead of strippers containing methylene chloride and substitution of water based paint for oil based ones.
- On-site recycling of all waste solvents / thinners and oil and off-site recycling of paint thinner solvent wastes and waste oil.
- Separate storage of waste paints and thinners, contaminated rags and brushes to facilitate recycling and reuse. Rags could be laundered for reuse.
- Vehicle maintenance area to be designed to prevent contamination of ground water by accidental spillage of oil.
- Maintaining appropriate inventory control.

e. Site security

Adequate security arrangement will be made to ensure that the local inhabitants and the stray cattle are not exposed to the potential hazards of construction activities.

f. Migrant Laborers

Safe and secure camping area will be provided for the migrant laborers during construction period. Adequate arrangements will be made for water supply, sanitation and cooking fuels.

The construction site will be provided with sufficient and suitable toilet facilities for workers to allow proper standards of hygiene. These facilities would be connected to a septic tank and maintained to ensure minimum environmental impact.

g. Traffic pattern

Heavy vehicular movement will be restricted to daytime only and adequate parking facility will be provided.

B. ENVIRONMENTAL MANAGEMENT DURING OPERATION

The EMP in the design stage endeavors to mitigate the problems related to health, safety and environment. The proposed project will be designed taking into account all applicable standards / norms both for regulatory and safety purposes.

The design basis will lay special emphasis on measures to minimize sewage generation and emission control at source. The specific control measures related to gaseous emissions, sewage discharge, noise generation, solid waste disposal etc. are described below.

a. Air Quality Management

Major pollutants envisaged from the proposed project are generally from the DG sets but it is likely that it is not installed. The major pollutants will be oxides of nitrogen and carbon monoxide besides the particulates and sulphur dioxide. The baseline ambient air quality levels in the project area are within the permissible levels as specified by regulating agency. The following methods of abatement will be employed for the air pollution control at the source level:

- Use of ultra low sulphur diesel will be used in the DG sets.
- Green belt development with specific species will reduce PM levels.
- Use of clean fuel by the vehicles will reduce the emission of pollutants.
- The emission form the stacks of DG sets (if used) will be monitored for exit concentration of oxides of nitrogen and sulphur dioxide. Sampling ports will be provided in the stacks according to CPCB guidelines.

b. Noise level management

Some of the practices proposed for noise attenuation are as follows:

- All noise generating sources in the complex will be equipped with appropriate noise control measures. Sound levels will be consistent with Chandigarh administration regulations.
- Ambient noise levels will be periodically monitored to determine compliance with the norms.
- Noise attenuating green belt shall be developed for effective reduction in noise wherever feasible taking local meteorology into consideration.

c. Solid waste management

Solid waste generated from the proposed project would comprise garbage / food waste from households and horticulture wastes. These will be disposed off as described below:

- Organic and inorganic solid waste will be segregated as per the provisions specified in the solid waste management rules and MC rules.
- STP sludge, which is organic in nature, is proposed to be used for horticultural purpose only after removal of oil & grease.
- The collected inorganic solid waste will be disposed to a Govt. designated waste disposal site.
- E-waste generated will be disposed off through approved agencies of CPCB/ Chandigarh Pollution Control Committee as per electronic waste management and handling rules 2011.

d. Water management

The major water requirement for the proposed project will be met from the Public Health Deptt. Chandigarh Administration. In order to conserve the water resources, following measures will be taken to minimize usage in the operational phase:

- Rainwater harvesting for optimum utilization of rainwater to recharge the ground water level / borewell area to be adopted as per Rainwater management plan (Annexure-XI)
- Well design storm water network to collect the rain water from the site area and diverted to the proposed rainwater harvesting pits for recharging the ground water.
- All efforts to conserve water in the complex to comply with the standards of water conservation practices.
- Use of low flow fixtures and appliances for reduced water consumption such as low flush closets and cisterns.
- Ground water quality will be periodically monitored and records to be reviewed and analyzed on regular basis.

e. Traffic pattern

Vehicular movement s will be regulated inside the site with adequate roads and parking lots as per traffic management plan (Annexure-XVII).

