Development of Tourist Destination at Pathankot Dalhousie Road around Ranjit Sagar Lake

Punjab Infrastructure Development Board (PIDB)

Shivalik (Dhauladhar) Tourism Development Board (SDTDB)

Layout Plan and Detailed Project Report (DPR) | July 2020

FEEDBACK INFRA
Making Infrastructure Happen

BDP.

Contents

Introduction

Introduction

The main aim of the project is to utilize the huge tourism potential of Ranjit sagar lake.

The project is strictly planned on the guidelines of Punjab Eco Tourism Policy, 2009

The project will involve development of facilities like Eco Resorts, Eco-friendly Accomodation, Recreational greens, Adventure Sports centre, nature interpretation centres, visitor centres, awareness centres and other support facilities.

Total development area under project is 74.76 acres (30.25 Ha) and tentative built-up area is estimated to be 1,21,017 m2

The project will be executed on PPP mode

Considered in its entirety, this precinct can create an exciting destination where adventure, relaxation and culture can be experienced in a single visit.

The project site is located at a distance of approximately 32 km from Pathankot city.

Land Details

The land is divided into the following parcels:

Site 1: Niloh Tikka Palangi - 56.22 Acres

Site 2: Faugli Tikka Kulara Island - 18.54 Acres

Total area of Site 1 + Site 2 = 74.76 acres (30.25 Ha)

Development will be undertaken in area on parcels having elevation above 527.91 m above MSL, i.e. High Flood Line (HFL) as intimated by Ranjit Sagar Dam Construction (RSDC) . For safeguarding the development further, a green buffer area of 3 m shall be retained as it is i.e area between HFL 527.91 m and HFL + 3.0 m = 531 m approx above MSL.

Topography of the site is undulating with elevation varying from 528-640 m above MSL.

Some land parcels are vegetated and some are non vegetated (open land) will be left as natural green area.

Land belongs to Ranjit Sagar Dam Authority (diverted land), Panchayat land and Shamlat land (under process of transfer).

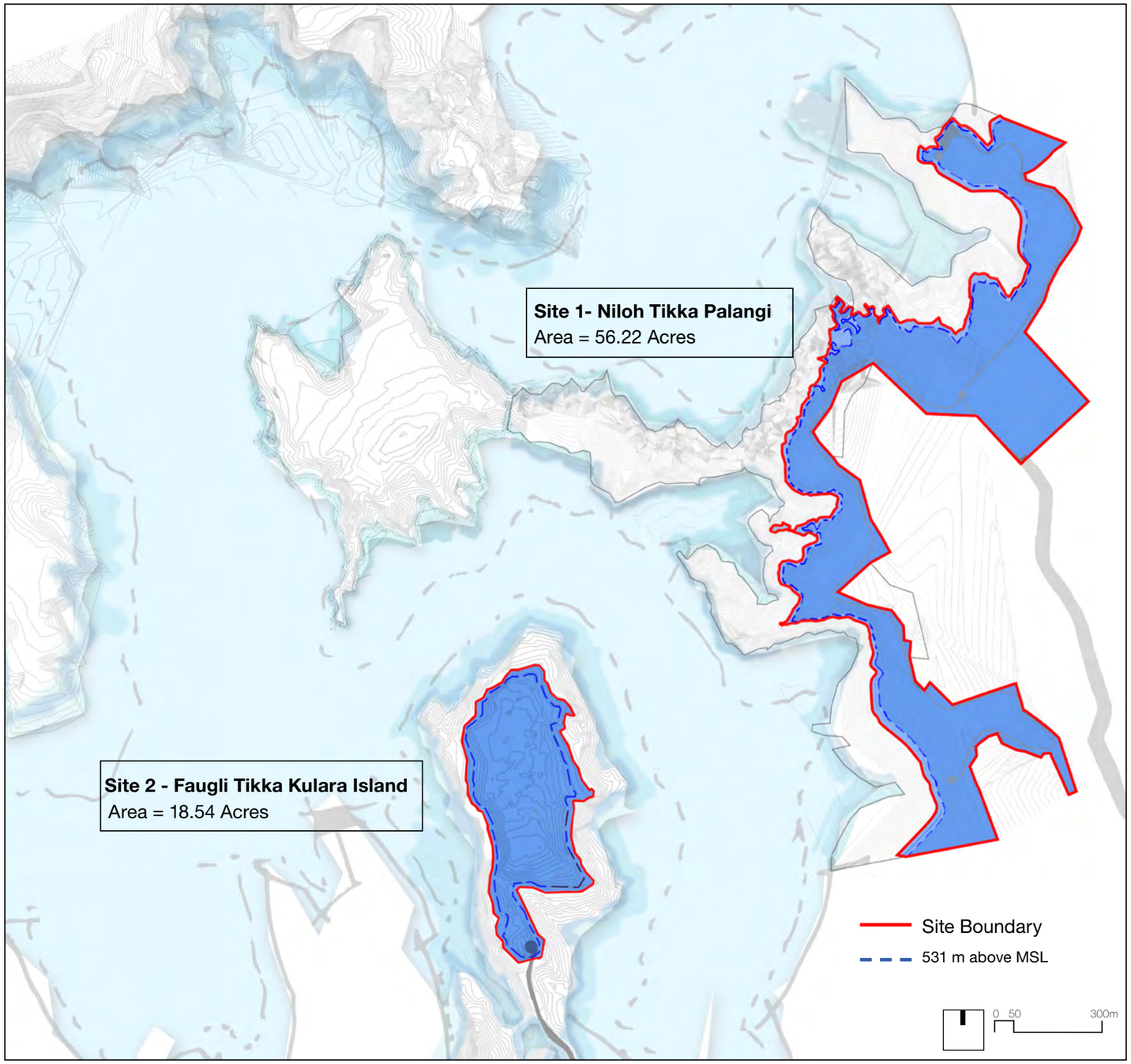


Fig. 1.1.a : Land Details

Larger Context

The site has good connectivity with the following important tourist points and cities:

- **Vaishno Devi,** Located at a distance of 174Km from the site, is connected via highways NH1A and NH1C.
- **Katra,** Located at a distance of 160Km from the site is connected via highways NH1A and NH1C.
- **Jammu Airport,** Located at a distance of about 118Km from the site can be accessed through NH1A.
- **Udhampur,** Located at a distance of 120km from the site is connected through Dhar- Udhampur road.
- **Pathankot Airport, Pathankot Railway station and Pathankot Bus Station,** Located at a distance of 37Km from the site, is connected through NH20.
- **Amritsar city-** with Airport, Railway station and Golden Temple- located at a distance of 153Kmfrom the site is connected through highways SH33, NH20 and NH15.
- **Dalhousie and Dalhousie bus station** is located at a distance of 57km from the site and connected through SH33.
- **Chamba** is located at a distance of 100km from the site ahead of Dalhousie.
- **Dharamshala** is located at a distance of 90 km from the site, connected through highways SH33 and SH17.
- **Palampur** is located at a distance of 115km from the site ahead of Dharamshala.

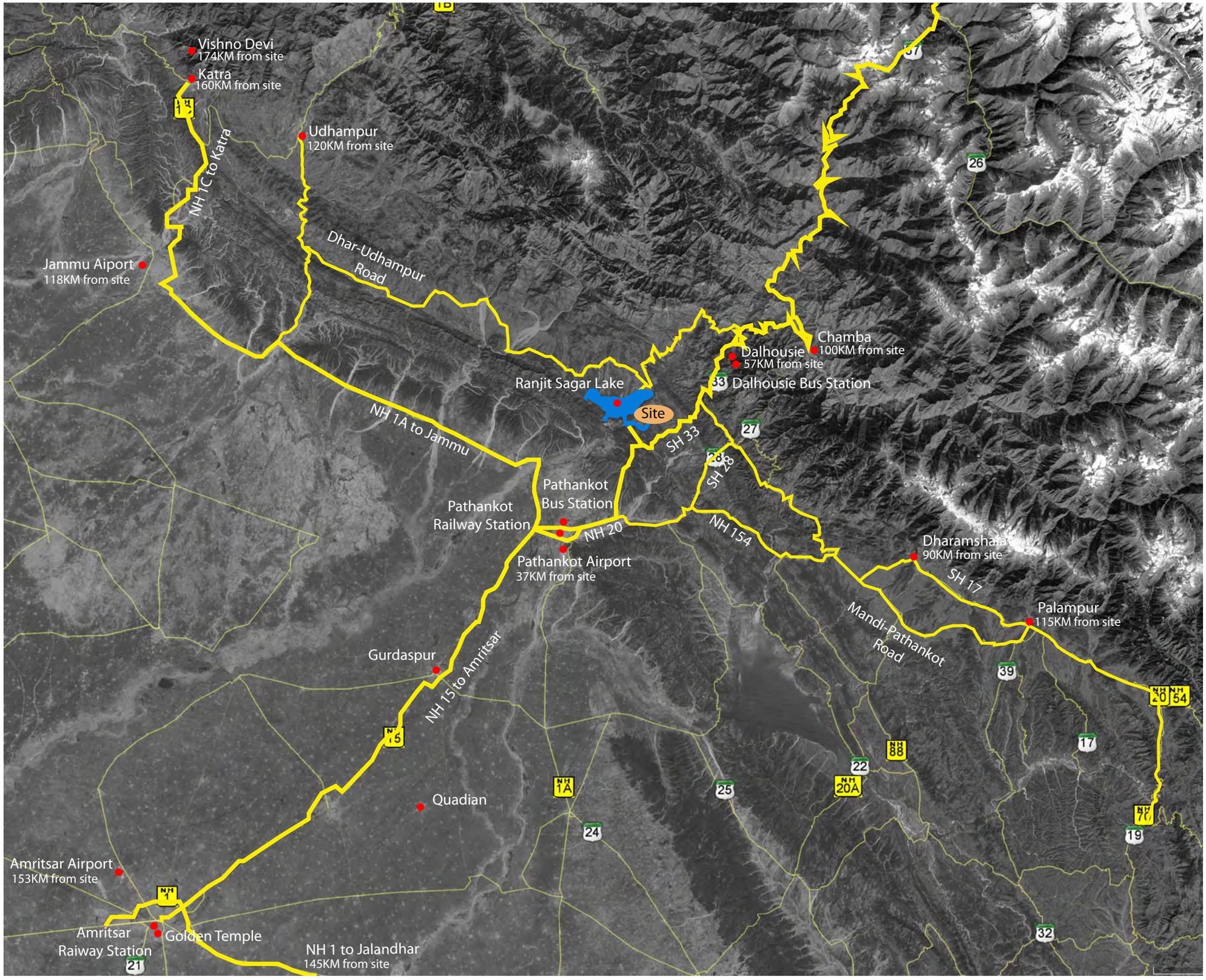
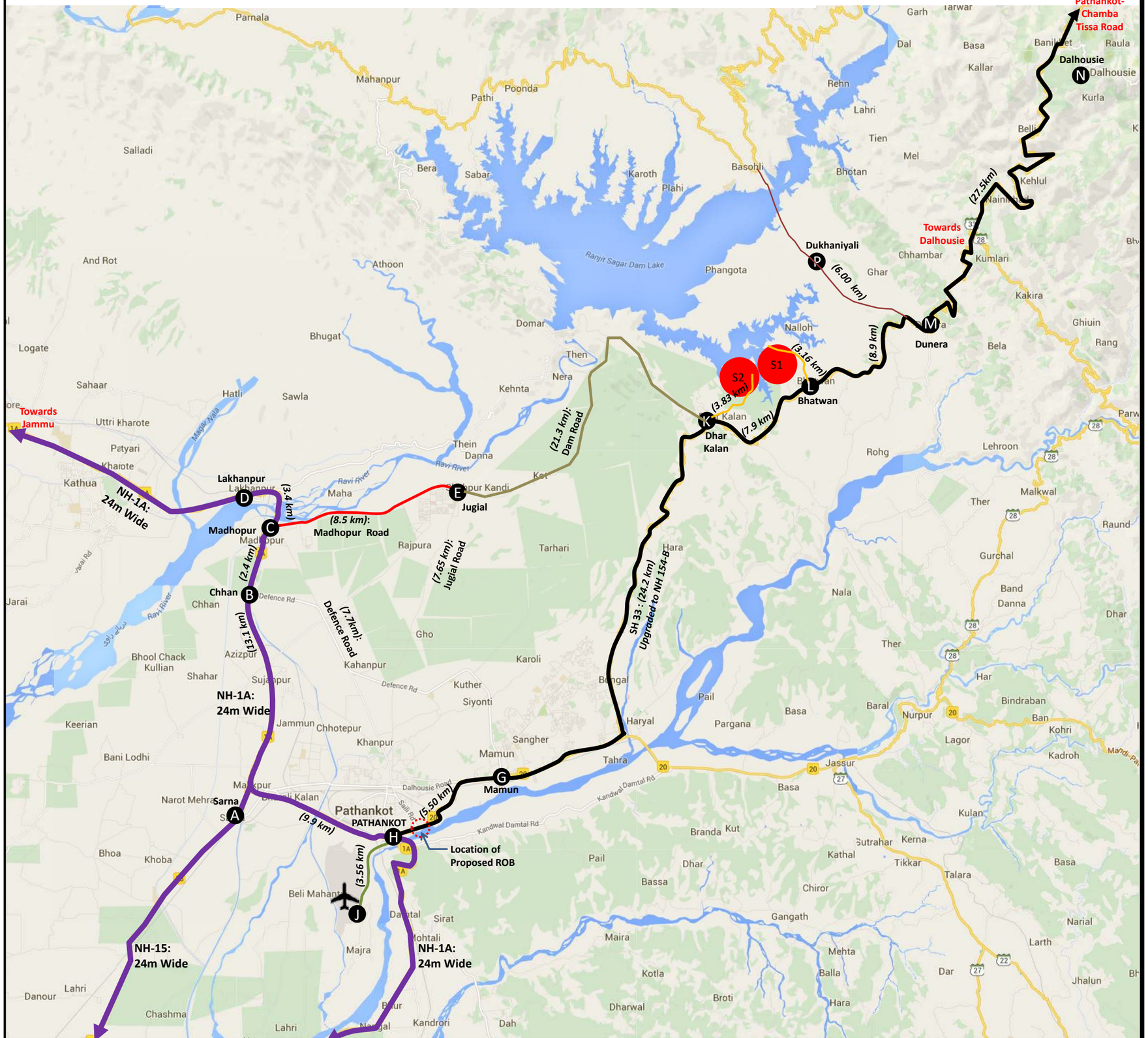


Fig. 1.1.b : Context Plan showing important places of importance within 150 Km Radius from the site.

Connectivity



Legend:

- National Highway
- State Highway
- Dam Road
- Madhopur Road
- Airport Road
- Village/ Other Roads
- Link Road by Punjab Mandi Board
- Pathankot Airport
- City/ Towns
- Sites 1, 2
- Railway Crossing

Distance from various Cities to Site (in Kms)	
Pathankot	37
Dalhousie	57
Jammu	118
Amritsar	153
Jalandhar	150
Phagwara	166
Ludhiana	220

**Distance taken from ISBT of each city*

Road No.	Available ROW (in M)	Existing Carriage way as per PWD (in M)	Proposed Carriage way (in M)	Concerned Authority
J TO H	14.50	5.50	7.00	Airport Road
*H TO G	-	18.00	-	BRO
*A TO H	-	36.00	-	NHAI
*G TO K	-	9.00	-	BRO
*A TO B	-	24.00	-	NHAI
*B TO C	-	24.00	-	NHAI
*C TO D	-	24.00	-	NHAI
*C TO E	-	6.00	10.00	
*K TO L	-	9.00	10.00	BRO
*L TO M	-	9.00	10.00	BRO
L TO S1	-	3.00	3.75	Mandi Board
K TO S2	-	3.75	9.00	Mandi Board

**Row of NH-1, NH-1A, NH-15, SH-33, H to G, A to H, G to K, B to F, A to B, B to C , C to D, C to E , K to L & L to M is not measured physically and is estimated from Google Earth.*

ROUTE NUMBER	ROUTES TO ACCESS SITE	DISTANCE
Route 1	J-H-G-K-S2	38 KM
Route 2	C-E-K-S2	34 KM

Project Component Mix

This section sets out the:

Proposed project Component mix for integrated land development in terms of recreation, commercial and residential activities.

Project Component Mix

Area requirement for each use has been worked out as per the demand assessment in accordance to the overall vision of the project.

Various international standards and Indian norms corresponding to the land use proposed have been used to define the area programme for the project. The project is being planned under **Punjab Eco-tourism Policy 2009.**

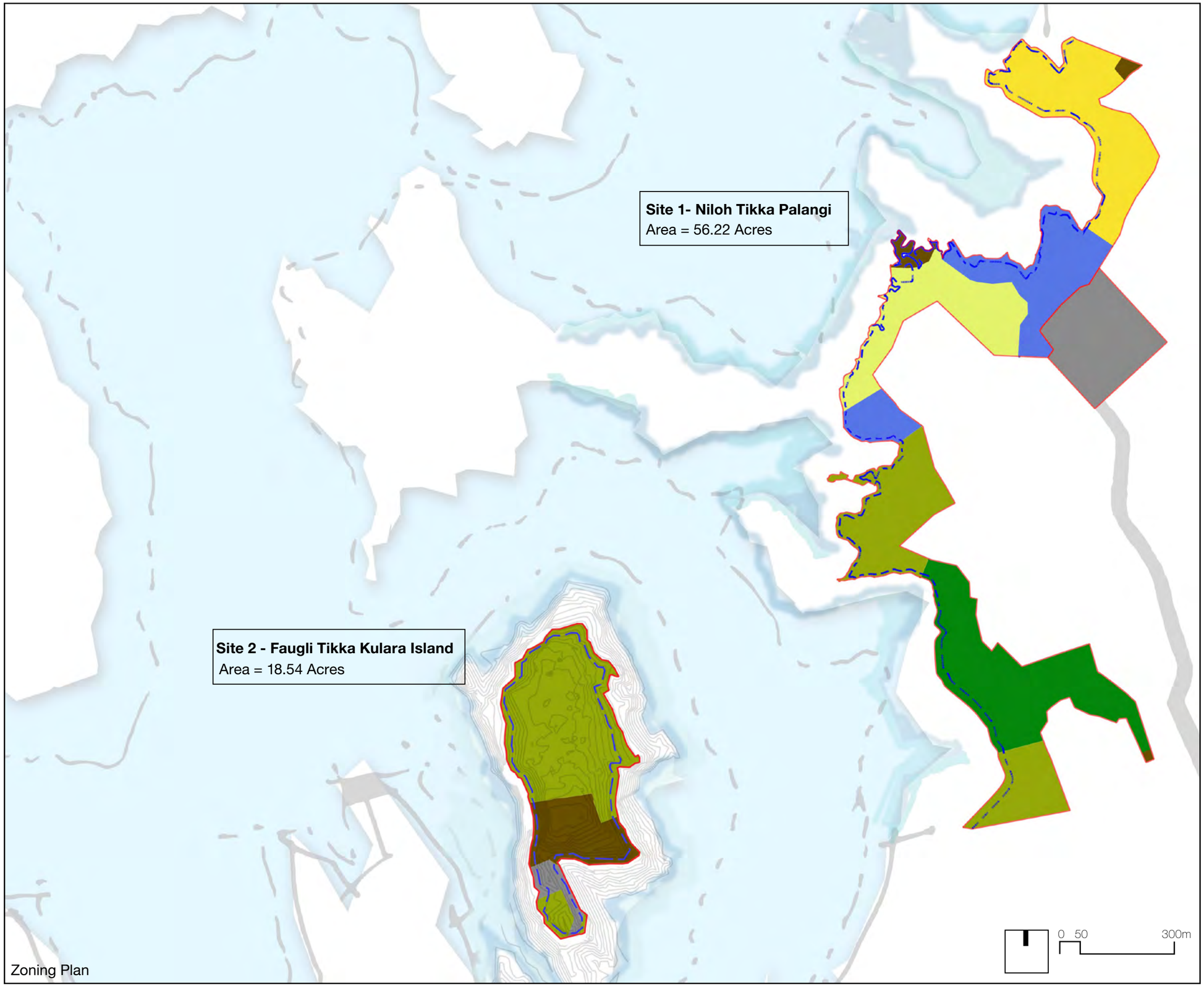
S.no.	Pocket Name	Village Name	Component No.	Components	Site Area (Acres)	Site Area (Hectares)	Site Area (%)	Max. Ground Coverage (Sq. m)- *As per Punjab Eco Tourism Policy 2009*	Max. BUA (Sq. m) *As per Punjab Eco Tourism Policy 2009*
1	Site 1	Niloh Tikka Palangi	1	**Interpretation cum Convention Centre** *Interpretation Centre* *Convention Centre* *Information Centre*	9.00	3.64	18%	20.00%	0.40
			2	**Eco Friendly Accomodation** *Villas*	10.00	4.05	20%		
			3	**Eco Resort** *Rooms*	11.00	4.45	22%		
			4	**Nature Zone** *Nature camps* *Bird Watching Zones* *Pedestrian Walkways*	12.00	4.86	24%		
			5	**Greens (Unbuildable)** *Nature Trail* *Gardens*	4.36	1.76	9%		
			6	**Support Facilities** *Facility Blocks - Reception/Dining/Gym/Club* *Utilities* *Boating Deck* *Driver/ Staff Facilities*	2.00	0.81	4%		
			7	**Roads**	1.00	0.40	2%		
					49.36	**19.98**	**100.00%**	**39950.50**	**79901.0**
			8	**Parking Site** *Common Visitor Parking*	6.86	2.78	100%	0.00%	0.00
		Sub - Total			**56.22**	**22.75**		**39950.50**	**79901.01**
2	Site 2	**Faugli Tikka Kulara Island**	1	**Eco Resort** *Villas* *Rooms* *Gardens* *Bird Watching Zones* *Nature Trail* *Pedestrian Walkways*	13.62	5.51	73%	20.00%	0.40
			2	**Support Facilities** *Interpretation Centre* *Facility Blocks - Reception/Dining/Gym/Club* *Utilities* *Boating Deck* *Driver/ Staff Facilities*	4	1.62	22%		
			3	**Roads & Parking** *Access Roads* *Visitor Parking*	0.92	0.37	5%		
		Sub - Total			**18.54**	**7.50**	**100.00%**	**15005.72**	**30011.4**
3		**Total**			**74.76**	**30.25**		**54956.22**	**109912.4**

Zoning of Project Components

This section sets out the:

Zoning of project components identified in Section 2, and their land allocation based on a requirement of various activities identified in the Site Assessment Report.

Zoning Plan



Legend

- Site Boundary
- 531 m above MSL
- Interpretation cum Convention Centre
- Eco Friendly Accomodation
- Eco Resort
- Nature Zone
- Greens (Unbuildable)
- Support Facilities
- Parking

4

Design Principles & Approach

Introduction

The site has a very rich spectrum of landscapes, vegetation and natural heritage. It has potential to become a premier eco-destination. Ecotourism or Ecologically Sustainable Tourism has been defined as **"responsible tourism to natural areas that conserves the environment and improves the well being of local communities."** It is one of the tools whereby people are encouraged to visit natural beauty of forests to promote action to conserve it. It accommodates and entertains visitors in a way that is minimally intrusive or destructive to the environment and sustains & supports the native culture. Working towards achieving these fundamental principles, the site shall be developed in harmony with the broad framework outlined in the Tourism Master Plan for the State.

The focus of the development shall be on conservation of natural resources through an adaptive design and planning approach sensitive to the local site context and environment.

The Theme

The picturesque region of Shivalik - Dhauladhar is associated with the quintessential Himalayan countryside build in a timeless setting of mountains and lakeside. The unique setting finds its parallel in the picturesque Italian Lakeside that has been always been popular with discerning visitors from around the world, drawn by the dramatic scenery, superb climate and elegance of the traditional architecture. Visitors have always admired the blue waters and relaxed in luxurious villas in the wooded lakeside slopes above Lake Comu, one of the most popular Italian Lakeside. Today, most of the towns around the shores of Lake Comu are popular with tourists, walkers, cyclists and swimmers.

As befits the theme for the development, this Himalayan Lake side may be inspired by the most dramatic Italian Lake side development creating its own unique character by adopting a vernacular design approach using materials that complement the local site context enhanced by lovely lakeside walks and stupendous views.

The Approach

- to adopt design approach that responds well to the local site context, the topography, the wind, and the sun;
- to design buildings that are environmentally sustainable;
- to promote cultural conservation and traditional wisdom;
- to use local vernacular forms that have proven to be energy efficient and "green," honed by local resources, geography, and climate;
- To minimize forest-clearing across the site, areas with sparse and moderate tree-cover are identified for larger intervention zones and the areas that have the denser foliage may be considered for minimum natural clearings and smaller intervention (smaller building footprints, meandering pathways and road access);
- to use material palette that is locally available and rapidly renewable;
- to adopt passive design strategies considering functional requirements of each building type, their adjoining road and pedestrian accesses, as well as in response to their surrounding landscape features

Himalayan Architecture

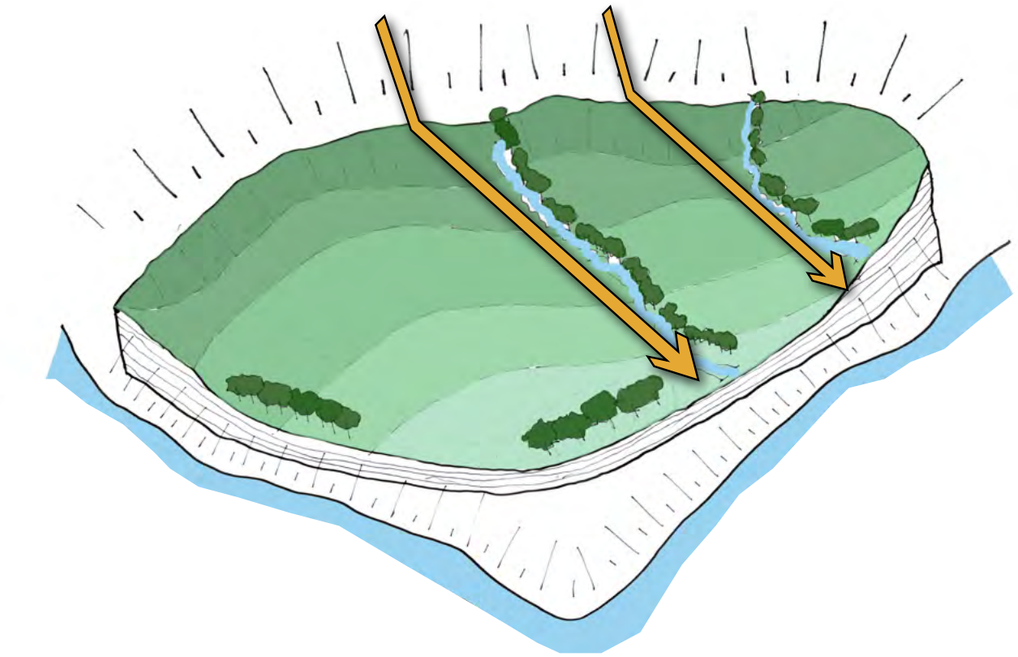
Italian Lakeside

Design Principles

Layout design principle 1

Preserving natural areas/features on site, integrating them into planning, minimizing disruptions of natural ecosystems and maximize benefits from prevailing site conditions.

IMPORTANT AND PROMINENT WATER CHANNELS WITH HEAVY VEGETATION



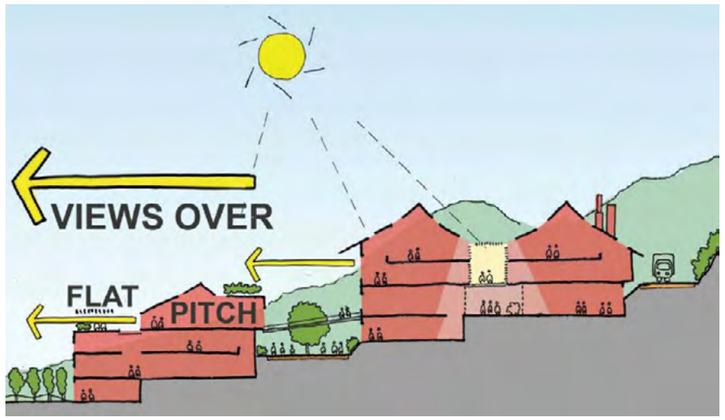
This overall design principle of working with the existing site conditions and natural features translates into a number of smaller aspects of planning which include:

- Creating a landscape to heal, protect, enhance and sustain the natural ecology
- Strengthening the hill slope zones
- Protecting existing important trees, during planning of buildings, planting additional trees.
- Creating fire lines along the adventure camps, for the safety of the area
- Restricting animal movement
- Preserving existing water drainage channels
-Garland Drains should be provided along the 531m contour, to collect run-off.

Layout design principle 2

Density & Volume

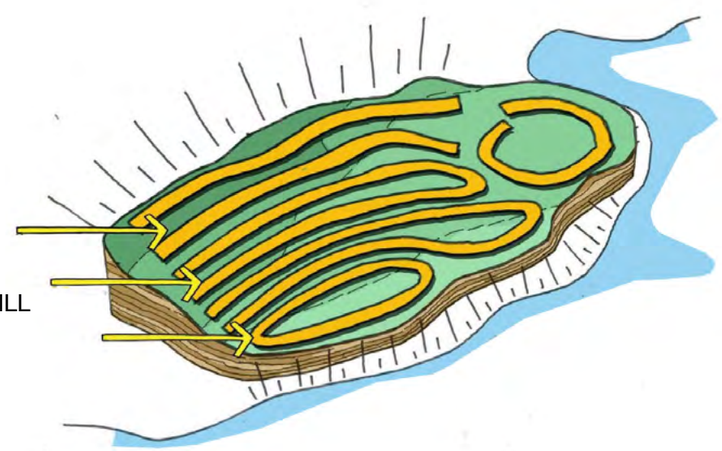
- Higher and lower areas of the site to be treated with corresponding building typologies
- Terraced relationships between different uses ensure unobstructed views
- The HFL level designated by the Department of Irrigation is 527.91m above MSL
- Further, 3m above the HFL area shall be left as it is as buffer
  (i.e. approx. till 531 m above MSL HFL as intimated by Ranjit Sagar Dam Construction (RSDC)



Layout design principle 3
Working with existing contours, to achieve soil conservation and minimize cut and fill within the development.

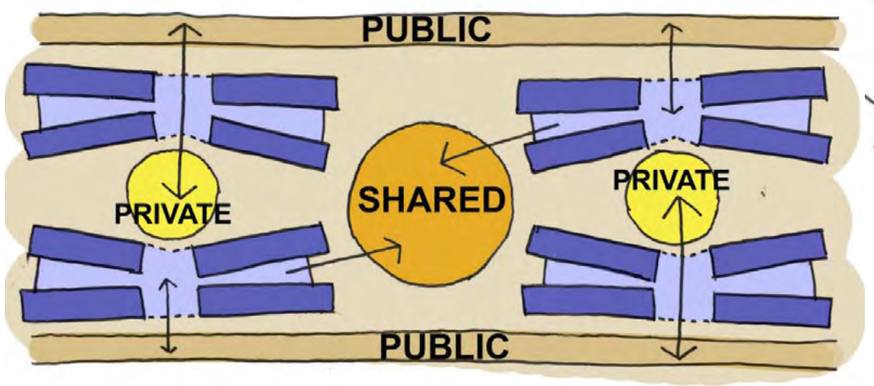
- Minimizing cut and fill
- Building on developable parcels of land
- Maintaining the right solar orientation

‘RIBBONS OF LINES’
MINIMIZING CUT AND FILL

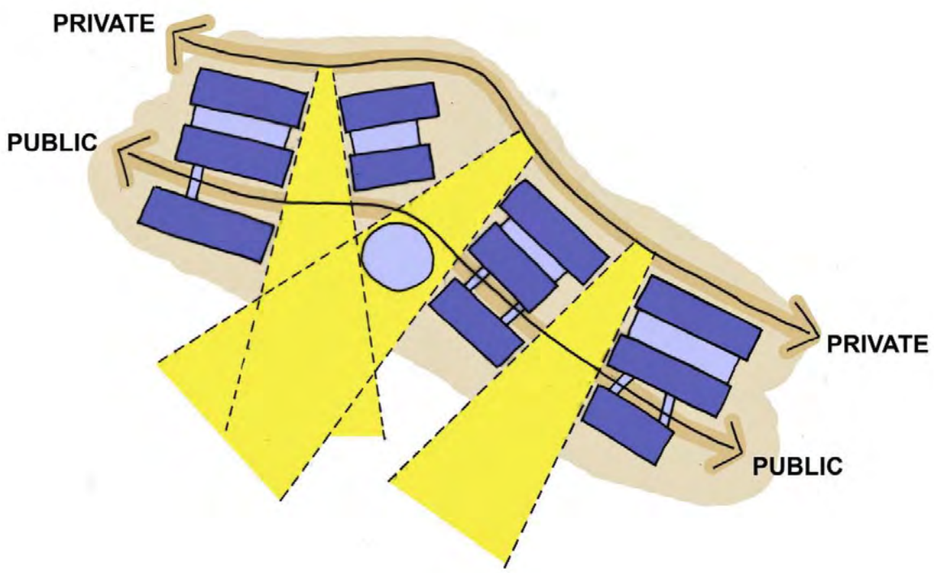


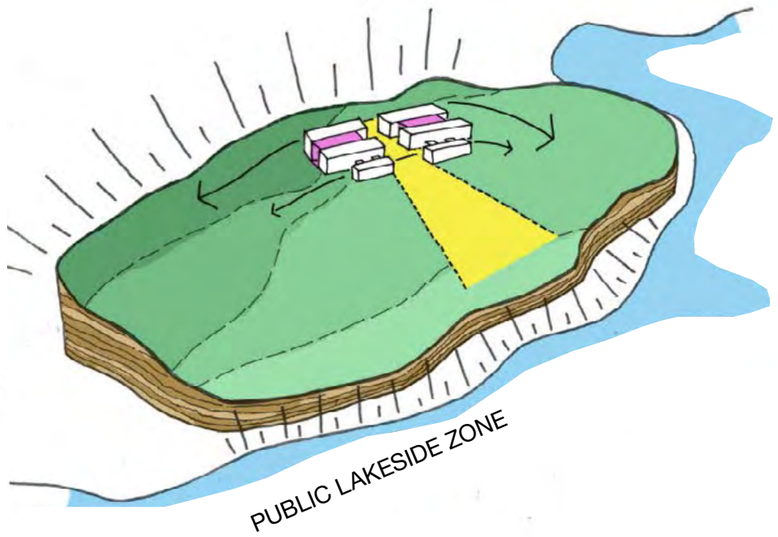
Layout design principle 4

Creating Public/Private Areas- to maintain hierarchies of functions and uses



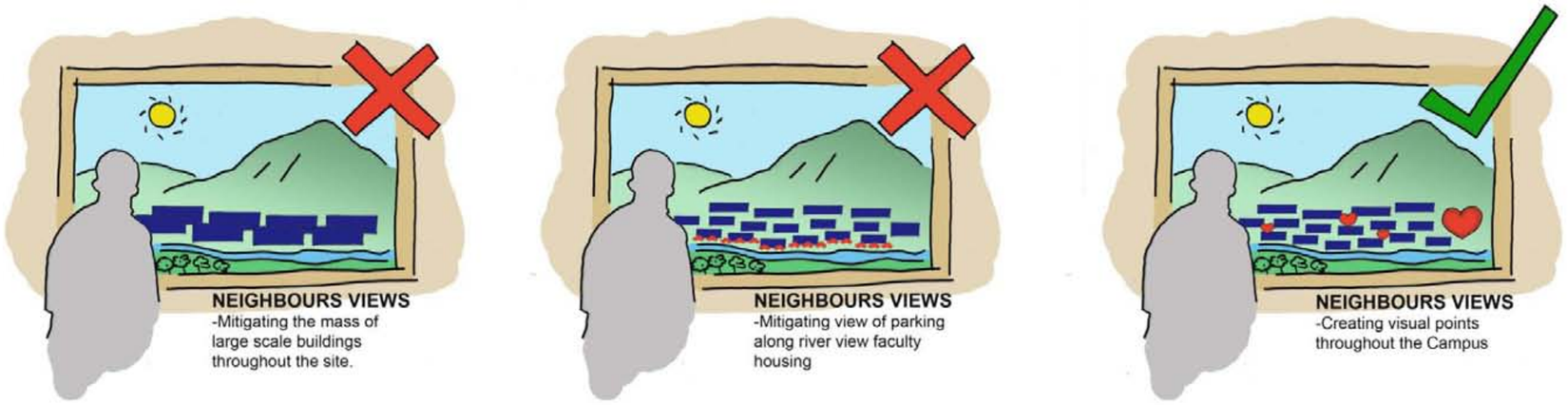
Creating Public/Private Areas - Lakeview Resorts and Hotels





Layout design principle 5

Approach and Neighbour views



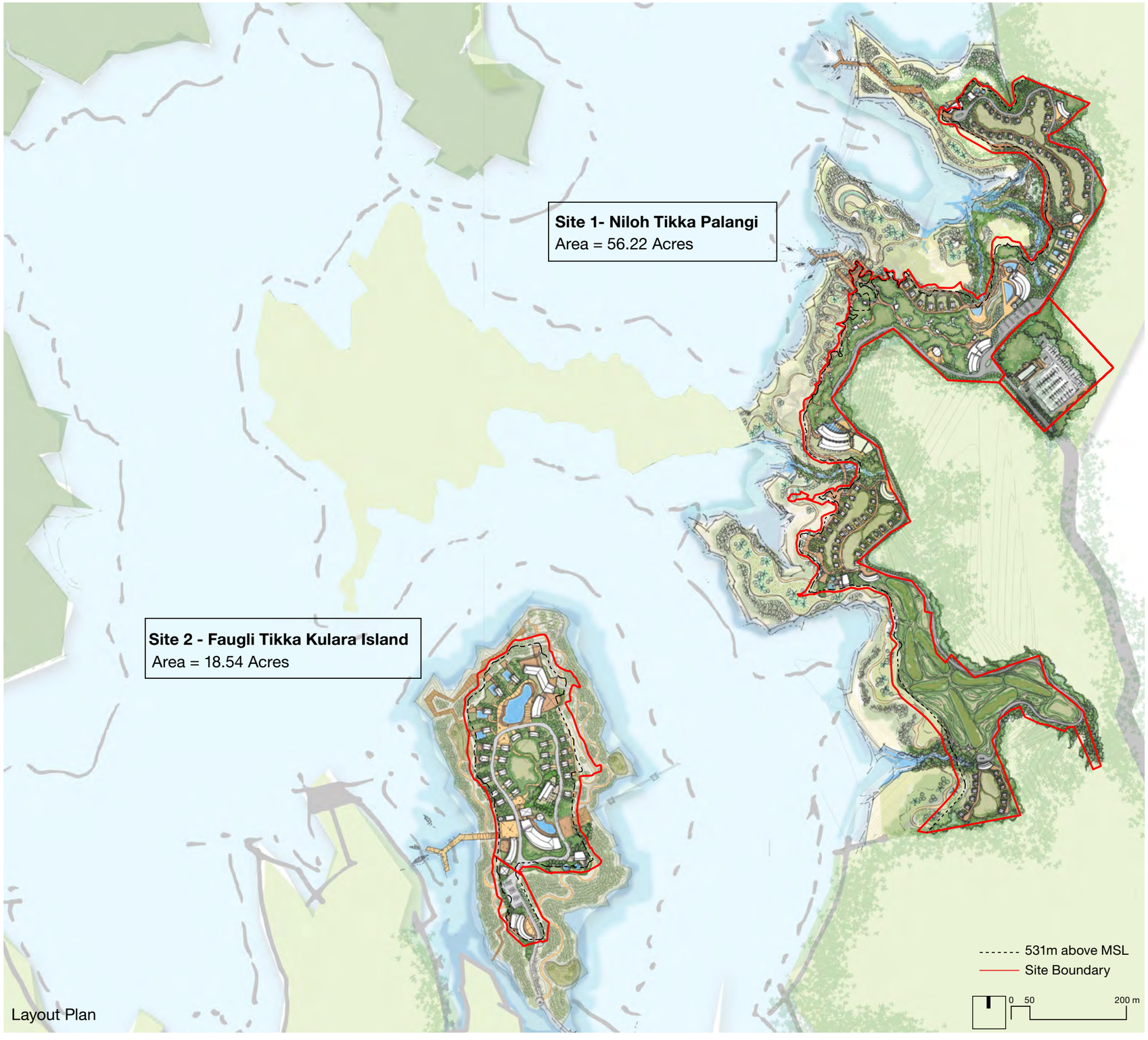
- Mitigating the mass of large scale buildings
- Creating visual points throughout the sites
- Smaller scale buildings to the front

Layout Plan

Salient Features of the Layout Plan

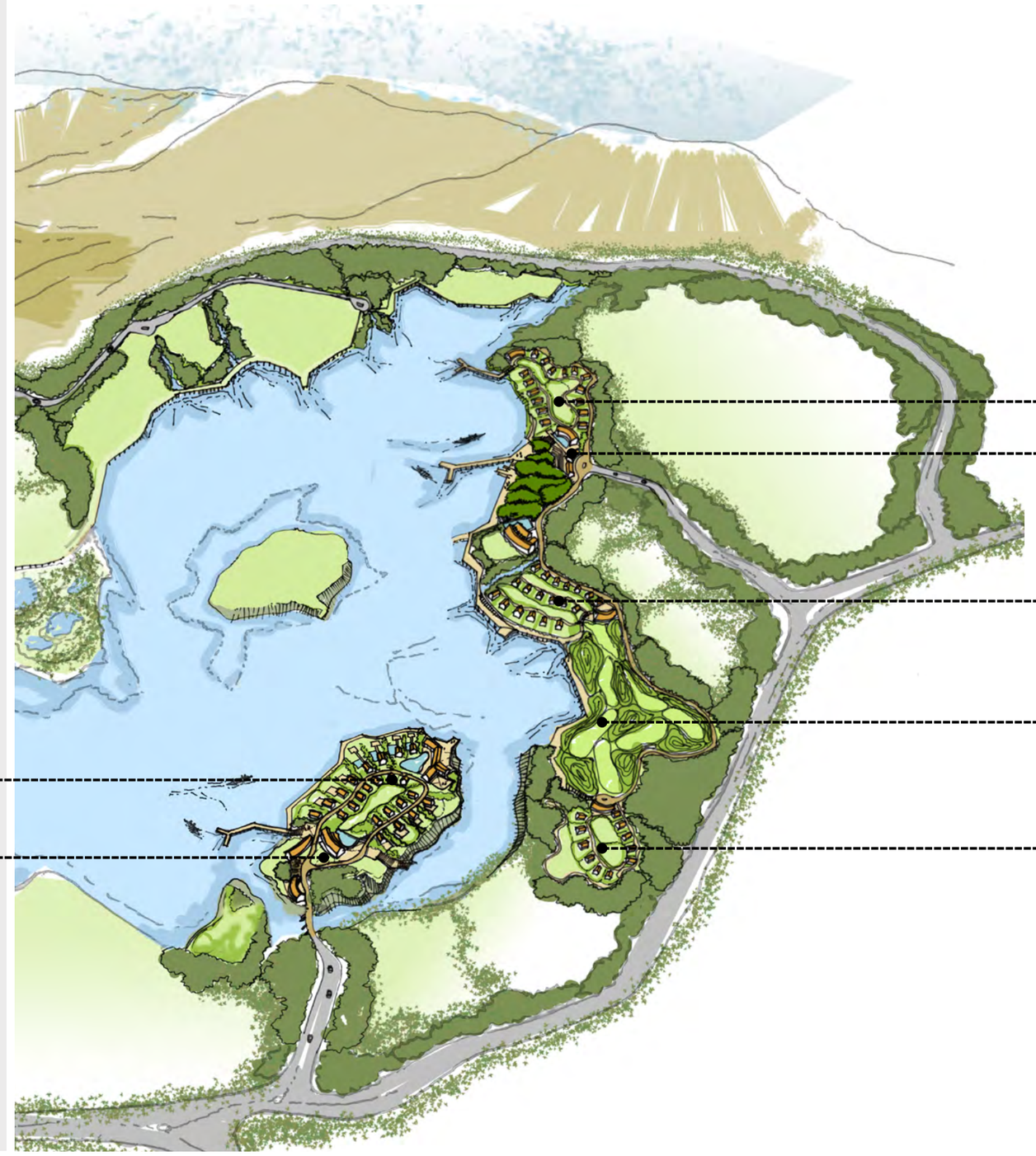
- The Lake – a key element of the layout concept is to connect the various sites and uses to the Lake – either through expansive views across the lake, boating deck to access waterways to reach various site functions via boats. Also creating multiple approach routes through landscape areas to reach lake side from different points of the sites.
- Views – the overall layout capitalises on the site's setting and topography with views out of the resort over the Lake. New views and vistas will be created all along the lake side.
- An attractive, pedestrian–friendly and eco-friendly layout – central to the layout concept is the creation of attractive, pedestrian and eco friendly places – resorts, camp sites, retail with a network of car-free routes and spaces
- A broad range of guest accommodation – Eco resorts, Eco-tels, Eco friendly accomodation and nature camps.
- Support facilities like Interpretation cum Convention Centre**,** Shops, etc for the tourists and the local residents.
- Top class adventure sports facilities
- A strong landscape structure – plays an essential part in defining the character of the different sites and permeates the whole development linking the different parts of the sites and acting as a unifying feature.