f. Human Health and Safety Management Plan

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

- The primary concern on potential health risks for the construction workers and other employees on site during construction are associated with drinking water quality. The project would ensure safe potable water supply to the workers on site.
- Adequate space needs to be provided for construction of temporary sheds for construction workers to avoid unhygienic conditions.
- Construction site will be provided with a readily available first aid kit including an adequate supply of sterilized dressing materials and appliances. Suitable transport to take injured or sick person to the nearest hospital will be immediately provided.
- The project will ensure safe working of all workers. Each construction worker will be provided with safety gadgets and made to wear during the construction work. This will include protective footwear, helmets, gloves to all workers employed for the work on mixing, cement, lime mortars, concrete etc. the welder's protective eye shields to workers who are engaged in welding works, earplugs to workers exposed to loud noise, safety belts to the labourers working at higher platforms and masks to avoid dust.

- The project will strictly follow the statutory child labour act. The project will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. Face masks will be provided for use to the workers when paint is applied in the form of spray. Adequate safety measures will be ensured for workers during handling of materials at site. The project will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations and safe means of entry and exit.
- The project will take adequate precautions to prevent danger from electrical equipments. No materials will be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights will be provided to protect the public. All machines to be used in the construction will conform to the relevant Indian Standards Codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision.
- Work spots will be maintained clean and provided with optimum lighting.

g. Fire safety and protection

Fire fighting system in the CAP complex will consist of fire detection system and fire fighting system as per IS: 2189. Addressable Fire Detection and Alarm system will be provided to meet the requirement of the National Building Code. High rise board displaying important contact no. of fire station / relevant Department will be provided at the entry gate which will be accessed by anybody in case of fire. Fire detection is proposed to be provided in all the common area and provision in the panel for connecting the residents to the main system. A combination of smoke and heat detector will be provided in common areas, substation and electrical room depending upon usage of area.

- Each floor will be provided loop zone from main fire alarm panel on the central security room. A repeater panel will be provided in guard room of the complex.
- Public address system equipment will be inbuilt in the panel for sounding of alarm in the event of fire and to ensure orderly evacuation of the buildings.
- The proposed complex will be provided with adequate fire protection arrangements such as underground fire water storage tanks, two underground water tanks of sizes (80 x 40 x 10+2 feet and 56 x 30 x 10+2 feet) have been proposed in the campus. one over head fire water storage on each cluster, fire pump, wet riser system, hose reel hose box, fire pump with sprinkler, manual fire alarm system, portable fire extinguisher, one standby DG set connected with lift, emergency light, portable fire extinguisher. Placement of facilities shown in Fig. 10.1.The fire safety plan will be implemented by Chandigarh Administration in due course of time of construction.
- Automatic sprinklers will be installed in the complex. Portable fire extinguishers will be provided at strategic locations.

- The materials used for construction of the building will be of non combustible. Non combustible materials will only be used for the construction / erection of false ceiling including all fixtures and shall be of low flame rating.
- The construction of electric substation and installation of transformers, LT and HT panels will be as per the provisions specified by the concerned authorities. The HT and LT panels shall be separated with the walls of 4 hrs fire rating. Each transformer will be separated from the other by fire resistant shield wall extending up to one meters on sides above the highest point of the transformer so that fire risk is minimized.

h. Rainwater Harvesting Plan

The project will adopt all appropriate methods on the proposed site for harvesting of rainwater as detailed in Section 2. Rainwater harvesting Plan is annexed in Annexure-XI.

The storm water drains carrying the surface run off from the plot area will be directed towards these recharge pits. There will be a provision of sedimentation tanks where any silt or floating materials carried away by the flowing water will be settled down before the water enters the recharge area.

i. Landscaping and Green Belt Development Plan

It is proposed to develop landscape and green area in approx 29.08% of total area in the complex (Annexure-XVI). The implementation for development of green belt is of immense importance, as it not only acts as a pollution sink for dust emission, gaseous pollutants and noise pollution but also enhances the visual appearance of the developed site.