5.1.1 Layout Plan



Layout Plan

Indicative View



Site 1
Niloh Tikka Palangi

Illustrative Layout - Niloh Tikka Palangi

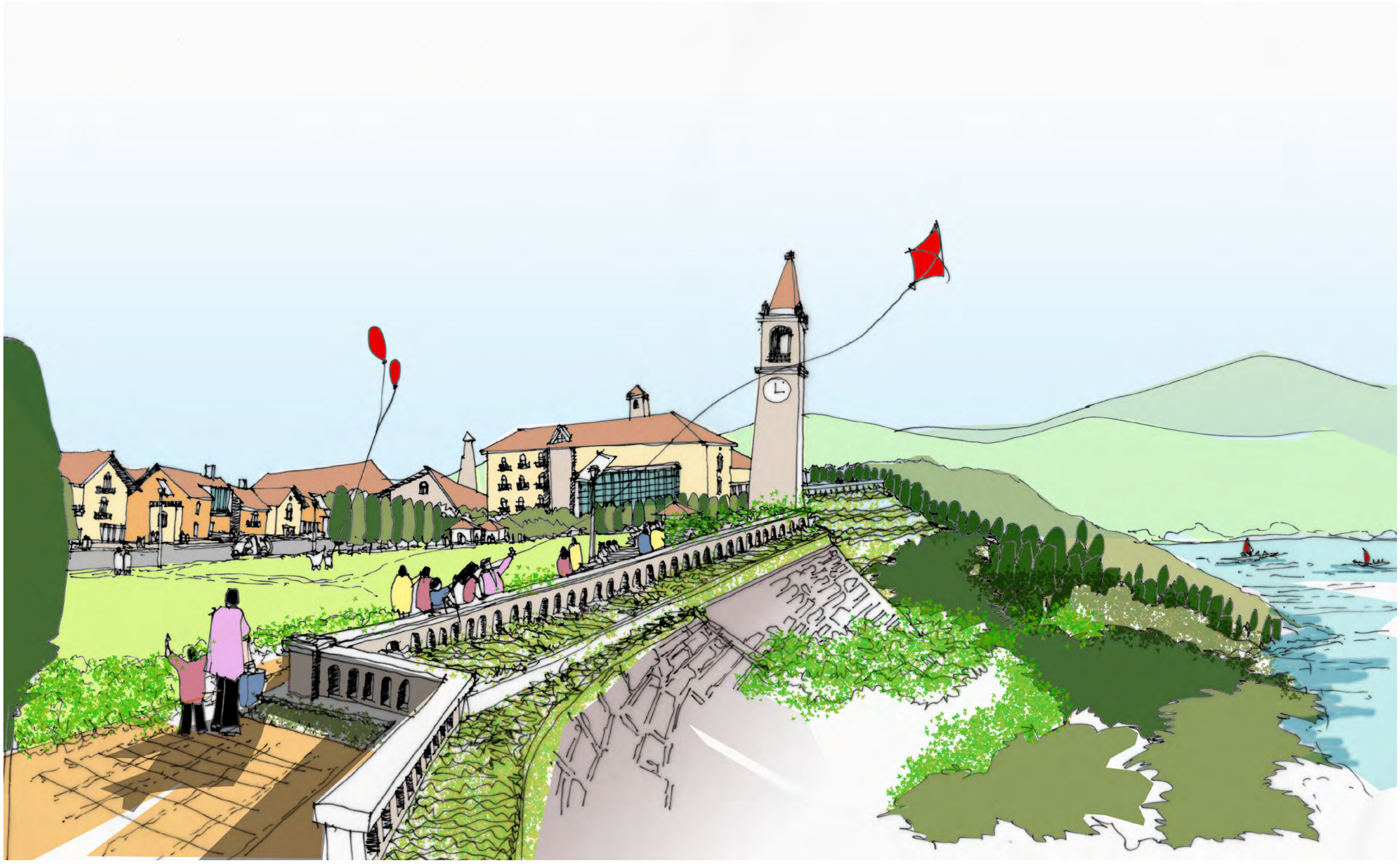
Landscape Strategy - Niloh Tikka Palangi

Artist’s Impression - Niloh Tikka Palangi; View of the Interpretation cum Convention Centre

Indicative View

Niloh Tikka Palangi- Photo

Niloh Tikka Palangi- Visualization ; Eco Friendly Accomodation



Artist’s Impression - View of the open space in Faugli Tikka Kulara Island ; Eco Resort

Site 2
Faugli Tikka Kulara Island

Illustrative Layout - Faugli Tikka Kulara Island

Landscape Strategy - Faugli Tikka Kulara Island

Indicative View

Faugli Tikka Kulara Island- Photo

Faugli Tikka Kulara Island- Visualization; Access Road

Artist’s Impression - View of Faugli Tikka Kulara Island from the Ranjit Sagar Lake

Development Control Regulations

Urban Design Guidelines

The Development Control Regulations to accompany the layout plan, the Landuse plan, and the other design layout schemes as presented in the Layout Plan chapter. These design guidelines express the fundamental intentions for design of buildings, open spaces and landscapes that will occur on the different sites part of the layout. The guidelines reflect dual objectives:

1. To have the layout reflect and fit into the unique pristine environment of its site.
2. To achieve the goal for the development to be a truly sustainable intervention.

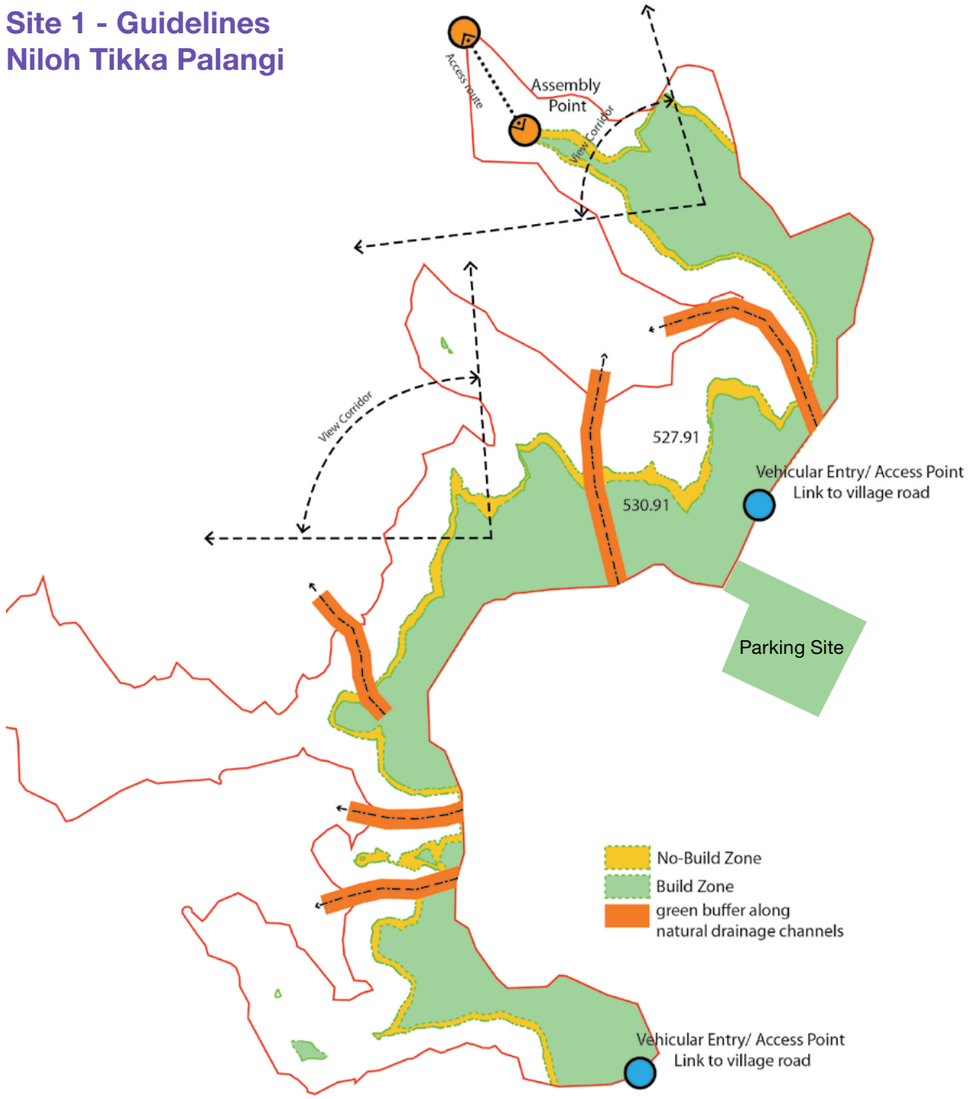
The guidelines will inform future architects and other design consultants as well as the representatives from the Punjab Infrastructure Development Board (PIDB) / Department of Housing and Urban Development, Punjab who will be responsible for implementing this Layout. Included in this Chapter are:

a. General Development Guidelines created for the entire site after detailed investigation into most appropriate layouting approach and layout strategies for the Site. This covers the relevant governing regulations and byelaws which shall be adhered to by the developers.

b. Urban Design Guidelines created for each individual site after detailed investigation into most appropriate layout strategies for the Site and the proposed landuse. These include:

- Land use zones/ component mix and land allocation
- Stream buffer easements including compound walls on plot frontage
- FAR
- Ground coverage
- Building setbacks
- Permissible setback
- Permissible building heights
- Elevation controls
- Right of way sections
- Parking requirements

Site 1 - Guidelines
Niloh Tikka Palangi



Mandatory Guidelines

BOUNDARY WALL	Any form of Boundary walls and fences along plot periphery that may obstruct views is strictly not permitted. Hedges upto height 0.9m can be used if required.
STREAM BUFFERS	12m Horizontal buffer green is required on both sides from all water streams (as per Eco Tourism policy Page 19, point 4)
FAR	F.A.R. as per Eco-tourism Policy 2009 – **Max. 0.4**
GROUND COVERAGE	As per Eco-tourism Policy 2009 – **Max. 20%**
BUILDING SETBACKS	**Minimum 10m setback from Public roads.** **Minimum 6 m setback on all sides**
PERMISSIBLE BUILDING HEIGHTS	Permissible height as per Eco-tourism Policy 2009 – **Maximum height of the building will be Ground + one floor** and in **no case structure will be higher than 30 feet** including that of structures like water tank etc.
PERMISSIBLE ROAD WIDTHS (Road Width mentioned is ROW)	**Minimum 9m ROW.** Total roads+ Parking area **not to be more than 5%** of the total site area (as per Eco Tourism Policy). Minimum 9m ROW clear, unobstructed emergency access path for fire tender within the plot and from plot to the nearest village road to be provided.
PARKING REQUIREMENTS	As per Eco Tourism Policy & PUDA Byelaws 2013- rule no. 19 or any amendments thereof.
ENTRY	Entry via Waterways - Boating Deck and 9m wide access road connection from nearest Public/ Village Road.
DESIGN INTENT	**Eco Hotels, Interpretation centre**
PROJECTIONS	**As per PUDA Byelaws- Ref. Sec. 2.1**

Recommendatory Guidelines

ELEVATION CONTROLS	• Elevations should follow the theme of traditional Himalayan architectural styles. • Roofs should have traditional Himalayan steep and pitch. • Public facades to have Min. 45% fenestration while private facades to have Min. 25% fenestration.
MATERIALS	Use of locally manufactured/eco-friendly materials with lowest environmental impact
	Parking areas shall be designed so that no trees are felled for the same and it should be paved with materials which allow percolation of water. The parking design should camouflage with nature.

Definitions:

Build-Zones: Parts of land parcels which are free from any ecologically sensitive natural features and therefore most suitable for development.

Non-Build Zones: Sensitive parts of any land parcel, which are not ideal for development as they are on valleys or have dense vegetation or other ecologically delicate feature.

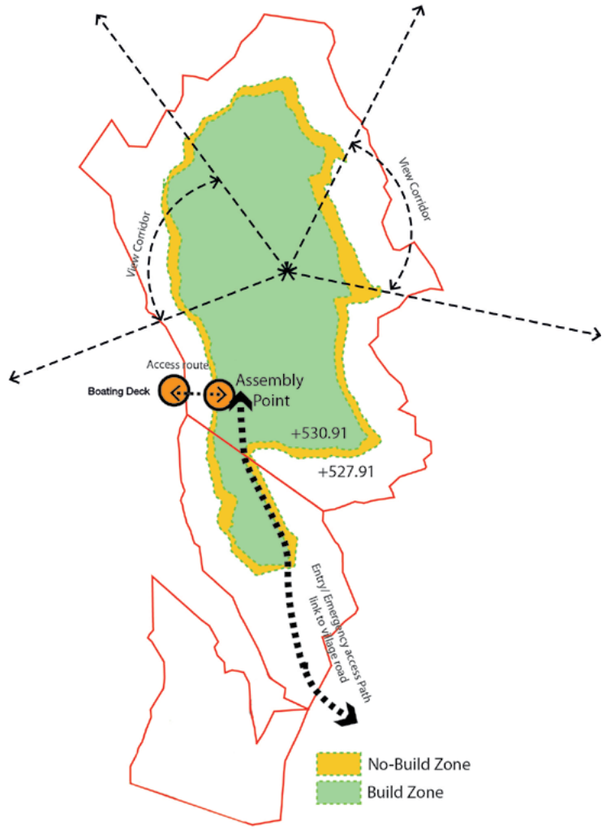
Green Buffers: Ecologically sensitive ‘Main Valleys’ (Prominent natural depressions on land surface which channelize water into the lake) and ‘Seasonal Valleys’ (Minor valleys which become active only during rainy seasons) has been preserved as natural green zone. Any kind of construction is strictly prohibited within these demarcated areas.

Development Guidelines - Site 1

Additional Notes:

1. Barrierfree Environment: The development shall adhere to norms as specified in PUDA Byelaws(Refer Appendix) to achieve a Barrierfree environment for specially abled people. All rooms on ground floor to be accessible by ramp of maximum 1:12 slope. All public facility buildings to be accessible to wheelchair users on all floors.
2. All Courtyards, Dwelling Units, Basements, Staircases and basements shall adhere to PUDA Byelaws(Refer Appendix).
3. Fire safety for the entire campus shall be as per PUDA Byelaws and NBC.
4. Permissible road widths will be considered as ROW for specific land parcel.

Site 2 - Guidelines
Faugli Tikka Kulara Island



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BUILDING SETBACKS	**Minimum 10m setback from Public roads.** **Minimum 6 m setback on all sides**
PERMISSIBLE BUILDING HEIGHTS	Permissible height as per Eco-tourism Policy 2009 – **Maximum height of the building will be Ground + one floor** and in **no case structure shall be higher than 30 feet** including that of structures like water tank etc.
PERMISSIBLE ROAD WIDTHS (Road Width mentioned is ROW)	**Minimum 9m ROW.** Total roads+ Parking area **not to be more than 5%** of the total site area (as per Eco Tourism Policy). = 3723 Sqm. Minimum 3723 Sqm shall be given. Minimum 9m ROW clear, unobstructed emergency access path for fire tender within the plot and from plot to the nearest village road to be provided.
PARKING REQUIREMENTS	As per Eco Tourism Policy & PUDA Byelaws 2013- rule no. 19 or any amendments thereof.
ENTRY	Entry via Waterways - Boating Deck and 9m wide access road connection from nearest Public/ Village Road.
DESIGN INTENT	**Eco Resort**
PROJECTIONS	**As per PUDA Byelaws- Ref. Sec. 2.1**

Recommendatory Guidelines

ELEVATION CONTROLS	• Elevations should follow the theme of traditional Himalayan architectural styles. • Roofs should have traditional Himalayan steep and pitch. • Public facades to have Min. 45% fenestration while private facades to have Min. 25% fenestration.
MATERIALS	Use of locally manufactured/eco-friendly materials with lowest environmental impact
	Parking areas shall be designed so that no trees are felled for the same and it should be paved with materials which allow percolation of water. The parking design should camouflage with nature

Development Guidelines - Site 2

Additional Notes:

1. Barrierfree Environment: The development shall adhere to norms as specified in PUDA Byelaws(Refer Appendix) to achieve a Barrierfree environment for specially abled people. All rooms on ground floor to be accessible by ramp of maximum 1:12 slope. All public facility buildings to be accessible to wheelchair users on all floors.
2. All Courtyards, Dwelling Units, Basements, Staircases and basements shall adhere to PUDA Byelaws(Refer Appendix).
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4. Permissible road widths will be considered as ROW for specific land parcel.

Compliance to PUDA Byelaws

PUDA Byelaws 2013

Section	Norm Regarding	Description of Norm	Adaptation in Layout
Part IV Section 180{2}(i)	**Barrier Free Environment**	In case of public buildings or assembly buildings, provisions contained in "the persons with disability (equal opportunities, protection of rights and full participation) Ac, 1995" in so far as these relate to planning, designing and construction of public buildings and guidelines and space standards for barrier free environment as specified under the said act, shall also be complied with.	Incorporated in DCR.
Part IV Section 180{2}(i)	**Site Coverage**	**Residential Plots:** Maximum permissible site coverage shall be: First 250 square meters: upto 65% Next 100 Square meters: upto 60% Next 100 Square meters: upto 50% Beyond 450 Square meters: upto 40% **Group Housing Plots** Maximum permissible site coverage shall be: Upto 30% Upto 0.20 percent of the total covered area of group housing project shall be allowable for convenient shopping such as grocery shop, vegetable shops, laundry and dry cleaning, medical store, confectionery, bakery, hair cutting saloon, stationery shop, milk booth **Independent Floors** Maximum permissible site coverage shall be: First 250 square meters: upto 65% Next 100 Square meters: upto 60% Next 100 Square meters: upto 50% Beyond 450 Square meters: upto 40% **Industrial Buildings** Maximum permissible site coverage shall be: First 425 square meters: upto 65% Next 425 Square meters: upto 60% Beyond 425 Square meters: upto 50% **Commercial Buildings** Maximum permissible site coverage shall be: 40% **Public Buildings:** Public Offices: upto 40% Education or religious buildings, hospitals, nursing home or medical laboratory: upto 40% Hotel, Banquet hall, club, community centre, public concert hall or auditorium: upto 40% Museum, gymnasium or public exhibition: upto 40% Amusement park or sports: upto 10% Marriage Palaces: upto 35% upto 5% total covered area shall be permissible for the housing of staff.	Punjab Eco Tourism Policy 2009 used for Site coverage.

PUDA Byelaws 2013 (Contd.)

Section	Norm Regarding	Description of Norm	Adaptation in Layout
Part IV Section 180{2}(i)	**Floor Area Ratio**	Maximum FAR shall not exceed: i. Public Offices: 1:1.50 ii. Educational or religious buildings: 1:1.00 iii. Hospital, nursing home or medical laboratory: iii.a. Area 1000-2000 sq yards with road 40 feet: 1:1.50 iii.b. 2001 to 4000 square yards with roads 60 feet: 1:1.75 iii.c. 4001 square yards and above with road 80 feet: 1:2.25 iv. Banquet Hall, Club, Community Centre, Public concert hall or auditorium: 1:1.00 v. Museum, Gymnasium or public exhibition hall: 1:1.00 vi. Amusement Park and Sports Complex: 1:0.10 **vii. Residential Buildings** vii.a. First 250 Sqm: 1:1.95 vii.b. First 100 Sqm: 1:1.40 vii.c. First 100 Sqm: 1:1.20 vii.d. First 450 Sqm: 1:0.90 **viii. Group Housing** viii.a. Min. Approach road 60'-79': 1:2.00 viii.b. Min. Approach road 80'-150': 1:2.50 viii.c. Min. Approach road above 150': 1:3.0 **ix. Commercial sites** ix.a. Road width between 80'-100': 1:2.00 ix.b. road width between 101'-150': 1:2.50 ix.c. Road width between 151'-200': 1:3.00 **x. Hotel** x.a. Plot size 1000 sq yards- 2000 sq yards with road 40': 1:2.00 x.b. Plot size: 2001 sq yards - 4000 sq yards with road size 60': 1:2.50 x.c. Plot size 4001 square yards and above with road 80' and above: 1:3.00 **xi. Industrial Plots** xi.a. Plots upto 425 sqm: 1:1.50 xi.b. For next 425 sqm: 1:1.40 xi.c. Beyond 850 sqm: 1:1.30 xii. Information technology, knowledge based industries, research institutions: 1.3.00	Punjab Eco Tourism Policy 2009 used for FAR.
Part IV Section 180{2}(i)	**Height of Building and Setbacks**	**For Non Residential Buildings:** Maximum height shall have no restriction subject to clearance from Air port Authority. Setbacks : Minimum 6m or 1/3rd of the height of building whichever more. However for buildings above 48m, the maximum setbacks shall be 16m. **For Residential Buildings:** Front and Rear setbacks shall be equal to 1/4th of the height of the building or 2m whichever more. Side setback, shall be equal to 1/5th of the height of the buildings or a minimum of 1.5m. Maximum height of plotted residential buildings without stilts shall be 36' excluding mumty, parapet, lift room, architectural features. For independent floors, stilts are compulsory and not counted in the height of the building.	Punjab Eco Tourism Policy 2009 used for Heights. Setbacks prescribed are wider than those prescribed in PUDA byelaws.

PUDA Byelaws 2013 (Contd.)

Section	Norm Regarding	Description of Norm	Adaptation in Layout
Part IV Section 180{2}(i)	**Distance between buildings**	Minimum distance between buildings shall not be less than 2/3rd of the average height of buildings in case air ventilation is drawn but not less than 2/5th of the average height of the building when no air, light and ventilation is drawn.	Setbacks prescribed are wider than those prescribed in PUDA byelaws.
Part IV Section 180{2}(i)	**Projections**	Refer section 180 {2}(i) point number 18 for all projection details. (PUDA Byelaws appended in the Annexure)	PUDA byelaws shall be followed for projections.
Part IV Section 180{2}(i)	**Parking**	As per PUDA Byelaws 2013- Rule No. 19 and amendments thereof.	As per PUDA Byelaws 2013- Rule No. 19 and amendments thereof. Total Road + Parking not to exceed 5% of total land Area as per Punjab Eco Tourism Policy 2009.

PUDA Byelaws 2013 (Contd.)

<table>
<tr><th>Section</th><th>Norm Regarding</th><th>Description of Norm</th><th>Adaptation in Layout</th></tr>
<tr><td>Part IV
Section 180{2}(i)</td><td>Parking (Contd.)</td><td>As per PUDA Byelaws 2013- Rule No. 19 and amend-ments thereof.</td><td>As per PUDA Byelaws 2013- Rule No. 19 and amend-ments thereof.
Total Road + Parking not to exceed 5% of total land Area as per Punjab Eco Tourism Policy 2009.</td></tr>
<tr><td>Part IV
Section 180{2}(i)</td><td>Courtyard, Dwelling Unit, Lift, Basement, Staircase</td><td colspan="2">Refer section 180 {2}(i) point number 20-25. (PUDA Byelaws appended in the Annexure)</td><td>PUDA byelaws shall be followed for courtyards,Dwelling Units, Lifts, Basements, staircases.</td></tr>
<tr><td>Part IV
Section 180{2}(i)</td><td>Street Width</td><td colspan="2"><table><tr><td>Category of Building</td><td>Min. Street Width</td></tr><tr><td>Residential Building</td><td>10.6m (3.5 Feet)</td></tr><tr><td>Group Housing</td><td>18m (60 Feet)</td></tr><tr><td>Independent Floors</td><td>12 m (40Feet)</td></tr><tr><td>Local Commercial G+1</td><td>18 m (60 Feet)</td></tr><tr><td>Commercial (above 3 Storey)</td><td>25m (80 Feet)</td></tr><tr><td>Industrial Buildings</td><td>12m (40 Feet)</td></tr><tr><td>Nursing Home/ Hospital
a. Plot size 1000sqyd-2000 sqyd with Min. frontage of 60’
b. Plot size 2001 sqyd-4000 sqyd with Min. frontage of 90’
c. Plot size 4001 sqyd and above with Min. frontage of 120’</td><td>40 Feet
60 Feet
80 Feet</td></tr></table></td><td>Street widths shall be as per chapter “Development Control Regulations”. The Minimum street width has been kept 9m (ROW) .

Total Road+ Parking Area not to exceed 5% of overall site area (as per Punjab Eco Tourism policy 2009)</td></tr>
</table>

PUDA Byelaws 2013 (Contd.)

Section	Norm Regarding	Description of Norm		Adaptation in Layout
Part IV Section 180{2}(i)	**Street Width (Contd.)**	Category of Building	Min. Street Width	Street widths shall be as per chapter "Development Control Regulations". The Minimum street width has been kept 9m (ROW) **.** **Total Road+ Parking Area not to exceed 5% of overall site area (as per Eco Tourism policy)**
		Hotel a. Plot size 1000sqyd-2000 sqyd with Min. frontage of 60' b. Plot size 2001 sqyd-4000 sqyd with Min. frontage of 90' c. Plot size 4001 sqyd and above with Min. frontage of 120'	40 Feet 60 Feet 80 Feet	
		No Hotel site shall be eligible for incentives under any policy of the state government having plot size less than 1000 square yards.		
Part V Section 180{2}(i)	**Fire Protection**	Fire protection would be as per IS-1642-1960 code of practice for safety of buildings, material and details of construction please refer Bureau of Indian standard code or the NBC 2005		PUDA byelaws shall be followed for Fire Safety.

Note: PUDA Byelaws compliance to be modified appropriately as per hilly and island topography.

Compliance to Punjab Eco Tourism Policy 2009

Compliance to Punjab Eco Tourism Policy 2009

S.No.	Item	Recommended in Punjab Ecotourism Policy, 2009	PUDA Bye-Laws	Project Proposed
1	**Height**	Maximum 30 Feet (9.15 m) Height	Max ht. of building : G+1 (in no case structure will be higher than 30 feet including structures like water tank etc.)	As per Eco Tourism Policy
2	**Ground Covergae**	Maximum 20%	As per Eco-tourism Policy, 2009-Max 20%	As per Eco Tourism Policy
3	**Materials**	Eco friendly vernacular locally sourced	Use of locally manufactured/eco-friendly materials with lowest environmental impact	As per Eco Tourism Policy
4	**Road Percentage**	Maximum 5%	-	As per Eco Tourism Policy
5	**Activities**	Eco -Tourism, Camping, Eco- Hotels, Adventure sports, visitor centres, interpretation and awareness centres, other Support facilities	-	As per Eco Tourism Policy
6	**Infrastructre**	Infra should be planned for, solid waste suitably disposed	-	As per Eco Tourism Policy
7	**Community empowerment**	Facilitate community empowerment and local livelihood	-	As per Eco Tourism Policy
8	**Boundary Wall**	-	Boundary walls and fences along plot periphery that may obstruct views - strictly not permitted. Hedges up to height 0.9m can be used if required.	As per PUDA Bye-Laws
9	**Stream Buffers**	-	12 m Horizontal buffer green on both sides from all water streams (as per Eco Tourism policy Page 19, point 4)	As per PUDA Bye-Laws
10	**Building Setbacks**	-	Min. 6m setback on all 4 sides (Front, Rear, Sides)	As per PUDA Bye-Laws
11	**Permissible Road Widths**	-	·Minimum 9m RoW ; clear, unobstructed emergency access path for fire tender	As per PUDA Bye-Laws
12	**Parking Requirements**	-	2 ECS per 100 sqm of covered area (as per PUDA Byelaws)	As per PUDA Bye-Laws
13	**Entry**	-	Entry via Waterways- Jetty and 9m wide access road connection from nearest Public/ village road	As per PUDA Bye-Laws
14	**Projections**	-	As per PUDA Byelaws-Ref Sec-2.1	As per PUDA Bye-Laws
15	**Elevation Controls**	-	Public facades to have Min. 45% fenestration while private facades to have Min. 25% fenestration.	As per PUDA Bye-Laws

Understanding Punjab Eco Tourism Policy

The project is being planned under the Punjab Eco-tourism Policy 2009.

The Punjab Eco-tourism Policy 2009, Section 5.3 Para (C) states the Guidelines for 'Setting up and operation of Eco-Resorts/Units for promotion of eco-tourism where approval of Ministry of Environment and Forests, GOI, have been obtained under Forest Conservation Act, 1980'. These will be applicable for the 'Development of Tourist Destination at Pathankot Dalhousie Road around Ranjit Sagar Lake'.

While the complete Punjab Eco-tourism Policy has been enclosed as Annexure A as part of this report, the main points under Section 5.3 Para (C) that forms the main guidelines for the development of this project have been presented in the following section.

Punjab Eco-tourism Policy 2009

On-Site Facilities	Mandatory Requirement	Desirable Requirement
1. Land and Basic architecture	Minimum 2.5 acres of land	
	Only upto 20% of the total land can be constructed upon; however this will not include area for parking and internal road; the total area for these (parking & internal road) will be not more than 5% of the total area	In keeping with the local landscaping, incorporate architectural styles typical to the area, thus blending with the environment
		Existing resources to be used before creating new one
		Avoid over construction. Respect, support historic and religious object sites
		Adequate greening of open area in and around the site including encouraging visitors to participate.
		Implement sound environment principle through self-regulation
	Follow planning restriction, standards and codes provided by the government and local authority e.g. PUDA, local bodies etc.	
2. Accommodation and provision of other infrastructural facilities	Maximum height of the building will be Ground + one floor and in no case structure will be higher than 30 feet including that of structures like water tank etc.	Use of locally manufactured/eco-friendly materials with lowest environmental impact
		Use materials, systems, and components that can be recycled or reused
3. Energy Use		
	As far as possible reduce total building energy consumption and peak electric demand.	
		Provide day lighting integrated with electric lighting controls
		Use efficient equipment and appliances
		Limit the burning of firewood and Use renewable or other alternative energy sources
4. Water Use	Preserve site watersheds and groundwater aquifers, if required, site specific plan to be placed	
	Install rainwater harvesting system.	Conserve and re-use rainwater for their operations
	Maintain appropriate level of water quality on the site and in the resort specially areas adjoining river/stream/spring.	Reduce potable water consumption
	reduce building water consumption by recycling of water	

On-Site Facilities	Mandatory Requirement	Desirable Requirement
5. Waste-Disposal and Recycling	Sewage not directed to ground water and solid waste is systematically collected and disposed/re-used suitably within campus site and not at public place	
	Adequate precautionary measures should be taken to avoid noise pollution	
	As far as possible Control and reduce environmentally unfriendly products such as plastics, asbestos, CFCs, pesticides and toxic, infectious, explosive or flammable material.	Use of eco-friendly materials for stationery and other activities like publicity materials etc.
6. Interpretation Centre	Provide information services to visitors on nature conservation, local attractions including flora ,fauna and unique feature of the area, safety and security, local customs, traditions, prohibitions and regulations and self-conduct and behaviour	
7. Other facilities	Provision of accommodation and ancillary facilities for support staffs, if on site.	Linkages with other tourist destination centres

Off-Site Facility	Mandatory Requirement	Desirable Requirement
		Ecotourism activities to be undertaken with the active involvement of local people/community/ forest department
	At least 10% employment for service sector to be provided to locally trained people residing within a distance of 10 km from the site subject to availability.	Facilitate capacity building of the local community

Development Control Regulations

Recommended Architectural Guidelines

Recommended Architectural Guidelines

The purpose of this chapter is to help equip all those involved in the development of Tourism Layout, with guidance on achieving and assessing the quality of urban design envisioned for this development. This Chapter introduces the various building-block typologies included in Layout, and gives an overview of design characters visualised for each typology.

The typologies have been developed essentially by adopting local architectural styles; considering functional requirements of each building type, their adjoining road and pedestrian accesses, as well as in response to their surrounding landscape features. This segment includes all recommendory guidelines for architectural intent.
Typologies have been divided into four categories which are as follows: 01. Villas/Resorts, 02. Amenity Block, 03. Interpretation Centre, 04. Temporary Structures for Faugli Tikka Kulara Island

9.1 Typology 1 (Resorts/Villas)

Architectural typology guidelines for resorts/villas have done based on seven parameters which are as follows: a) Plot Details, b) Building Height, c) Variation in Clusters, d) Interface Strategy, e) Massing Strategy, f) Style & Elements, g) Visual Character along with an additional segment on reference palette. We have provided for two categories of villas in the layout

- Spa & Golf Villas (premium and mid range)
- Luxury Villas (super premium)

Plot Details have been separately mentioned for Faugli Tikka Kulara Island under 9.4 Typology 4 (Temporary Structures)

Key Plan

a) Plot Details

We recommend that spa & golf villas can follow 'Type 1' module whereas luxury villas are recommended to follow 'Type 2' module.

1. Type 1 Villa (Fig. 9.1.a.i)

Plot dimension: An optimum module of (20m x 15m) has been considered to showcase the design principles. It may vary based on contextual background of respective land parcels.

Ground Coverage & FAR: Please refer to Chapter 6 for respective land parcels.

Setback: It will have a minimum 3m setback along access road side and 5m setback along lake side which will require contextual landscape inputs accentuating 'entry' as well as 'view' zone.

Plot Privacy: It will also have a minimum 2m side green buffers to ensure plot privacy without use of any sort of boundary wall.

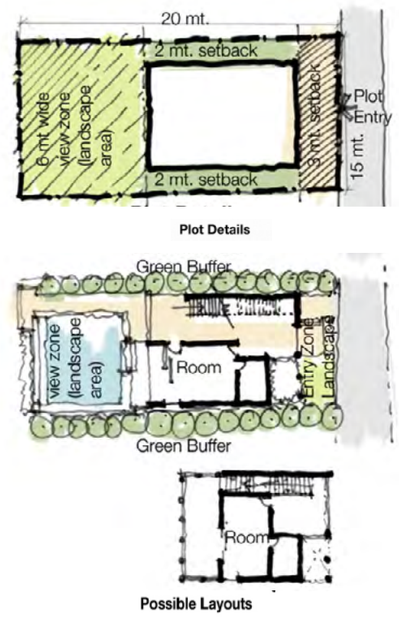
2. Type 2 Villa (Fig. 9.1.a.ii)

Plot dimension: An optimum module of (45m x 30m) has been considered to showcase the design principles. It may vary based on contextual background of respective land parcels.

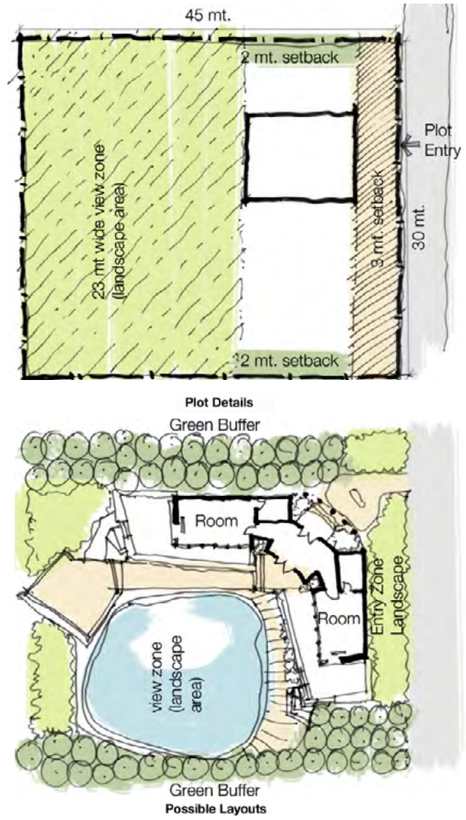
Ground Coverage & FAR: Please refer to Chapter 6 for respective land parcels.

Setback: It will have a minimum 5m setback along access road side and 5m setback along lake side which will require contextual landscape inputs accentuating 'entry' as well as 'view' zone.

Plot Privacy: It will also have a minimum 2m side green buffers to ensure plot privacy without use of any sort of boundary wall.



(i) Type 1 Villa



(ii) Type 2 Villa

Fig. 9.1.a Plot Details

b) Building Height

1. Permissible height as per Eco-tourism Policy 2009 is 30 feet. (Please refer to Chapter 6 for details)
2. Type 1 villas are recommended to have two-storied structures where as Type 2 villas may have one-storied structure. Balconies can be inside/projected outside the building based on existing view/vista with suitable climate protective measures. (Fig. 9.1.b.(i-ii))

Roof Type

1. Type 1 villas may follow equal pitch & unequal eves height / equal pitch & equal eves height as recommended options for roof design. (Fig. 9.1.b.i)
2. Type 2 villas may follow 'lean-to roof at shallower pitch' model for the roof design. (Fig. 9.1.b.ii)
3. Pitched roofs with large overhangs (1m) to provide shelter and shade from solar gain and elements.
4. Steep pitch blocking site views will not be recommended. (Fig. 9.1.b.(iii-iv))

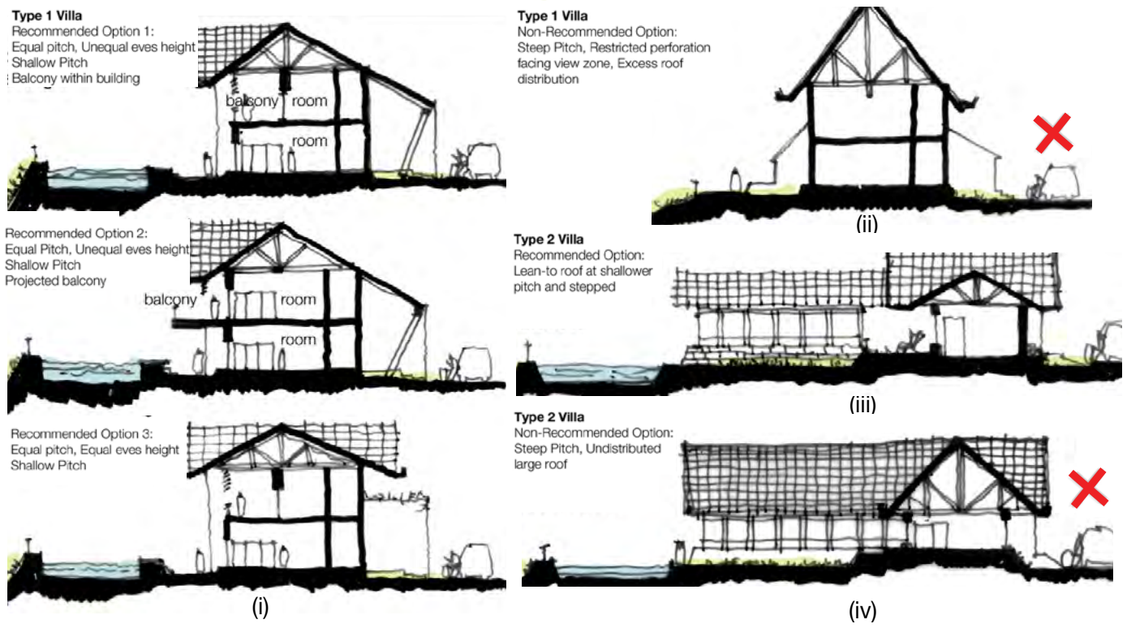


Fig. 9.1.b Height Details

c) Variation in Clusters

Clustering can be done in following ways:

1. SPA Villas (Type 1) may follow staggered/stepped character to make best use of its existing landform along with accentuating existing views (Fig. 9.1.c.(i-ii))
2. Golf Villas (Type 1) may celebrate the view of central green more by following inward cluster typology (Fig. 9.1.c.iii)
3. Luxury villas (Type 2) may be accommodated in a row for maximum views. Additional green buffers will ensure more privacy for the villas (Fig. 9.1.c.iv)

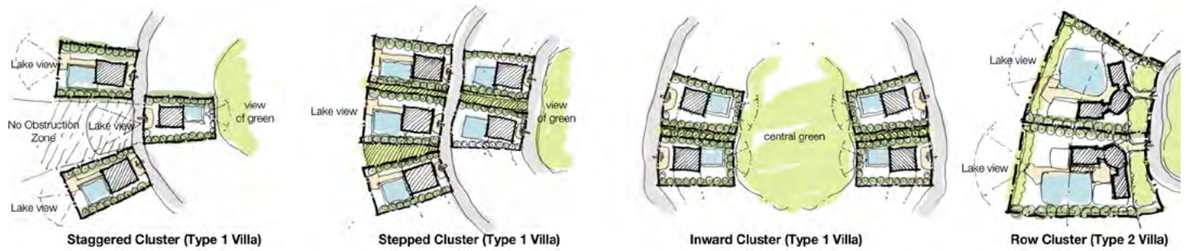


Fig. 9.1.c Cluster Details

d) Interface Strategy

Buildings may be arranged in two ways predominantly to make best use of its contours and existing views.