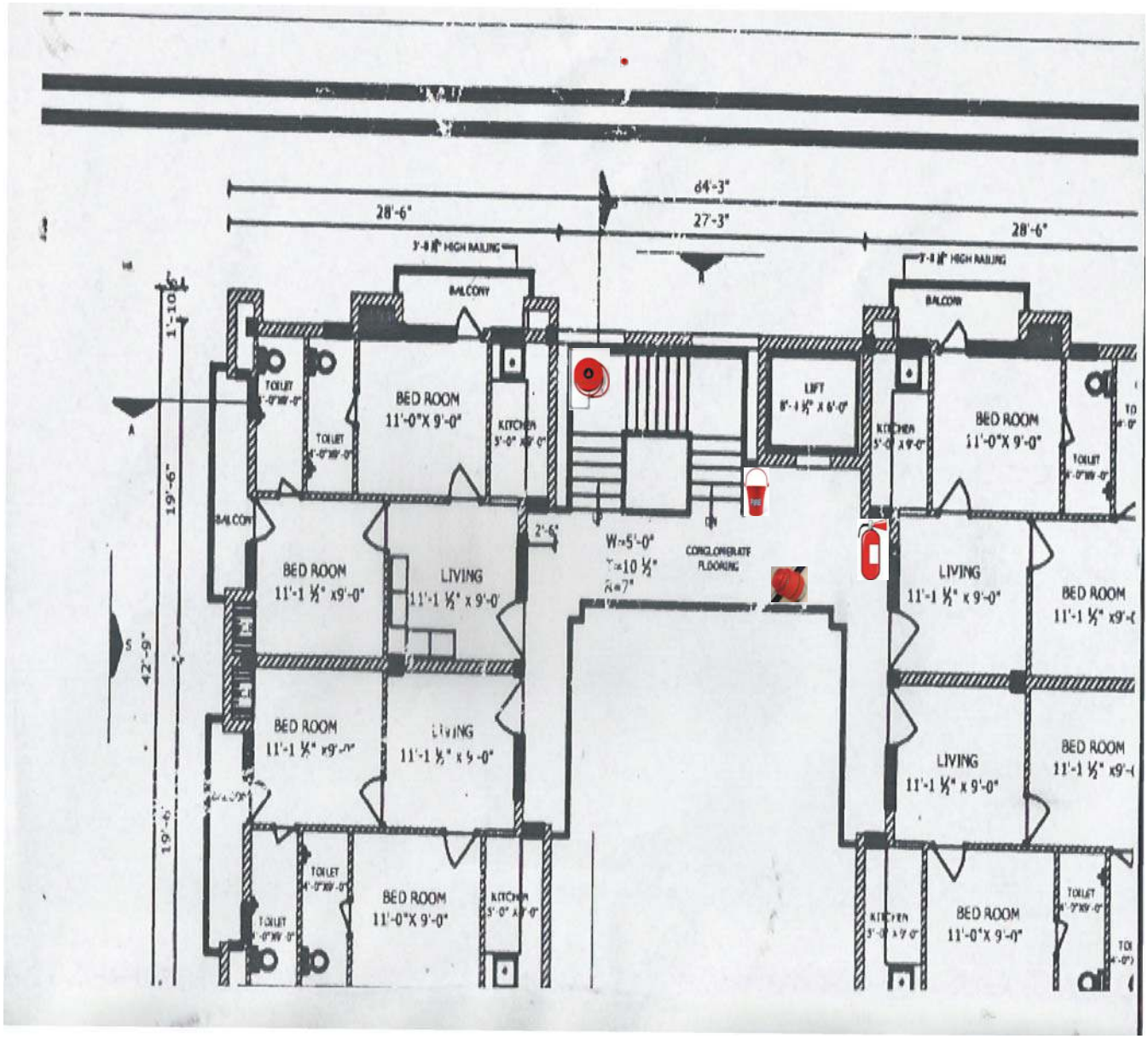


Fig. 10.1 Placement of Fire Safety arrangements in one of the units

The species to be grown on the site will be fast growing native species having broad leaf base so that a permanent green belt is created in a short period. The effective plantation will also stabilize the soil and reduce any nuisance during windstorm. Trees, plants with consultation with Horticulture department, Chandigarh will be planted. Sampling will be taken from the Govt. nurseries. Species of the types that can be planted are:

Delonix regia	-	Gulmohar
Nuhinia rurpurea	-	Kachnar
Polyalthia longifolia	-	Ashok
Melia Azadirrachta	-	Neem
Plumeria alba	-	Champa
Yellow duranta	-	Chandni
Nerium indicum	-	Kaner

Besides this the visual aesthetics of the proposed site will be enhanced by developing parks/ lawns with local ornamental plants in the open spaces.

j. Vehicle parking and Management Plan

The layout plan of the proposed site has developed an internal road network in such a manner that it will not only cater to individual tower buildings but also integrate the whole of CAP complex in an interesting composition of built masses and open spaces with a pedestrian dominated movement pattern.

Entry point to the housing complex has been worked out keeping in view the desired movement of vehicles and road network around the site. Main entry to the complex is planned from the main road. Adequately wide roads to cater to two way traffic and to meet the fire regulations are planned inside the complex. As per the requirements, it is proposed to provide total equivalent car space for 2174 cars.

k. Energy conservation plan

Various energy conservation measures to be adopted in the proposed project are described below:

Solar Architectural Features

The proposed project will provide enough day light factors in the building to permit maximum day light to interior to minimize overall energy consumption. These features will also minimize the impact of climate both in summer and in winter and as a result, the use of electricity bill likely to be reduces. The energy consumption per square foot of built up area has been assumed to be 3-4 watt.

Thermal Characteristics of Building envelope

The proposed project will follow the following u-factors related to the building envelopes**:**
Roof U Value (max.): 0.08 Btu per hour per sq. ft per degree F.

Characteristics of Glass

The project will provide heat reflected, tinted and toughened glass having properties which will make it energy saving element in the building and shall provide safety and transparency of the desired level.

Energy saving measures

- Over deck insulation and application of high SRI reflective paint on the roof
- Masonry work in super structure with autoclave aerated concrete (ACC)Blocks / fly ash bricks
- Windows with reflective glass coating/ high performance double glazed unit.
- Paints with low VOCs will be used.
- Replacement of conventional pillar cock with pillar cock having infrared sensor and load flow technology.
- Use of CFLs, LED.
- Solar Water heating system
- Energy efficient solar lighting system, provision of atleast two solar lights in the compound
- Proper roof insulation and venting.
-

C. COST TOWARDS CONSTRUCTION OF PROJECT AND THE IMPLEMENTATION OF ENVIRONMENT MANAGEMENT PLAN

Chandigarh Armed Police will make a provision of about 494 Lacs for construction of project and 1360 Lacs, 102.5 lacs of Capital Cost and Recurring Cost respectively for effective implementation of the environment management plan.

Table 10.1a
Cost estimate & time schedule for the construction of 1656 no. of houses for residential complex of Chandigarh armed police Dhanas, UT, Chandigarh
Cost Estimate

S. No.	Particulars	Type of Houses	No. of Houses	Funds required Rs. (in crore)
1	Cost estimates for construction of residential complex of Chandigarh Armed Police	Type-II	1272	355,81,55,000
2		Type-III	264	79,52,94,000
3		Type-IV	96	42,60,28,000
4		Type-V	24	15,91,67,000
		Total Amount		**493,86,44,000 (App. 494)**

Time schedule of construction:
2 years after obtaining clearance of cutting of trees & Environmental clearance whichever is later

Table 10.1b
Cost towards the Environment Management Plan

Component	Capital cost Rs. (in lacs)	Recurring cost Rs. (in lacs)
Sewage Treatment Plant	750	50.0
Rain Water Harvesting System	100	5.0
Solid Waste Management	50	2.5
Environmental Monitoring	50	10.0
Green area/ Landscape area development	250	20.0
Fire Fighting / Safety Management	110	10.0
Miscellaneous	50	5.0
Total	**1360.0**	**102.5**

Funds to be arranged by the Chandigarh administration under appropriate head of account.

D. ENVIRONMENTAL CELL

Environment management cell will be established to manage all environmental related activities on the site. The cell will be headed by the representatives of:

- Chandigarh Armed Police/ SSP Headquarters
- Chandigarh Pollution Control Committee
- SE Construction Circle-I, Chandigarh
- SE Public Health, Chandigarh
- Environmental Consultants

SECTION -11 ENVIRONMENTAL MONITORING PLAN

A. NECESSITY

Environmental monitoring is important and crucial parameters are of immense importance to assess the status of environment during construction and operation phases of the project. With the knowledge of baseline conditions, monitoring program can serve as an indicator for any deterioration in environmental conditions due to construction and operation of the proposed housing complex and suitable mitigation steps could be taken in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficiency of control measures can only be determined by monitoring.