1. If the arrangement follows principles of 'stepped' cluster then buildings should be placed at such levels where the building at lower level does not block the view of the one which is at top. Access roads at two different levels along with an intermediate stepped landscape zone may make the interface more attractive (Fig. 9.1.d.i)
2. If the arrangement follows principles of 'staggered' cluster then buildings can be accommodated at the same level with a common access road where the two adjacent villas at front towards the lakeside will have 'no obstruction buffer zone' which will allow the villas on the other side of the road views towards the lake side (Fig. 9.1.d.ii)

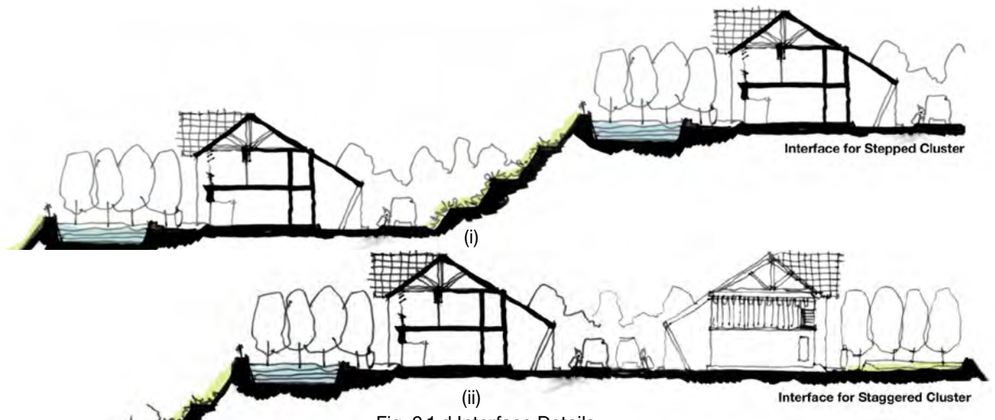


Fig. 9.1.d Interface Details

e) Massing Strategy

1. Buildings will have more perforation along lake edge to allow maximum views from inside the building. 'Road edge' will have at least 25% fenestrations whereas 'Lake edge' will have minimum 40% - 50% fenestrations (Fig. 9.1.e.(i-ii))
2. Roof will be distributed following same shallow pitch (Fig. 9.1.e.(i-ii))
3. Type 1 villas will have two stories and type 2 villas will be one storied building (Fig. 9.1.e.(i-ii))
4. Skylights at strategic location (eg. above entrance/ balcony) will encourage penetration of direct as well as diffused sunlight (Fig. 9.1.e.(i-ii))

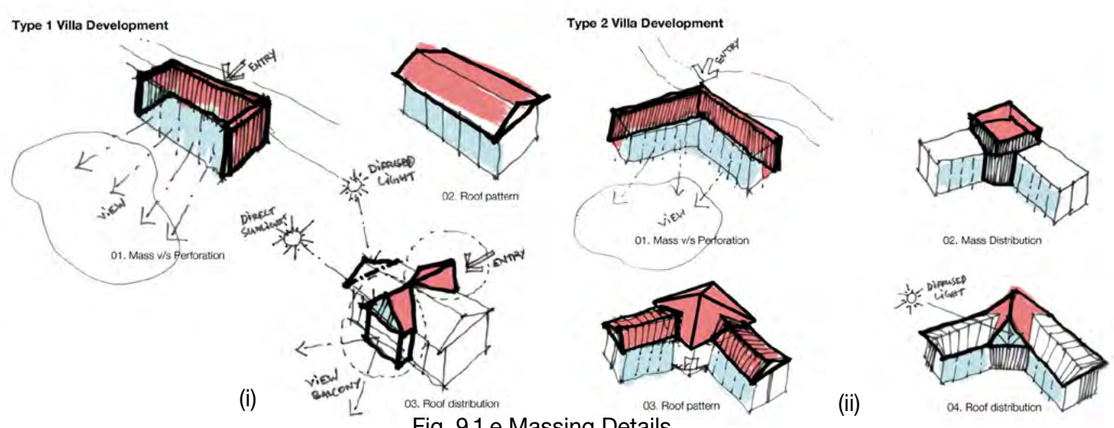


Fig. 9.1.e Massing Details

f) Style & Elements

Use of locally manufactured/eco-friendly materials with lowest environmental impact will be preferred. Traditional construction methodologies along with typical elements of 'Himalayan Architecture' will create unique style for concerned typology. Preferred materials will be as follows:

- Natural stone and stone alternatives
- Slate and similar alternatives
- Timber and timber alternatives
- No use of metal cladding (e.g. Aluminium cladding, etc.)

Also, to make construction more cost-effective (apart from luxury villas), alternative use of Garsa Tile cladding along with Galvalume roofing with insulation may help to serve the purpose efficiently.

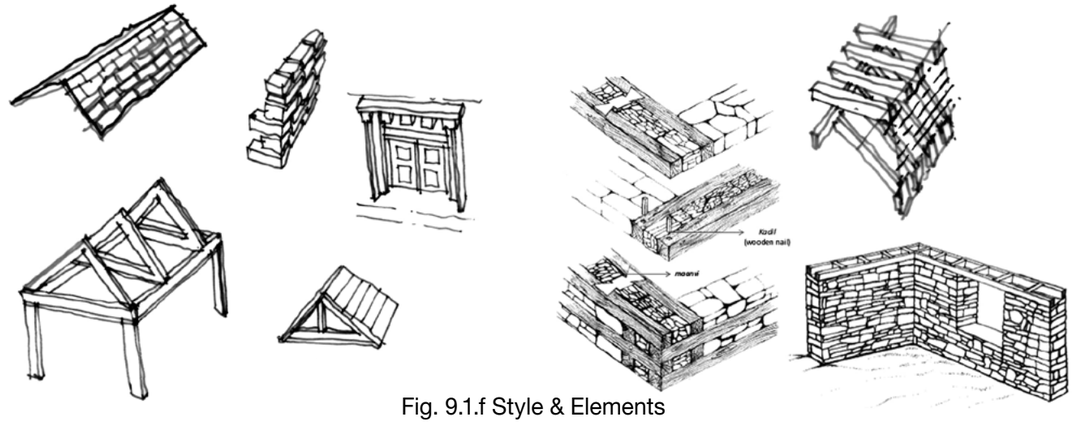


Fig. 9.1.f Style & Elements

g) Visual Character

1. Architectural language should be based around the theme of traditional Himalayan architectural styles found in the local region like Himachal Pradesh, Jammu & Kashmir.
2. Elevational Treatment should be developed to emphasise the views from individual units. It should provide privacy where required to public faces of buildings (esp. villas).
3. A clear definition between solid and open should be recommended.
4. Smaller openings to be of a regular shape and rhythm in keeping with the traditional style referenced.

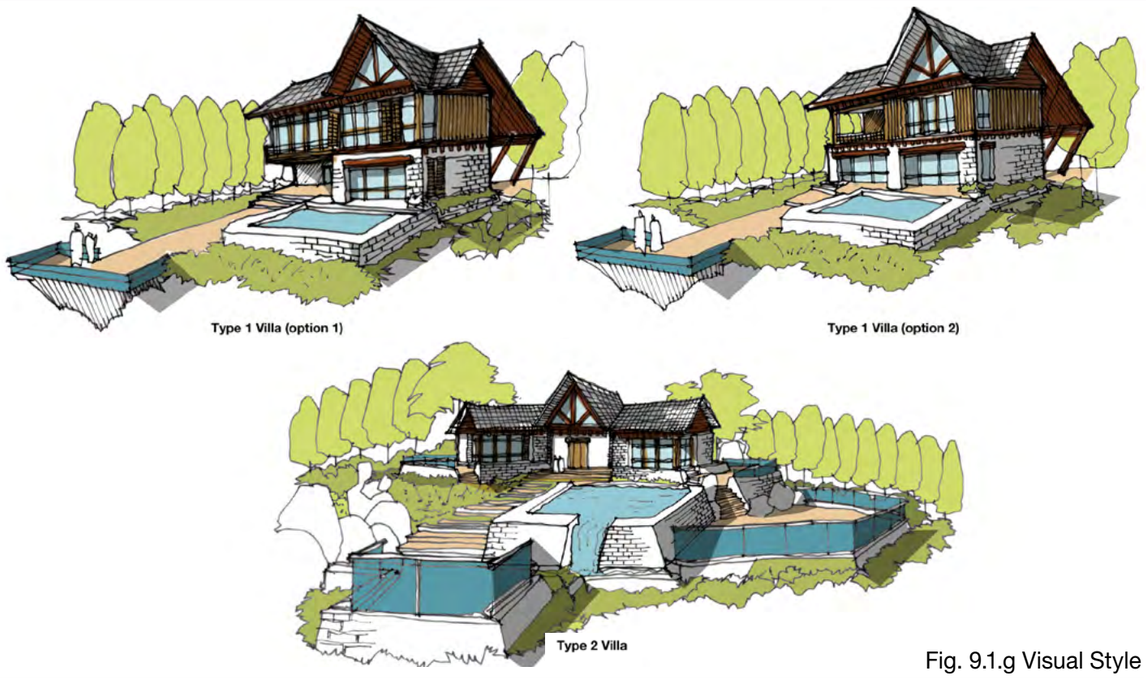


Fig. 9.1.g Visual Style

h) Reference Palette

Reference palette showing precedents of desired outdoor/indoor spaces along with reference of traditional 'Himalayan Architecture' is included below.

Fig. 9.1.h Reference Palette

9.2 Typology 2 (Amenity Blocks)

Amenity Blocks are major components of the layout. All the sites will have these typologies with reference to proposed programmatic requirements. Typological architectural guidelines have been developed based on six parameters: a) Plot Details, b) Building Height, c) Variation in Typology, d) Style & Elements, e) Massing Strategy, f) Visual Character along with a reference palette. The programmatic requirement for the uses ensures common reception/dining/recreational facilities for different land parcels. Examples of some of the amenity blocks include dining hall, reception block, spa block and other common uses.

Key Plan

a) Plot Details

1. **Plot dimension:** An optimum module of (60m x 45m) has been considered to showcase the design principles. It may vary based on contextual background of respective land parcels (Fig. 9.2.a.i)
2. **Ground Coverage & FAR:** Please refer to Chapter 6 for respective land parcels.
3. **Setback:** It will have a minimum 6mt setback along access road side and 3m setback along rear side (Fig. 9.2.a.i)
4. **Plot Privacy:** It will also have a minimum 2m side green buffers to ensure plot privacy without use of any sort of conventional boundary wall (Fig. 9.2.a.i)

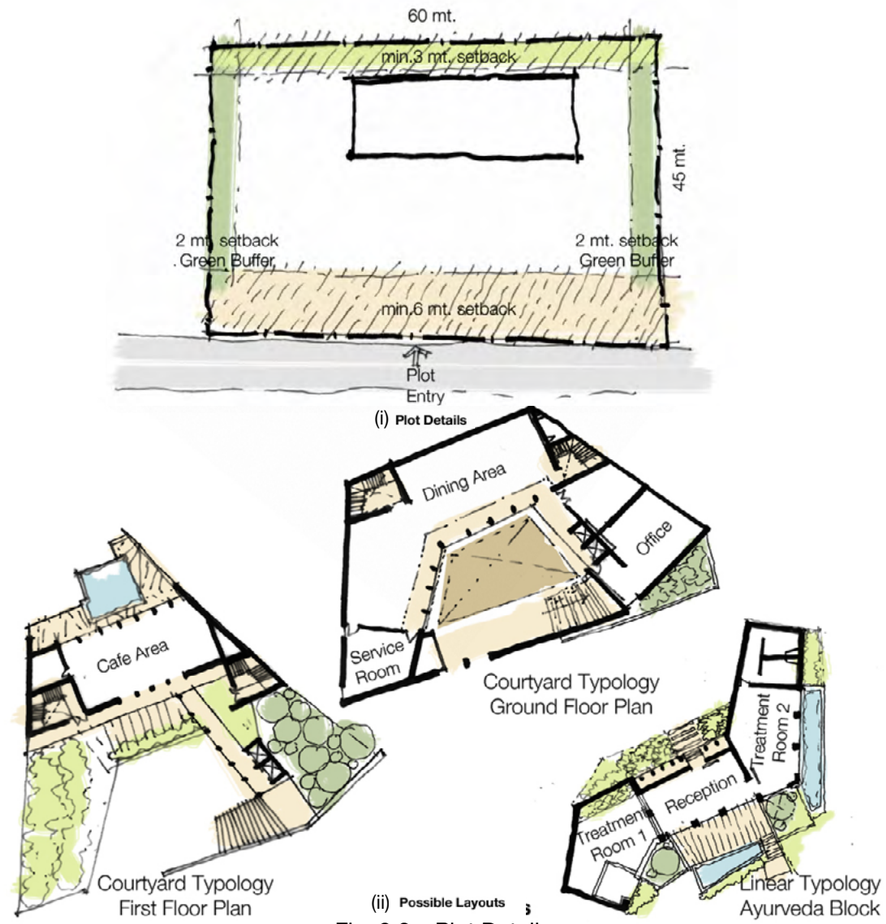


Fig. 9.2.a Plot Details

b) Building Height

1. Permissible height as per Eco-tourism Policy 2009 is 30 feet (Please refer to Chapter 6 for details). 'Courtyard Typologies' are recommended to have two-storied structures whereas 'Linear Typologies' can have one-storied structure (Fig. 9.2.b.(i-iii))

Roof Type

1. 'Courtyard blocks' may follow equal pitch & unequal eves height / equal pitch & equal eves height as recommended options for roof design (Fig. 9.2.b.ii)
2. 'Linear Blocks' may follow 'equal pitch & equal eves height' model for concerned roof design (Fig. 9.2.b.iii)
3. Pitched roofs with large overhangs (1m) to provide shelter and shade from solar gain and elements.
4. In these blocks we recommend the use of steep pitches to distinguish the public nature of their functions from other residential villas (Fig. 9.2.b.i)

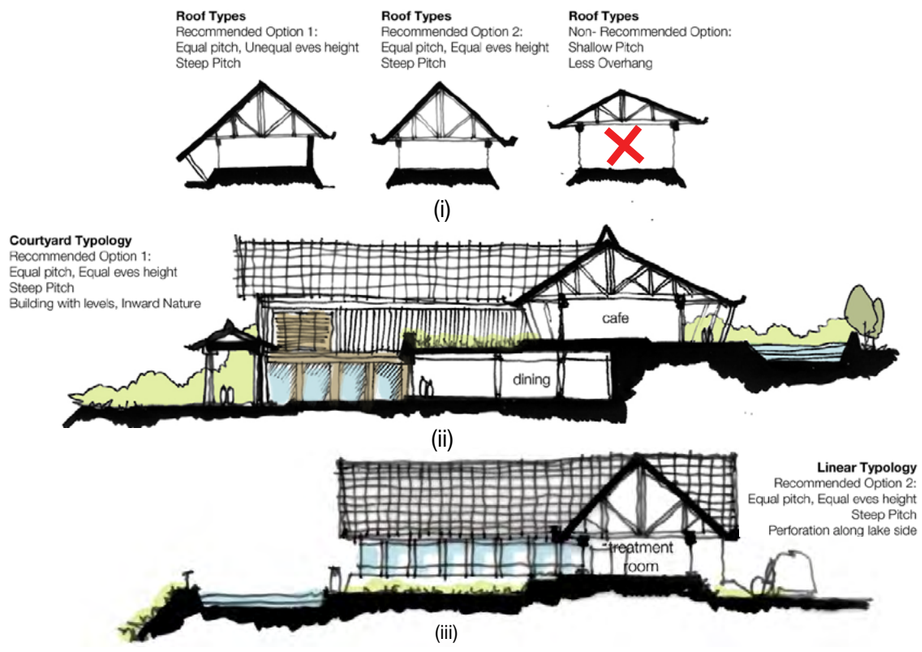


Fig. 9.2.b Height Details

c) Variation in Typology

Amenity Blocks may follow courtyard/linear typology.

1. Linear typology having 'L' or 'C' formation can create strategic congregation space towards the entry zone. The other side can be used for viewing decks (Fig. 9.2.c.(ii-iii))
2. 'Courtyard' typology may create unique scope for creating a series of connected public spaces within the building blocks. It will also facilitate the idea of optimum utilization of existing landform through different designed levels (Fig. 9.2.c.i)
3. It is recommended to strategically place the buildings to allow its visibility from different parts of the land parcel. This will also enhance accessibility to the common blocks.

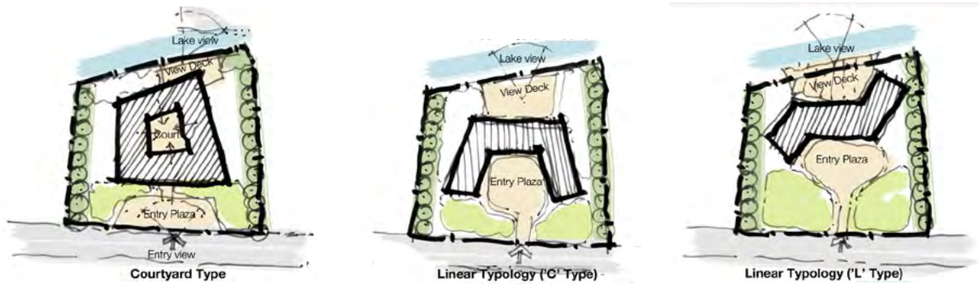


Fig. 9.2.c Variation Typology

d) Style & Elements

Use of locally manufactured/eco-friendly materials with lowest environmental impact will be preferred.

Traditional construction methodologies along with typical elements of 'Himalayan Architecture' will create unique style for concerned typology. Preferred materials will be as follows:

- Natural stone and stone alternatives
- Slate and similar alternatives
- Timber and timber alternatives
- No use of metal cladding (e.g. Aluminium cladding, etc.)

Also, to make construction more cost-effective (apart from luxury villas), alternative use of Garsa Tile cladding along with Galvalume roofing with insulation may help to serve the purpose efficiently.

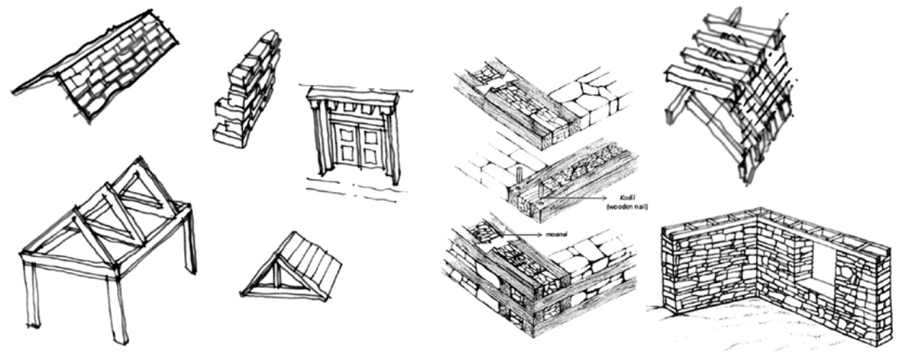


Fig. 9.2.d Style & Elements

e) Massing Strategy

1. Buildings will have more perforation along lake edge to allow maximum views from inside the building. 'Road edge' will have at least 25% fenestrations whereas 'Lake edge' will have minimum 40% - 50% fenestrations (Fig. 9.2.e.(i-ii))
2. Roof will be distributed following same shallow pitch (Fig. 9.2.e.(i-ii))
3. Skylights at strategic location (e.g. above entrance/ dining/reception) will encourage penetration of direct as well as diffused sunlight (Fig. 9.2.e.(i-ii))

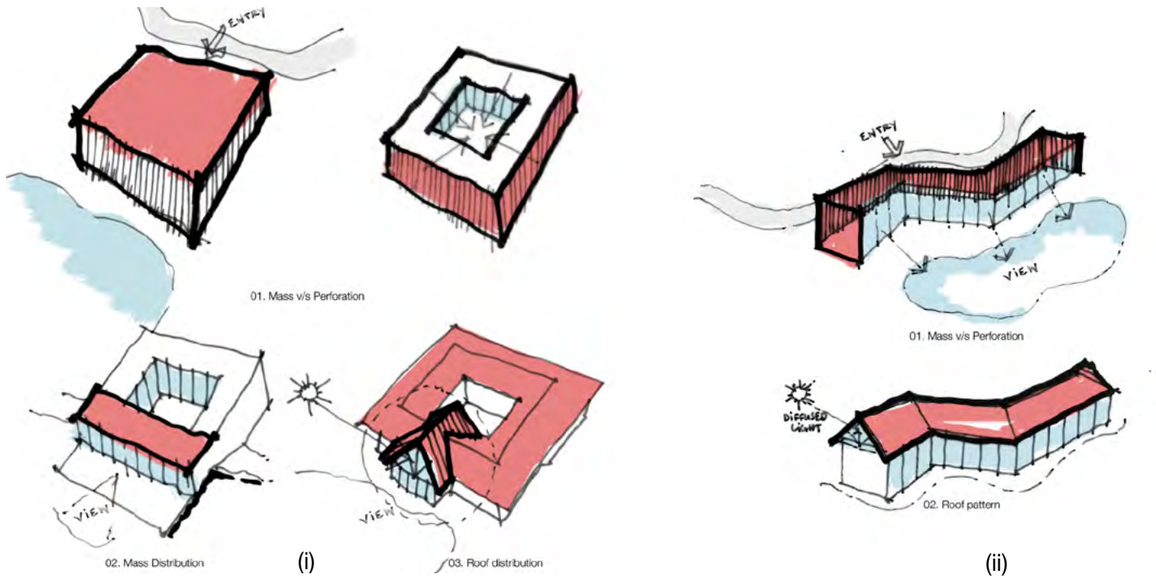


Fig. 9.2.e Massing Strategy

f) Visual Character

1. Architectural language should be based around the theme of traditional Himalayan architectural styles found in the local region like Himachal Pradesh, Jammu & Kashmir.
2. Building blocks will celebrate existing green/lake views through a thoughtful designed combination of mass & void.
3. Amenity blocks should be iconic in nature so that it can help people to orient themselves with respect to different site program.
4. It is anticipated that the courtyard typology will be a better fit for most of the amenity functions.
5. Smaller openings to be of a regular shape and rhythm in keeping with the traditional style referenced.

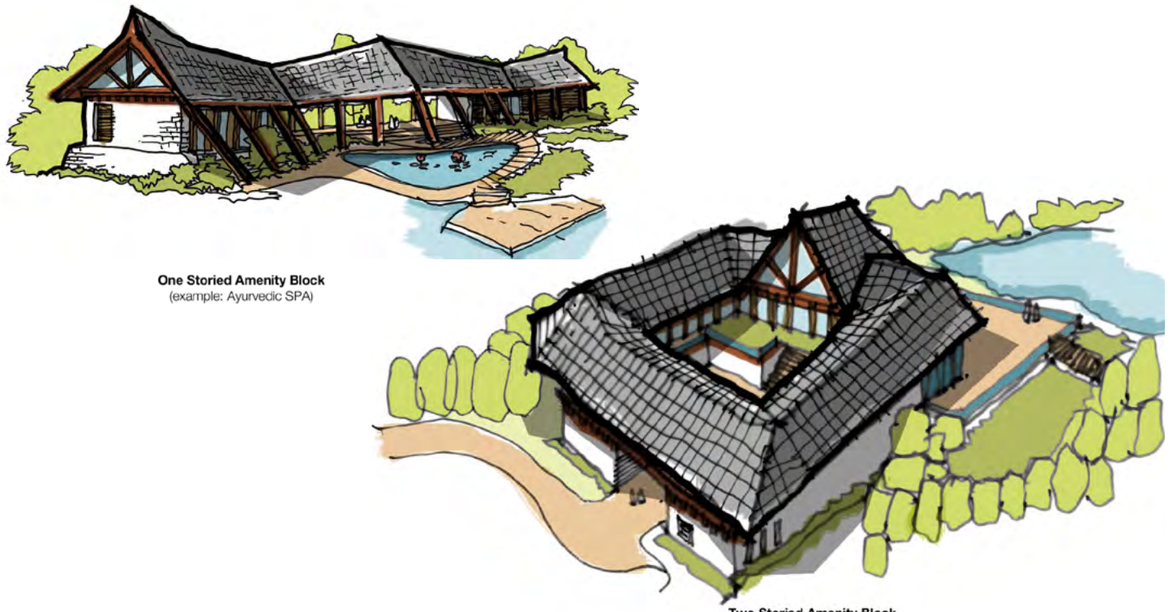


Fig. 9.2.f Visual Style

g) Reference Palette

Reference palette showing precedents of desired outdoor/indoor spaces along with reference of traditional 'Himalayan Architecture' is included below.

Fig. 9.2.g Reference Palette

9.3 Typology 3 (Interpretation cum Convention Centre)

Interpretation centre is proposed on the Palangi. The buildings design is used to create iconic structures within the layout. Architectural guidelines have been developed based on five parameters which are as follows: a) Plot Details, b) Building Height & Interface, c) Massing Strategy, d) Style & Elements, e) Visual Character along with an additional segment on reference palette.

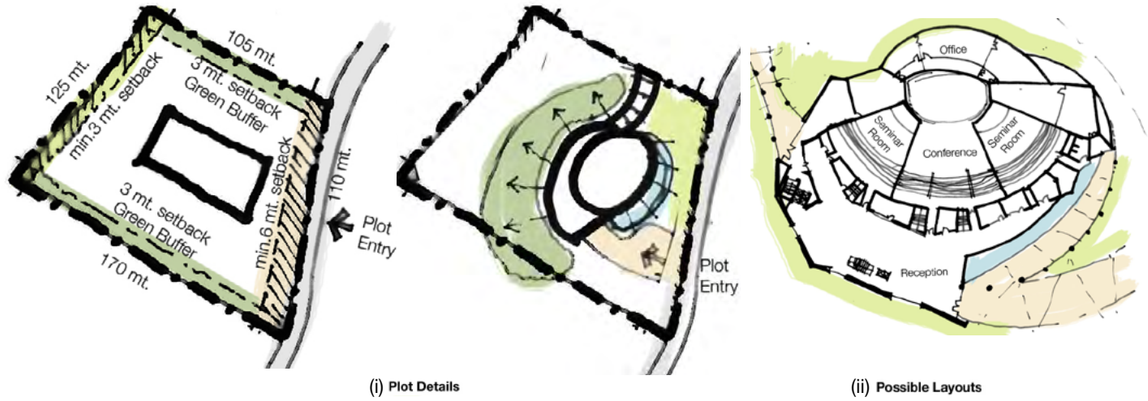
Key Plan

a) Plot Details

Plot dimension: An optimum module of (150m x 110m) has been considered to showcase principles. It may vary based on contextual background of respective land parcels (Fig. 9.3.a.i)

Ground Coverage & FAR: Please refer to Chapter 6 for respective land parcels

Setback: It will have a minimum 6mt setback along main site access road and 3m setback along rear side. It will also have a minimum 3m green buffer along two sides to ensure site privacy without use of any sort of conventional boundary wall (Fig. 9.3.a.i)



(i) Plot Details (ii) Possible Layouts

Fig. 9.3.a Plot Details

b) Building Height & Interface

1. Permissible height as per Eco-tourism Policy 2009 is 30 feet (Please refer to Chapter 6 for details). It will be recommended to have single storied structure for conference block.
2. Controlled perforations along the entry plaza and congregation space is recommended.
3. Accentuating its visibility through designed built mass at strategic locations will help people to orient themselves.

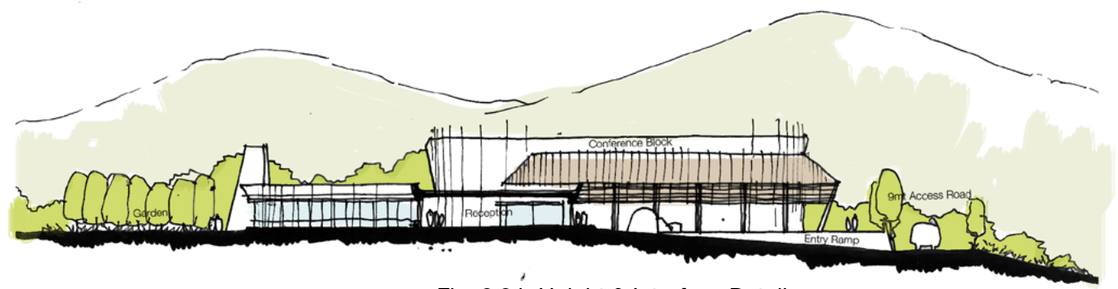
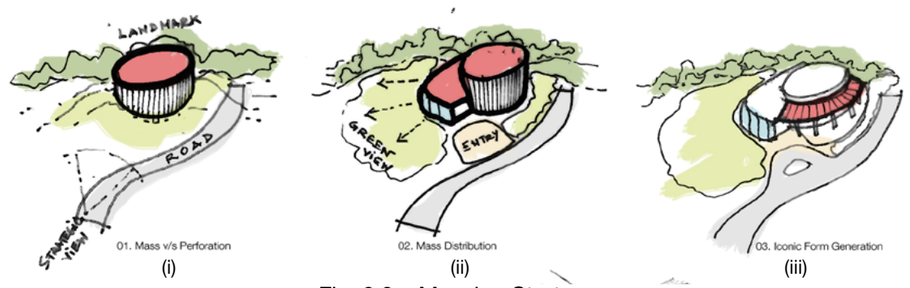


Fig. 9.3.b Height & Interface Details

c) Massing Strategy

1. Massing strategy of the building should be used to create more iconic structures based on the strategic location of the buildings. (Fig. 9.3.c.(i-ii))
2. Buildings are recommended to have more perforations along green landscape lawns (Fig. 9.3.c.(ii-iii))
3. More public facades of the building are recommended to have minimum 40-50% fenestrations while private facades are recommended to have minimum 25% fenestrations (Fig. 9.3.c.iii)



(i) (ii) (iii)

Fig. 9.3.c Massing Strategy

d) Style & Elements

Use of locally manufactured/eco-friendly materials with lowest environmental impact will be preferred. Conventional RCC construction along with strategic use of insulated walls/hollow blocks can make these public buildings sustainable. To encourage the theme of 'Himalayan Architecture', stone/timber/slate/garsa cladding is recommended. Use of metal cladding is not recommended.

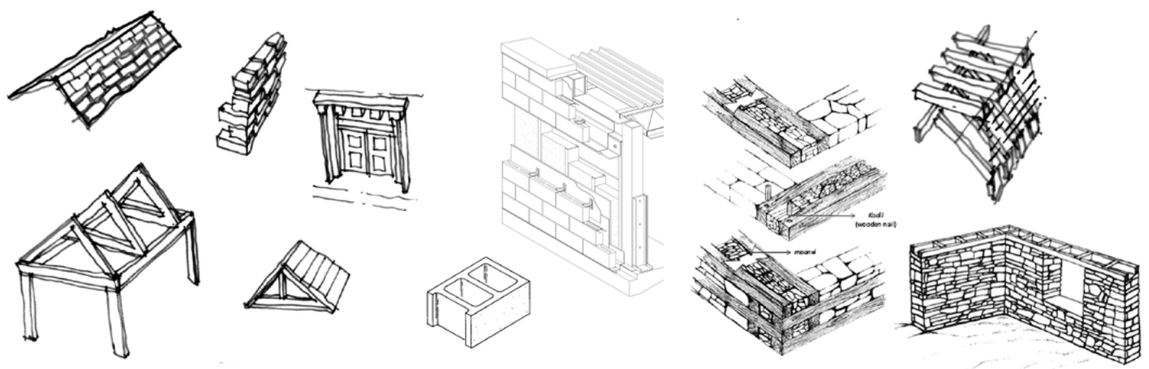


Fig. 9.3.d Style & Elements

e) Visual Character

1. Architectural language should be based around the theme of traditional Himalayan architectural styles found in the local region like Himachal Pradesh, Jammu & Kashmir.
2. Conference blocks should be iconic in nature so that it can help people to orient themselves.

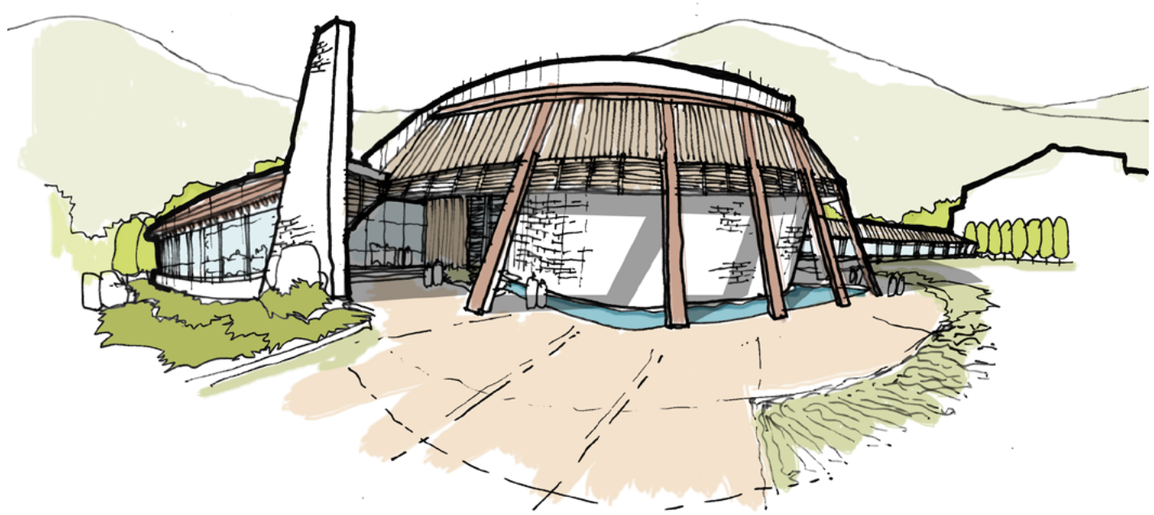


Fig. 9.3.e Visual Style

f) Reference Palette

Reference palette showing precedents of desired outdoor/indoor spaces along with reference of traditional 'Himalayan Architecture' is included below.

Fig. 9.3.f Reference Palette

9.4 Typology 4 (Temporary Structures for Faugli Tikka Kulara Island)

Architectural typology guidelines for resorts/villas have been done based on seven parameters, which are as follows: a) Plot Details, b) Building Height, c) Variation in Clusters, d) Interface Strategy, e) Massing Strategy, f) Style & Elements, g) Visual Character along with an additional segment on reference palette.

For Temporary Structures other details given under 9.1 b) Building Height, c) Variation in Clusters, d) Interface Strategy, e) Massing Strategy, f) Style & Elements, g) Visual Character and h) reference palette will remain same. Only (a) Plot details will vary as these are standard Range of Tents/Structures available.

Key Plan

a) Plot Details
We recommend that villas for Kulara Island can follow 'Type 1' & 'Type 2' module whereas luxury villas are recommended to follow 'Type 3' module.

1. Type 1 Villa (Fig. 9. 4.a.i)
Eco Resorts: Approximate Size of these Villas range from 40 - 50 sqm.
Ground Coverage & FAR: Please refer to Chapter 6 for respective land parcels.
Setback: It will have a minimum 5m setback along access road side and 5m setback along lake side which will require contextual landscape inputs accentuating 'entry' as well as 'view' zone.
Plot Privacy: It will also have a minimum 2m side green buffers to ensure plot privacy without use of any sort of boundary wall.

Fig. 9.4.a (i) Type 1 Villa: Eco Resorts

2. Type 2 Villa (Fig. 9.4.a.ii)
Eco Resorts Luxury: Approximate Size of these Villas range from 45 - 65 sqm.
Ground Coverage & FAR: Please refer to Chapter 6 for respective land parcels.
Setback: It will have a minimum 5m setback along access road side and 5m setback along lake side which will require contextual landscape inputs accentuating 'entry' as well as 'view' zone.
Plot Privacy: It will also have a minimum 2m side green buffers to ensure plot privacy without use of any sort of boundary wall.

Fig. 9.4.a (ii) Type 2 Villa: Eco Resorts Luxury

3. Type 3 Villa (Fig. 9.4.a.iii)
Eco Resorts with Pools: Approximate Size of these Villas range from 45 - 65 sqm.
Ground Coverage & FAR: Please refer to Chapter 6 for respective land parcels.
Setback: It will have a minimum 5m setback along access road side and 5m setback along lake side which will require contextual landscape inputs accentuating 'entry' as well as 'view' zone.
Plot Privacy: It will also have a minimum 2m side green buffers to ensure plot privacy without use of any sort of boundary wall.

Fig. 9.4.a (iii) Type 3 Villa: Eco Resorts with Pools

4. Reception Block & Other Visitor Facilities (Fig. 9. 4.a.iv)
Approximate Size of these temporary structures are in a range of 50-100 sqms. Multiple blocks/Tent Structures will be made as per the 9.2.(c) Massing Strategy & 9.2.(b) Building Height & Interface.
Ground Coverage & FAR: Please refer to Chapter 6 for respective land parcels.
Setback: It will have a minimum 5m setback along access road side and 5m setback along lake side which will require contextual landscape inputs accentuating 'entry' as well as 'view' zone.
Plot Privacy: It will also have a minimum 2m side green buffers to ensure plot privacy without use of any sort of boundary wall.

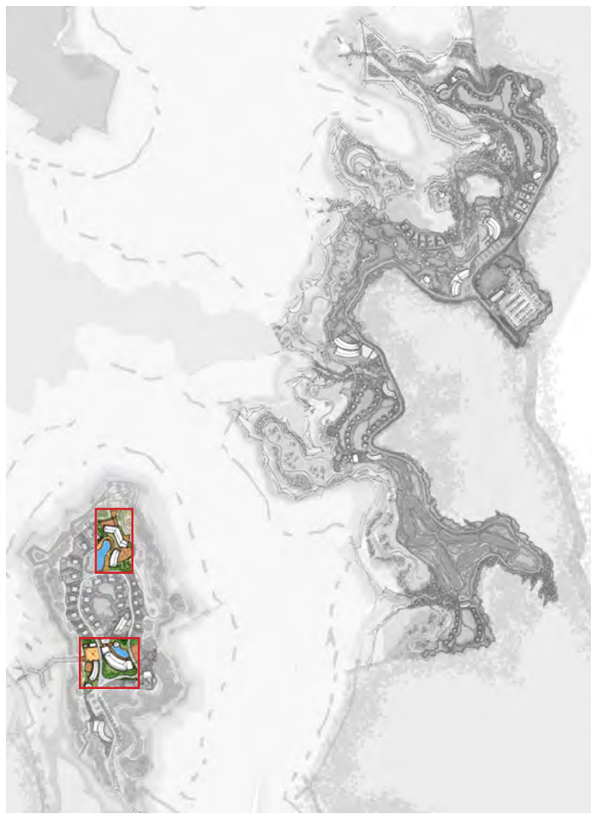
Fig. 9.4.a (iv) Reception Block & Other Visitor Facilities

5. Eco friendly Construction Techniques for Temporary Structures (Fig. 9. 4.a.v & vi)
Methods of Plinth Construction and Wooden Floorplate for making Temporary Structures/ Tents Used for Construction of Temporary Structures are included below.

Fig. 9.4.a (v) Eco friendly Construction Techniques

Fig. 9.4.a (vi) Eco friendly Construction Techniques

Key Plan



Note:

Architectural typology guidelines are based on PUDA Bye-Laws 2013 & Punjab Eco-Tourism Policy 2009. However, there is limited information available regarding the details of Temporary Structures, and hence the PUDA Bye-Laws 2013 & Punjab Eco-Tourism Policy 2009 compliance to be modified appropriately as per hilly and island topography.

A **Monitoring Committee(MC)** under the Chairperson of CCF (Hills) with representatives from Northern Regional Office of MoEF&CC; SEIAA, Punjab; Ranjit Sagar Dam Authority shall monitor the project. The committee shall also include two members of adjoining Joint Forest Management Committee (JFMC's). **All structural designs for the building works shall be finalised only after clearance from the Monitoring Committee for the implementation project.**

Development Control Regulations

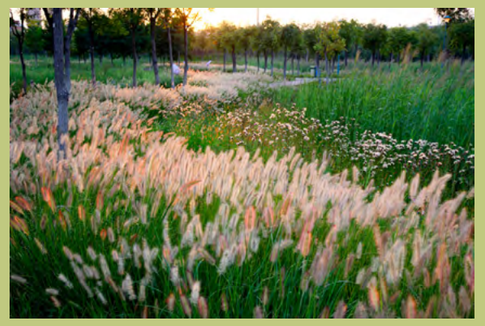
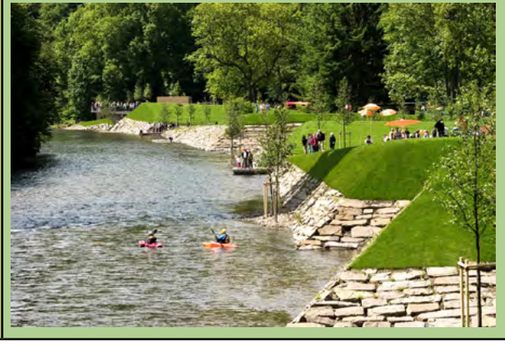
Landscape Design Guidelines

Landscape Design Guidelines & Principles

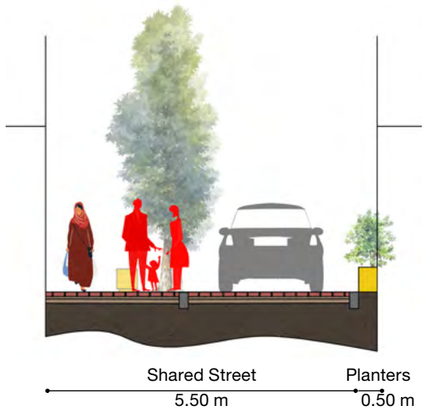
Landscape strategies that respond appropriately to the fluctuating water level should be adopted in the various flood zones. These strategies can be categorised under the following heads:
1. Planting Design
2. Landform Design
3. Hardscape Design
4. Material Palette

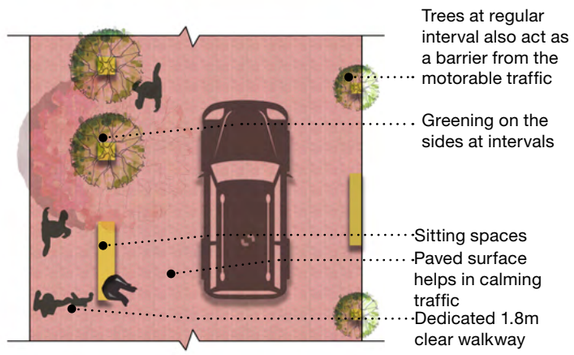
The following matrix establishes guidelines for the three flood zones that have been identified on all islands:

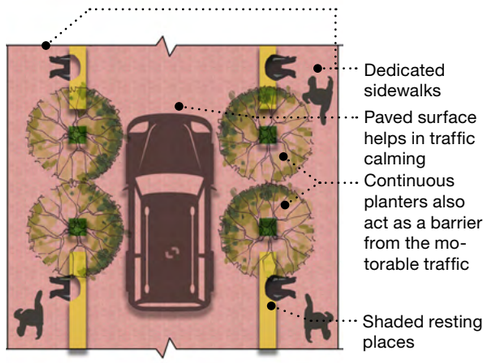
	Landscape Design Categories			
Zone	PLANTING DESIGN	LANDFORM DESIGN	HARDSCAPE DESIGN	MATERIAL PALETTE
I Flood Zone	• Native plants that are capable of withstanding dry & wet periods should be planted extensively to shore up the slopes and stabilise the sandy/rocky soil on the lower flood plain • Initially seeding should be employed to introduce appropriate species that will eventually self-propogate; native communities that currently exist should be allowed to grow • Wetland species should be introduced to create a new typology of shallow-marshland that become self-sustaining ecosystems through the year & also increase floral & faunal diversity for the region	• Dig a series of pits of varying depths in the flood-plain slopes that get filled in during the flood season & allow some to have a perennial source/inlet of water • As a result some cavities will turn into water ponds, some into wetlands, some into seasonal pools & some will stay as dry cavities • Such variation in depth accompanied by seasonal fluctuations will allow for a diverse plant community to establish over time	• Little to no hardscape in the flood zones • Stilted temporary structures where required • Elevated walkway/boardwalk system that restricts human intervention in ecologically sensitive areas • No permanent built structures	• Nonporous, local hard stone where required
II No-build Zone	• Planting strategies to include a mix of water tolerant & upland species • Create a meadow/grassland effect along slightly steeper slopes that can change with seasonal variation • Enhance & augment indigenous species of large & medium trees to reinforce the lower Himalayan forest typology • Introduce several flowering species • Landscape should be maintained & not be allowed to grow wild; however the overall aesthetic should be unmanicured	• Create pitched terraces along certain moderate slopes such that upper areas are stabilised and made usable • Create walkways & promenades at the upper levels of these terraces, planting beds at the middle levels & lower level elevated boardwalks thus allowing visitors to access the wetland edges during different seasons thereby creating diversity of user experience	• Hardscape treatments should be judiciously introduced in a manner that create opportunities for recreation and environmental education whilst preserving natural habitats and maintaining the overall functionality of the island during high flood seasons • Create a semi-intensive landscape system of walkways, pedestrian promenades and cycling tracks that are designed to allow for submersion during seasons of high flood • No permanent built structures	• Local stone as the primary material • Synthetic materials (FRPetc.) that are corrosion resistant, slip resistant & low maintenance for areas where landscape structures are required
III Build Zone	• Intensive & programmed planting design for the proposed gardens, streets & parks • While some ornamental species may be used efforts should be made to restrict the plant palette to native species as far as possible • Use lawn/turf only in areas where strictly necessary; all other areas should utilize native groundcovers that may be pruned/cut periodically	• Adhere to the natural topography as far as possible & create flat areas/terraces only in response to the overall layout & architectural program	• Although hardscape treatment may be more intensive in the build-zone vis a vis the lower zones, care should be taken to minimise excessive paving • Since the risk of being washed away is relatively lower in the upper areas, permeable materials should be extensively used in the hardscape	• Local stone • Timber in key areas • Metal in key areas • Gravel & mooram • Concrete paver blocks