The objectives of monitoring are:

- To verify the results of the impact assessment study in particular with regard to new development.
- To follow the trend of parameters which have been identified as critical
- To check or assess the efficiency of the pollution control measures
- To ensure that new parameters, other than those identified in the impact assessment study, do not become critical through the commissioning of new installations.
- To check assumption made with regard to the development and to detect deviations in order to initiate necessary measures
- To establish a database for future impact assessment studies for new project.

It is proposed to monitor essential parameters for ambient air quality, ambient noise quality and ground water quality both during the construction and operation phases of the project. A comprehensive environmental monitoring programme has been proposed as described below:

AMBIENT AIR QUALITY (AAQ) MONITORING

Ambient air quality parameters recommended for monitoring during construction activities are PM, CO, SO_2 and NO_2 monitoring shall be carried Quarterly during construction phase and once in each season (non monsoon) during operation phase in accordance to the National Ambient Air Quantity Standards / CPCC.

GROUND WATER QUALITY

Ground water/ drinking water used for the construction and human consumption will be monitored for the desired parameters as per BIS standard IS: 10500-2012, .quarterly during construction phase & 6- monthly during operation phase

EFFLUENT FROM STP

The effluents from STP will be monitored daily till its stabilization, weekly till one month and then annually.

NOISE LEVEL MONITORING

The measurements of noise levels will be carried out at all designated locations in accordance to the ambient Noise Standards formulated by MoEF. Noise level will be monitored on twenty-four hourly basis. Quarterly during construction phase and annually during operation phase

SUCCESS OF VEGETATION

To ensure the proper maintenance and monitoring of the proposed plantation activities, a regular survey of the survival rate of the planted trees is being up to a period of 2 years from the start of operation of the project.

The parameters to be monitored are shown in Environmental Monitoring Program (**Table 11.1**).

Table 11.1
Environmental Monitoring Program –Construction Phase

S. No.	Type of Monitoring	Location of monitoring stations/point	Frequency of Sampling	Parameters to be tested
1.	Ambient Air	3 locations around the site	Quarterly	PM_{10}, $PM_{2.5}$, NOx, SO_2
2	DG Stack	Point source	6 monthly	Noise, PM, CO, NO_2
3	Ambient Noise level	Appropriate construction locations	Quarterly	Day and night equivalent noise levels
4	Ground /Drinking Water	Drinking water supply to the labour camp	Quarterly	Physico-chemical and Biological (IS:10500-2012)
5	Soil	Project site	Once in 3 month	Quantitative as per standards

Environmental Monitoring Program –Operation Phase

S. No.	Type of Monitoring	Location of monitoring stations/point	Frequency of Sampling	Parameters to be tested
1	Ambient Air	3 locations	Annually or as per requirement of CPCC	PM_{10}, $PM_{2.5}$, NOx, SO_2 & CO/ CPCC consent
2	DG Stack	Point source	Annually or as per CPCC.	Noise, PM, CO, NO_2
3.	Ambient Noise level	3 locations	Annually	Noise levels Leq.
4.	Ground /Drinking Water	Drinking water supply	Six monthly	Physico-chemical and Biological (IS:10500-2012)
5	Effluent from STP	Before and After treatment	Daily till stabilization of STP Weekly till one month and then annually	pH, BOD,COD, O/G , TSS & TDS
6	Rainwater harvesting	Project site	Prior to monsoon	Inspection of stormwater drains and rainwater harvesting pits
7	Plantation survival rate	In the landscape area	Regularly from the start of operation	

The above monitoring will be got executed by the Chandigarh Armed Police (CAP) & will be submitted to the CPCC as per their norms.

REPORTING SCHEDULES

The environment management cell shall be responsible for timely conduct of the monitoring activities. The results of the analysis shall be intimated to the environment head. Any anomaly in test results shall be investigated and proper corrective actions shall be undertaken. A complaint register shall also be maintained to note any complaints from the residents and visitors in the project. Corrective actions taken against the complaints shall also be noted.

EMERGENCY

Alarming levels of pollutants in any of the monitored component may raise alarm in the proposed CAP project. However, such information should be made available to the residents/ occupants through notices. The latter may also be consulted on necessary steps to be taken on an immediate and long term basis to tide over the problem.