	Landscape Design Categories			
Zone	PLANTING DESIGN	LANDFORM DESIGN	HARDSCAPE DESIGN	MATERIAL PALETTE
I Flood Zone				
II No-build Zone				
III Build Zone				

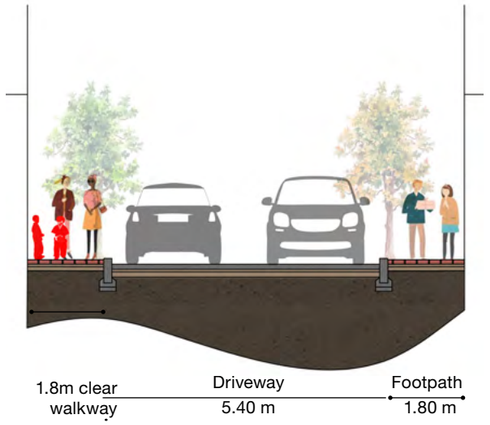
Right Of Ways

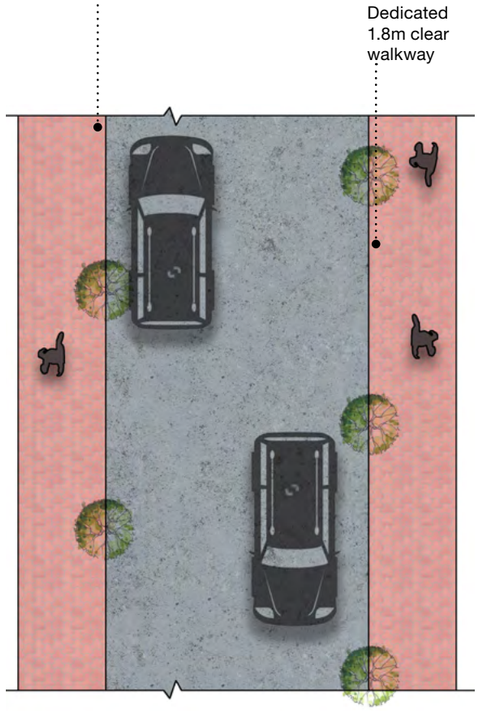




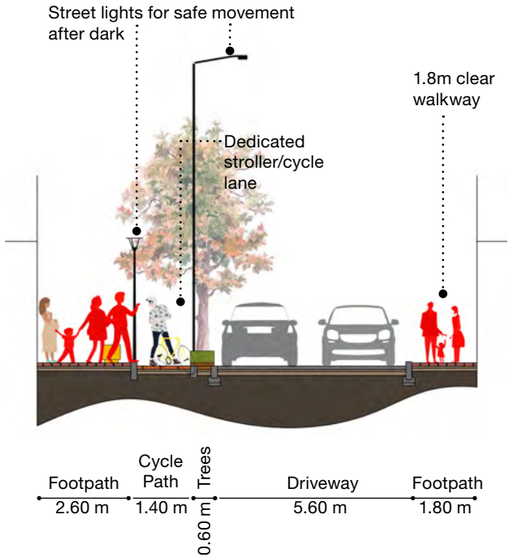


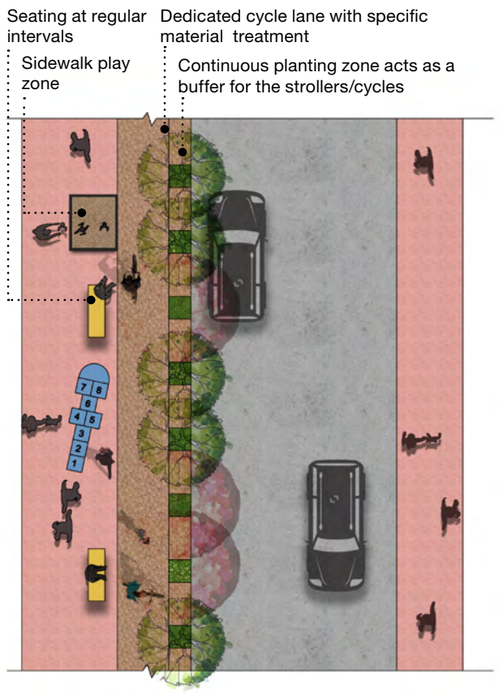
6m Shared Street Section and Plan as shared surface





9m Section and Plan with two-sided footpath & two-way traffic



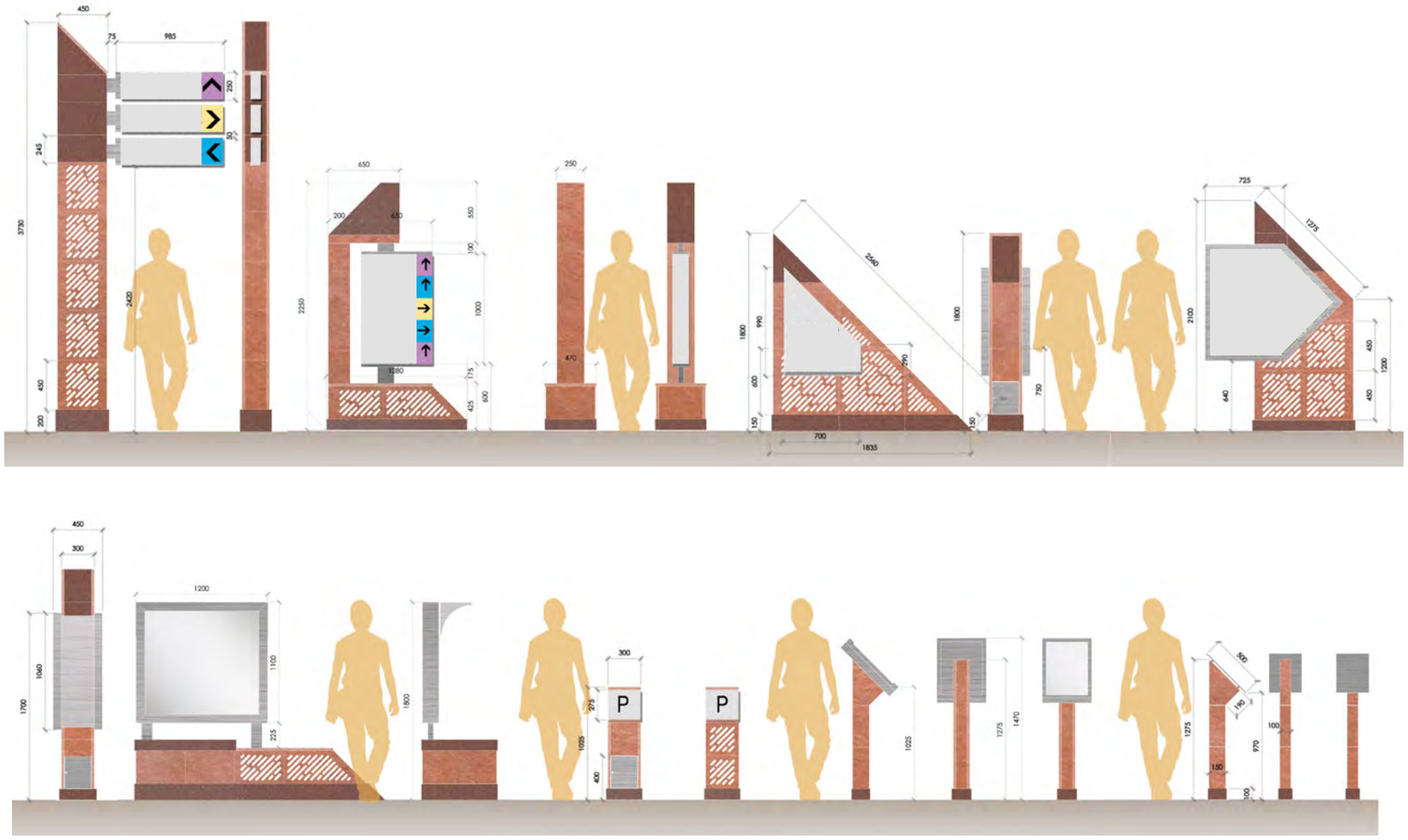


12m Street Section and Plan with two-sided footpath & two-way traffic

Note: Provision of charging points for electric vehicles shall be made at appropriate locations as per the circulation plan.

Key Plan

Way Finding Signage



Way Finding Signage Examples

Recommendations:

1. Signage should be memorable & used as landmarks at key decision points.
2. Signage should be clear- Simple language which is clearly understood.
3. Signage should be tactile- varying finishes that distinguish public & private areas.
4. Signage should be bright- high contrast color combinations to aid quick understanding.
5. Signage should be consistent, specific & designed with recognizable iconography.
6. Signage style should follow overall theme of the project.
7. Signage design should follow basic visibility norms along with human anthropometrical dimensions to increase its efficiency.
8. Signage height should not overpower the recommended architectural intent for the proposed development.
9. Signage locations should be strategic so that it does not create any conflict with designated ‘view corridor’ for proposed development.

Development Control Regulations

Infrastructure Guidelines

Summary of Infrastructure Plan

Water Supply

There are 2 operational Water Works projects by the Water Supply Department on either side of the Lake near Phangota Tikka Attarhawan that take raw water from the Reservoir and supply filtered water to the villages on their respective sides. In the initial phases water will be supplied through these water work projects.

Storm water discharge

All storm water will be consumed, percolated within the site. No storm water will be discharged in the lake (Except Rainy season).

Sewerage

The sewerage generated will be treated and recycled within the site to achieve zero discharge.

Solid waste

3 bin systems will be used for solid waste collection within the project area. Solid waste will be sent to upcoming Pathankot treatment facility once it is constructed and operational. Temporary storage areas will be designated within the site for collection.

Muck

All muck will be reused within the site in landscape development.

Power

As per preliminary interactions with PSPCL, the load can be serviced by the Sarna Grid – the existing sub-stations on the grid will be sufficient to meet the temporary demand as well as the demand during initial years in the project. For future and in steady state conditions, additional power can be sourced by construction of additional 66 kV sub-stations at Dam Colony site.

Features	Demand
Population (Residents + Staff + Visitors + Guests)	**3510**
Total Water Requirement	**1.61 MLD**
Fresh Water Requirement	**0.36 MLD**
Recycle Water Requirement	**1.19 MLD**
Wastewater Generation	**0.36 MLD**
STP Capacity (modules-Extended Aeration Technology)	**0.29 MLD**
Available Run-off/Year	**90710 Cum**
RWH Pits with Recharge Shaft/Well-Roof top	**6 Nos.**
Other Recharge Structures-Surface Run-off	**Percolation Tank**
Solid waste Generation	**1.61 MT/ Day**
Parking Given (As per Eco Tourism Policy)	**1259 Cars**
Power Requirement	**6.17 mVA**
Power Source	**PSPCL**
DG Capacity Required	**1.2 mVA**

Infrastructure Planning

1. Infrastructure Planning

The chapter captures the infrastructure components to be covered for the developments in the various land parcels and islands. Infrastructure planning and conceptual design of the following infrastructure components of the project have been carried out.

- Water suply
  - Water tapping and treatment
  - Water supply
  - Fire Fighting
  - Horticulture
- Sewerage
  - Sewage collection system
  - Sewage treatment
- Storm Water Drainage
- Solid waste management
- Power supply
  - Grid Substations
  - Internal Power Distribution System

The guidelines and norms used for carrying out the demand estimation and planning of various infrastructure components are as follows:

Water Supply

The criteria for the design of water supply scheme for the proposed development are framed as per the guidelines prescribed by Urban and Regional Development Plans Formulation and Implementation Guidelines (URDPFI) and The Central Public Health and Environmental Engineering Organisation Guidelines (CPHEEO) from Ministry of Urban Development, Government of India, the relevant I.S. codes and Consultant's past experience in related field.

Water Supply Norms

Domestic water demand: The CPHEEO and URDPFI Manual provides for a minimum water supply of 135 lpcd for cities, whereas the National Building code recommends water supply at the rate of 150 lpcd. The rate of water supply prescribed by various standards are as listed below.

Sl. No	City/ Country	Rate of Water Supply (Domestic)
1	National Building Code, India	150 – 200 lpcd (for population above 1,00,000)
2	CPHEEO Manual	135 lpcd

For workers, water demand is calculated at 45 lpcd.

Commercial water demand: Water demand for commercial area has been computed based on the population. Total water demand for the employees has been taken as 45 lpcd and for the visitors the demand is considered as 15 lpcd.

Hospitality Water Demand: As per CPHEEO manual, water demand @ 70 litres per seat has been recommended for Restaurants and water demand @ 180 litres per bed for Hotels.

Healthcare Water Demend: As per CPHEEO manual the water demand per bed for hospitals with number of beds exceeding 100 is 450 litres and for hospitals with number of beds not exceeding 100 is 340 litres, including water requirement for laundry.

Institutional water demand: As per CPHEEO manual the water demand for insititutions / schools would be at the rate of 45 litres per head per day.

Unaccounted for Water (UFW): As per CPHEEO manual, a maximum provision of 15% towards losses / Unaccounted for water is allowable in the system. But as the project is developed with a new water supply system the water losses would be far below the provisional figure.

Fire demand: As per the CPHEEO recommendations, provision of water for fire fighting is required to be made in large systems based on the following formula of $100\sqrt{P}$ Kilolitres per day (where, P = population in thousands).

Horticulture:. The water demand for irrigation of green areas is estimated at 20,000 litres/acre/day of the area under soft landscape.

Land requirement for Water Supply System

CPHEEO prescribes the following area requirement for setting up water work components. This area includes the land requirement for Water Treatment Plant (WTP), overhead reservoirs, pumping stations etc.

S. No.	Identified Capacities	Land Requirement (Hectares)
1	5 MLD	0.10
2	10 MLD	0.19
3	50 MLD	0.93
4	100 MLD	1.87
5	200 MLD	3.73
6	500 MLD	9.34

The area requirement for staff quarters may be considered as additional to the above as required.

Design Period for Water Supply System

The design period for various components of water supply system as prescribed by CPHEEO is as below.

S. No.	Components	Design Period
1	Civil structures	30 Years
2	Mechanical and Electrical components	15 Years
3	Water Treatment Units	15 Years
4	Water Mains / Distribution System	30 Years

Sewerage

The norms for design of sewerage system have been taken from the CPHEEO Manual on Sewerage and Sewage Treatment, Compendium of Sewage Treatment Technologies 2009 from National River Conservation Directorate under MOEF etc.

Sewerage Norms

Demand Norms: As per CPHEEO manual, 80% of water supply may be expected to reach the sewers however it recommends designing the system by considering minimum wastewater flow of 100 litres per capita per day.

Peak factor: The ratio of maximum to average hourly flow depends on the water use habit of the population of the project area and the contributing population. The quantity of water used in a day varies during the hours of the day due to habits of people.

Though the sewerage system will receive flow throughout the day, there will be some duration in which maximum sewage will be generated. Peak factors for domestic flow as per guidelines given in the CPHEEO Manual are furnished below:

Contributing Population	Peak Factor
Up to 20,000	3.00
From 20,000 to 50,000	2.50
From 50,000 – 750,000	2.25
Above 750,000	2.0

Since the total population of the project is less than 20,000, a peak factor of 3.00 shall be adopted for infrastructure design.

Ground Water Infiltration: The infiltration of ground water into sewerage system shall be considered during flow estimation. Estimation of the flow in sanitary sewer includes flows due to infiltration of water through the joints of pipes and through manholes. The quantity is contingent on the workmanship in laying of sewers and the depth of ground water table in the area. As sewers are designed for the peak discharges, the provision for ground water infiltration is to be considered for worst condition and conservative design. The CPHEEO recommendation on provision for infiltration is as below.

Norm	Minimum	Maximum
Litres/ha/day	5,000	50,000
Litres/km of sewer/day	500	5,000
Litres/day/manhole	250	500

Design Norms: The parameters for the design of sewerage network are as below:

Parameters	Norm Used
Min. velocity of flow in pipes flowing half full	0.60 m/sec
Max. velocity of flow	3.00 m/sec
Flow conditions in pipe upto 400 mm	0.50 full running
Flow conditions in pipe from 450 - 900 mm	0.67 full running
Minimum size of pipe	150mm
Minimum depth of Sewer • For Branches • For branch, sub-laterals, laterals and trunk sewer • As per site conditions, the pipe may be laid on concrete bedding	1.5m
Formulas for calculation for design of sewer lines	Manning's formula $V=1/n \times 3.968 \times 10^{-3} \times D^{2/3} \times S^{1/2}$ $Q=3.118 \times 10^{-6} \times D^{8/3} \times 1/n \times S^{1/2}$ Where, Q=Discharge in lps V=Velocity in m/s S=Slope of hydraulic gradient D=Internal dia. of the pipe in mm n=Manning's coefficient of roughness
Manning's Co-efficient 'n'	0.011 (for RCC pipes)
Earth cover for pipes	Minimum: 1 m Maximum: 7 m

Land requirement for Sewerage System

The land area requirement for sewerage recycling depends on the technology used. The land requirement as per Compendium of Sewage Treatment Technologies norms for sewerage treatment for some of the major techniques is as below:

S. No.	Recycling Technique	Land Requirement (Per MLD in Hectares)
1	Activated Sludge Process (ASP)	0.15-0.25
2	Waste Stabilisation Pond Systems (WSPS)	0.8-2.3
3	Upflow Anaerobic Sludge Blanket Process (UASB)	0.2-0.3
4	Duckweed Pond System (DPS)	2-6
5	Facultative Aerate Lagoon (FAL)	0.27-0.4
6	Trickling Filter (TF)	0.25-0.65
7	Biological Filtration and Oxygenated reactor (BIOFOR) Technology	0.04
8	High rate Activated Sludge Biofor –F Technology	0.08
9	Fluidized Aerated Bed (FAB)	0.06
10	Submerged Aeration Fixed Film (SAFF) Technology	0.05
11	Cyclic Activated Sludge Process (CASP)	0.1-0.15

Tertiary Treatment

Tertiary Treatment to improve wastewater quality before it is reused or recycled shall be carried out to remove any turbidity, nitrogen, phosphorus, metals and pathogens. Processes involving some type of physiochemical treatment such as coagulation, filtration, activated carbon adsorption of organics, reverse osmosis and additional disinfection be can applied to achieve the same. Tertiary treatment of wastewater is practiced for additional protection of wildlife. It is critical when the wastewater is to be reused for irrigation.

Design period for Sewerage System components

The design period for various components of sewerage system as prescribed by CPHEEO is as below.

S. No.	Components	Design Period
1	Collection system / Sewer Network	30 Years
2	Pumping Stations (Civil Works)	30 Years
3	Pumping Machinery	15 Years
4	Sewerage Treatment Plant	30 Years
5	Effluent Disposal and Utilization	30 Years

Storm Water Drainage

The design of Storm Water Drainage System involves multiple activities such as definition of catchments and run-off areas, determination of maximum rainfall intensity, estimation of run-off, locating the points for collection of storm water, hydraulic design of network, disposal of storm water at appropriate outfall point after checking its adequacy etc.

The design criteria to be followed for determining storm water drainage infrastructure requirement for the project are broadly based on the recommendations as laid down in the CPHEEO Manual of Sewerage and Sewage Treatment, Ministry of Urban Development, Government of India and as per provisions laid down in the relevant I.S. codes and Consultant's past experience in related field.

Graywater (including from laundry, kitchen and washing areas) shall not be released in storm water system. It shall be reused and separate pipes shall be installed for graywater collection from fixtures to divert graywater to a treatment system.

Storm Water Drainage Norms

Maximum Intensity: The rainfall intensity for any particular area can be calculated using empirical formula as below, relating the maximum intensity, return period and duration.

Rainfall intensity (i) =K Tx/(D+a)n

Where,

i = maximum intensity (cm/h)
T = return period in years
D = duration in hours
K = 11.45 (Constant)
x = 0.156 (Constant)
a = 1.25 (Constant)
n = 1.0324 (Constant)

Estimation of Storm Water Runoff: Storm water run-off reaching the drains can be determined by using the rational formula as below.

Flow (Q) = C I A / 360

Where,

Q = Flow in cum/ sec/ Ha
C = Coefficient of run off (is to be taken as 0.2- 0.9 depending on surface)
I = Intensity of rainfall per hour in mm i.e. 71 mm/hr
A = Area in hectare

Hydraulic Design: Manning's formula shall be used for designing slope and size of the drainage line to carry the design flow at stated velocity.

$V = 1/n \times R^{2/3} \times S^{1/2}$

$Q = 1/n \times A \times R^{2/3} \times S^{1/2}$

Where,

Q = Discharge in lps
S = Slope of hydraulic gradient
R = Hydraulic radius in m
V = Velocity in m/s
n = Manning's coefficient of roughness
A = Cross sectional area of flow

Solid Waste Management

Major physical components of the Municipal Solid Waste Management could be as follows:

- Generation
- Composition
- Storage at the source of generation

- Segregation of recyclable materials
- Primary collection
- Street cleaning
- Temporary storage
- Transportation, and
- Treatment & Disposal

The norms and guidelines for determining solid waste generation for the project have been taken from CPHEEO Manual on Solid Waste Management and based on Consultant's past experience in related field.

Waste Generation Norm

The solid waste generation for the project can be estimated using guidelines as below.

S. No.	Waste Source	Estimated Waste Generation
1	Residential refuse	0.3 to 0.6 kg/cap/day
2	Commercial refuse	0.1 to 0.2 kg/cap/day
3	Street sweepings	0.05 to 0.2 kg/cap/day
4	Institutional refuse	0.05 to 0.2 kg/cap/day

Power Supply

The Guidelines for estimation of power demand and requirement of electricity systems in the project have been taken from the recommendations of Punjab State Electricity Regulatory Commission, URDPFI Guidelines and Consultant's past experience in related field.

Power Supply Norms

Connected Load: The guidelines for connected load for various land uses are as below:

S. No.	Name of Category	Load (kW)
A	**Residential (Plots)**	
1	Up to 100 (Sq. Yards)	5
2	From 101- 200 (Sq. Yards)	8
3	From 201-250 (Sq. Yards)	10
4	From 251 -350 (Sq. Yards)	12
5	From 351- 500 (Sq. Yards)	20
6	Above 500(Sq. Yards)	30
B	**Residential (Flats)**	
1	One bedroom set	5
2	Dwelling unit (single room flat) under basic service to urban poor under JnNURM/EWS flats	1.5
3	Two Bedroom Set	7
4	Three Bedroom Set	10
5	Four Bedroom Set	12
6	Five Bedroom Set	15
C	**Commercial Area**	
1	Shop	10
2	Other Commercial plot(s) for dispensary, school, hospital etc. including other common services falling under commercial category	35 Watts per sq. yard
D	**Other load for common services**	As per requirement

One third of the total residential load and 40% of all commercial load as calculated above will be taken as colony load, which will be further increased by 40% to take into account future growth of load. The load shall be converted in to kVA by using a power factor of 0.90.

Street / Park Lighting: The power requirement for street lighting is to be worked out using the guidelines as below:

S. No	Road Width	Power Requirement
1	7 meter wide road	150W at span length of 30 meter
2	12.5m & 15 meter wide road	250W at span length of 30 meter
3	19m & 27m wide road	400W at span length of 35 meter
4	Park illumination	Lump Sum

Substation requirement: The requirement of substation for various power demand ranges are as below:

S.No.	Sub-station Requirement	Power Demand
1	11 KV	up to 2.0 MVA
2	33 KV	above 2.0 MVA but up to 10 MVA
3	132 KV	above 10 MVA

Norm Regarding	Description of Norm	Assumptions	Demand
Water Supply			
Water Demand	**Domestic water demand:** The CPHEEO and URDPFI Manual provides for a minimum water supply of 135 lpcd for cities, whereas the National Building code recommends water supply at the rate of 150 lpcd. The rate of water supply prescribed by various standards are as listed below. **Commercial water demand**: Water demand for commercial area has been computed based on the population. Total water demand for the employees has been taken as 45 lpcd and for the visitors the demand is considered as 15 lpcd. **Hospitality Water Demand**: As per CPHEEO manual, water demand @ 70 litres per seat has been recommended for Restaurants and water demand @ 180 litres per bed for Hotels. **Healthcare Water Demend:** As per CPHEEO manual the water demand per bed for hospitals with number of beds exceeding 100 is 450 litres and for hospitals with number of beds not exceeding 100 is 340 litres, includng water requirement for laundry. **Institutional water demand:** As per CPHEEO manual the water demand for insititutions / schools would be at the rate of 45 litres per head per day. **Unaccounted for Water (UFW):** As per CPHEEO manual, a maximum provision of 15% towards losses / Unaccounted for water is allowable in the system. But as the project is developed with a new water supply system the water losses would be far below the provisional figure. **Fire demand:** As per the CPHEEO recommendations, provision of water for fire fighting is required to be made in large systems based on the following formula of 100√ P Kilolitres per day (where, P = population in thousands). **Horticulture:**. The water demand for irrigation of green areas is estimated at 20,000 litres/acre/day of the area under soft landscape.	**Hospitality** • Persons per hotel room: 2 Pax • Persons per Villa: 3-4 Corporate convention center Capacity: 400 pax • Area per pax in restaurant: 1.6 sqm • Service area to total area ratio in restaurant: 25-50% **Residential** • Standard residential unit size: 300sqm Household size: 4 **Education** • Area per seat in school: 15 Sqm	Domestic, Commercial & PSP water Demand = ~0.36 MLD Horticulture = ~0.79 MLD Fire Demand: ~0.39 MLD

<table>
<tr>
<td>Land requirement for Water Supply System</td>
<td>CPHEEO prescribes the following area requirement for setting up water work components. This area includes the land requirement for Water Treatment Plant (WTP), overhead reservoirs, pumping stations etc.

<table>
<tr><th>S. No.</th><th>Identified Capacities</th><th>Land Requirement (Hectares)</th></tr>
<tr><td>1</td><td>5 MLD</td><td>0.10</td></tr>
<tr><td>2</td><td>10 MLD</td><td>0.19</td></tr>
<tr><td>3</td><td>50 MLD</td><td>0.93</td></tr>
<tr><td>4</td><td>100 MLD</td><td>1.87</td></tr>
<tr><td>5</td><td>200 MLD</td><td>3.73</td></tr>
<tr><td>6</td><td>500 MLD</td><td>9.34</td></tr>
</table>
The area requirement for staff quarters may be considered as additional to the above as required.</td>
<td></td>
<td>Land Requirement = 0.1 Ha or 0.25 acres</td>
</tr>
<tr>
<td>Design Period for Water Supply System</td>
<td>The design period for various components of water supply system as prescribed by CPHEEO is as below.
<table>
<tr><th>S. No.</th><th>Components</th><th>Design Period</th></tr>
<tr><td>1</td><td>Civil structures</td><td>30 Years</td></tr>
<tr><td>2</td><td>Mechanical and Electrical components</td><td>15 Years</td></tr>
<tr><td>3</td><td>Water Treatment Units</td><td>15 Years</td></tr>
<tr><td>4</td><td>Water Mains / Distribution System</td><td>30 Years</td></tr>
</table></td>
<td></td>
<td></td>
</tr>
<tr><td colspan="4">Sewerage</td></tr>
<tr>
<td>Sewerage Demand</td>
<td>Demand Norms: As per CPHEEO manual, 80% of water supply (excluding horticulture and unaccounted for water uses) may be expected to reach the sewers however it recommends designing the system by considering minimum wastewater flow of 100 litres per capita per day.
Peak factor: The ratio of maximum to average hourly flow depends on the water use habit</td>
<td></td>
<td>Sewerage Generation = ~0.29 MLD</td>
</tr>
</table>

of the population of the project area and the contributing population. The quantity of water used in a day varies during the hours of the day due to habits of people.

Though the sewerage system will receive flow throughout the day, there will be some duration in which maximum sewage will be generated. Peak factors for domestic flow as per guidelines given in the CPHEEO Manual are furnished below:

Contributing Population	Peak Factor
Up to 20,000	3.00
From 20,000 to 50,000	2.50
From 50,000 – 750,000	2.25
Above 750,000	2.0

Since the total population of the project is $<20{,}000$ a peak factor of 3 shall be adopted.

Ground Water Infiltration: The infiltration of ground water into sewerage system shall be considered during flow estimation. Estimation of the flow in sanitary sewer includes flows due to infiltration of water through the joints of pipes and through manholes. The quantity is contingent on the workmanship in laying of sewers and the depth of ground water table in the area. As sewers are designed for the peak discharges, the provision for ground water infiltration is to be considered for worst condition and conservative design. The CPHEEO recommendation on provision for infiltration is as below.

Norm	Minimum	Maximum
Litres/ha/day	5,000	50,000
Litres/km of sewer/day	500	5,000
Litres/day/manhole	250	500

Sewerage System Design

Design Norms: The parameters for the design of sewerage network are as below:

Parameters	Norm Used
Min. velocity of flow in pipes flowing half full	0.60 m/sec
Max. velocity of flow	3.00 m/sec
Flow conditions in pipe upto 400	0.50 full running

<table>
<tr>
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<td>
<table>
<tr><td>mm</td><td></td></tr>
<tr><td>Flow conditions in pipe from 450 - 900 mm</td><td>0.67 full running</td></tr>
<tr><td>Minimum size of pipe</td><td>150mm</td></tr>
<tr><td>Minimum depth of Sewer
• For Branches
• For branch, sub-laterals, laterals and trunk sewer
• As per site conditions, the pipe may be laid on concrete bedding</td><td>1.5m</td></tr>
<tr><td>Formulas for calculation for design of sewer lines</td><td>Manning’s formula
$V=1/n \times 3.968 \times 10^{-3} \times D^{2/3} \times S^{1/2}$
$Q=3.118 \times 10^{-6} \times D^{8/3} \times 1/n \times S^{1/2}$
Where,
Q=Discharge in lps
V=Velocity in m/s
S=Slope of hydraulic gradient
D=Internal dia. of the pipe in mm
n=Manning’s coefficient of roughness</td></tr>
<tr><td>Manning’s Co-efficient ‘n’</td><td>0.011 (for RCC pipes)</td></tr>
<tr><td>Earth cover for pipes</td><td>Minimum: 1 m
Maximum: 7 m</td></tr>
</table>
</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land requirement for Sewerage System</td>
<td colspan="3">The land area requirement for sewerage recycling depends on the technology used. The land requirement as per Compendium of Sewage Treatment Technologies norms for sewerage treatment for some of the major techniques is as below:
<table>
<tr><th>S. No.</th><th>Recycling Technique</th><th>Land Requirement (Per MLD in Hectares)</th></tr>
<tr><td>1</td><td>Activated Sludge Process (ASP)</td><td>0.15-0.25</td></tr>
<tr><td>2</td><td>Waste Stabilisation Pond Systems</td><td>0.8-2.3</td></tr>
</table>
</td>
<td></td>
<td>~1 acre of area required for provision of STP</td>
</tr>
</table>

		(WSPS)			
		3	Upflow Anaerobic Sludge Blanket Process (UASB)	0.2-0.3			
		4	Duckweed Pond System (DPS)	2-6			
		5	Facultative Aerate Lagoon (FAL)	0.27-0.4			
		6	Trickling Filter (TF)	0.25-0.65			
		7	Biological Filtration and Oxygenated reactor (BIOFOR) Technology	0.04			
		8	High rate Activated Sludge Biofor –F Technology	0.08			
		9	Fluidized Aerated Bed (FAB)	0.06			
		10	Submerged Aeration Fixed Film (SAFF) Technology	0.05			
		11	Cyclic Activated Sludge Process (CASP)	0.1-0.15			
Design period for Sewerage System components	The design period for various components of sewerage system as prescribed by CPHEEO is as below.						
		S. No.	**Components**	**Design Period**			
		1	Collection system / Sewer Network	30 Years			
		2	Pumping Stations (Civil Works)	30 Years			
		3	Pumping Machinery	15 Years			
		4	Sewerage Treatment Plant	30 Years			
		5	Effluent Disposal and Utilization	30 Years			
Storm Water Drainage							
Storm Water Drainage demand	**Maximum Intensity:** The rainfall intensity for any particular area can be calculated using empirical formula as below, relating the maximum intensity, return period and duration. Rainfall intensity (i) =K Tx/(D+a)n Where, i = maximum intensity (cm/h)						

<table>
<tr>
<td></td>
<td>T = return period in years
D = duration in hours
K = 11.45 (Constant)
x = 0.156 (Constant)
a = 1.25 (Constant)
n = 1.0324 (Constant)

Estimation of Storm Water Runoff: Storm water run-off reaching the drains can be determined by using the rational formula as below.
Flow (Q) = C I A / 360
Where,
Q = Flow in cum/ sec/ Ha
C = Coefficient of run off (is to be taken as 0.2- 0.9 depending on surface)
I = Intensity of rainfall per hour in mm i.e. 71 mm/hr
A = Area in hectare
Hydraulic Design: Manning’s formula shall be used for designing slope and size of the drainage line to carry the design flow at stated velocity.

$V = 1/n \times R^{2/3} \times S^{1/2}$

$Q = 1/n \times A \times R^{2/3} \times S^{1/2}$
Where,
Q = Discharge in lps
S = Slope of hydraulic gradient
R = Hydraulic radius in m
V = Velocity in m/s
n = Manning’s coefficient of roughness
A = Cross sectional area of flow</td>
<td>Surface inflow of rain-water shall be diverted through a network of garland drains located sufficiently. The drains can be made by cutting and digging along the contour line 531 m with appropriate design, size and structural strength.

Structural designs for the storm water drain should ensure to cater to water run-off capacities of the drains.

All structural drawings would need to be cleared by the monitoring committee for the implementation of the project.

No untreated storm water shall be drained into the lake.</td>
<td></td>
</tr>
<tr>
<td colspan="4">Solid Waste Management</td>
</tr>
<tr>
<td>Solid Waste Demand</td>
<td>Waste Generation Norm: The solid waste generation for the project can be estimated using guidelines from CPHEEO Manual on Solid Waste Management as below.
<table>
<tr><th>S. No.</th><th>Waste Source</th><th>Estimated Waste Generation</th></tr>
<tr><td>1</td><td>Residential refuse</td><td>0.3 to 0.6 kg/cap/day</td></tr>
</table>
</td>
<td></td>
<td>Solid Waste generation =~1.61 MT per Day</td>
</tr>
</table>

	2	Commercial refuse	0.1 to 0.2 kg/cap/day		
	3	Street sweepings	0.05 to 0.2 kg/cap/day		
	4	Institutional refuse	0.05 to 0.2 kg/cap/day		
Power Supply					
Power Demand	The Guidelines for electricity system in the project has been taken from the recommendations of Punjab State Electricity Regulatory Commission, URDPFI etc. **Connected Load:** The guidelines for connected load for various land uses are as below:			Average plot size for residential = 300 syd Internal road area share for residential = 15%	Power Demand = 7.35 MVA Power Demand for functioning of Utilities: 1.47 MVA Connected Load: 6.17 MVA

S. No.	Name of Category	Load (kW)
A	**Residential (Plots)**	
1	Up to 100 (Sq. Yards)	5
2	From 101- 200 (Sq. Yards)	8
3	From 201-250 (Sq. Yards)	10
4	From 251 -350 (Sq. Yards)	12
5	From 351- 500 (Sq. Yards)	20
6	Above 500(Sq. Yards)	30
B	**Residential (Flats)**	
1	One bedroom set	5
2	Dwelling unit (single room flat) under basic service to urban poor under JnNURM/EWS flats	1.5
3	Two Bedroom Set	7
4	Three Bedroom Set	10
5	Four Bedroom Set	12
6	Five Bedroom Set	15
C	**Commercial Area**	
1	Shop	10
2	Other Commercial plot(s) for dispensary, school, hospital etc. including other common services falling under commercial category	35 Watts per sq. yard
D	**Other load for common services**	As per requirement

One third of the total residential load and 40% of all commercial load as calculated above will be taken as colony load, which will be further increased by 40% to take into account

future growth of load. The load shall be converted in to kVA by using a power factor of 0.90.

Street / Park Lighting: The power requirement for street lighting is to be worked out using the guidelines as below:

S. No	Road Width	Power Requirement
1	7 meter wide road	150W at span length of 30 meter
2	12.5m & 15 meter wide road	250W at span length of 30 meter
3	19m & 27m wide road	400W at span length of 35 meter
4	Park illumination	Lump Sum

Substation requirement

11 KV	up to 2.0 MVA
33 KV	above 2.0 MVA but up to 10 MVA
132 KV	above 10 MVA.

Parking

As per the Eco Tourism Policy 5% of total site area shall be used for parking and roads. This is an eco-sensitive layout and a conservative approach to parking has been suggested in the EIA approval. Therefore a park and ride concept has been applied here. The park and ride concept entails that a larger consolidated parking lot is created at the masterplan level and from there visitors can either walk to their destination or use an EV vehicle service or a local pick and drop service. This concept allows for restrained use of private cars, a richer experience and lesser pollution.

As per the above understanding, following parking areas have been planned:

Niloh Tikka Palangi - Parking Site 1
This is proposed to be an exclusive consolidated parking area for Niloh Tikka Palang and Faguli Tikka Kulara Island. This site shall not be computed towards permissible built up area calculations. The size and capacity of this area is:
Exclusive Parking Site = 6.86 Acres = 27,761 Sqm = 1110 Cars

Over and above the exclusive parking site, 2% area is being considered for roads in Niloh Tikka Palangi. See page 8 for calculations.

Faugli Tikka Kulara Island - Parking Site 2
This parking area site is as per the prescribed 5% of total site area of Kulara Island. The size and capacity of this area is:
5% of 18.54 Acres = 0.92 Acres = 3723 sqm = 149 Cars

Total car parks thus provided is 1110+149 Cars = 1259 Cars. Please note that 1ECS is considered at 25 Sqm. Support facilities like driver waiting area, overnight stay dorms, toilets etc. shall be designed at both the parcels, preferably located adjacent to the parking sites.

Note: During the REC meeting held on 21-22 January 2020, it was appraised to the committee that the parking area for the entire facility has been provided in the master plan as per the Eco-Tourism Policy i.e. 5% of the total site area. It was also informed that as the facility shall attract more visitors, it was critical to provide additional parking facility.
In order to provide this, an exclusive parking area has been earmarked and requested to Forest Diversion which shall not have any construction and shall facilitate as parking for the entire facility at Site 1 & Site 2. The EIA approval considers such additional facility located in close proximity to the functions.This proactive measure shall further secure the native surrounding and restrict encroachment from illegal parking. Hence, the parking site area shall not be considered for BUA calculation. It’s exclusively for parking and the site is not accounted towards FAR consumption. Support infrastructure facility for drivers has been provisioned as per the directions of REC meeting on 21-22 January 2020.

Infrastructure Demand Tables

Summary

POPULATION				
	Land Parcels	Tourist / Resident Population	Staff Population	Total
SITE 1	NALOH TIKKA PALANGI	2260.00	205.00	**2465.00**
SITE 2	FAUGLI TIKKA KULARA ISLAND	900.00	145.00	**1045.00**
	TOTAL POPULATION	**3160.00**	**350.00**	**3510.00**

INFRASTRUCTURE DEMAND					
	Land Parcels	Water Demand (MLD/Day)	Sewerage Generation (MLD/Day)	Solid Waste Generation (MT/day)	Power Requirement (MVA)
SITE 1	NALOH TIKKA PALANGI	1.19	0.20	1.06	5.35
SITE 2	FAUGLI TIKKA KULARA ISLAND	0.41	0.09	0.56	2.00
	TOTAL DEMAND	**1.61**	**0.29**	**1.61**	**7.35**

Water Demand

SITE 1 - NALOH TIKKA PALANGI					
	Water Requirements	Norms		(litre/Day)	MLD
A	Total Potable Water Requirement			**251025**	**0.25**
B	Total Unaacounted for water	15%	of total demand	**37654**	**0.04**
C	Horticulture requirement	20000	l/acres/day	**646080**	**0.65**
D	Fire demand	100√ P Kiloliters per day	where, P = pop in thousands	**257889**	**0.26**
	Total Water Demand (A+B+C+D)				**1.19**
F	Total Potable Water demand (A+B)				**0.29**
G	Total Non-Potable Water demand (C+D)				**0.90**
J	Total Recycled Water demand (=G)				**0.90**
Site 2 - FAUGLI TIKKA KULARA ISLAND					
	Water Requirements	Norms		(litre/Day)	MLD
A	Total Potable Water Requirement			**113525**	**0.11**
B	Total Unaacounted for water	15%	of total demand	**17029**	**0.02**
C	Horticulture requirement	20000	l/acres/day	**148320**	**0.15**
D	Fire demand	100√ P Kiloliters per day	where, P = pop in thousands	**133956**	**0.13**
	Total Water Demand (A+B+C+D)				**0.41**
F	Total Potable Water demand (A+B)				**0.13**
G	Total Non-Potable Water demand (C+D)				**0.28**
J	Total Recycled Water demand (=G)				**0.28**
TOTAL					
	Water Requirements	Norms		(litre/Day)	MLD
A	Total Potable Water Requirement			**364550**	**0.36**
B	Total Unaacounted for water	15%	of total demand	**54683**	**0.05**
C	Horticulture requirement	20000	l/acres/day	**794400**	**0.79**
D	Fire demand	100√ P Kiloliters per day	where, P = pop in thousands	**391845**	**0.39**
	Total Water Demand (A+B+C+D)				**1.61**
F	Total Potable Water demand (A+B)				**0.42**
G	Total Non-Potable Water demand (C+D)				**1.19**
J	Total Recycled Water demand (=G)				**1.19**

Sewerage

Site No.	Sewerage Generation	Norm	Water Supply (MLD)	Sewerage (MLD)	STPs
SITE 1	NALOH TIKKA PALANGI	80% of potable water supply may be expected to reach the sewers	0.25	0.20	
SITE 2	FAUGLI TIKKA KULARA ISLAND		0.11	0.09	
	TOTAL		**0.36**	**0.29**	**Decentralised to 2-3 Locations; Approximately 1 Acre Area required for provision of STPs**

Solid Waste

SITE 1 - NALOH TIKKA PALANGI				
Solid Waste	Norms		Total	
Solid Waste Generated by Population			747	kg/day
Street Sweeping	0.125	kg/cap/day	308	kg/cap/day
Population	2465	Persons		
Total Solid Waste Generated			1055.1	kg/day
			1.06	MT/day
Site 2 - FAUGLI TIKKA KULARA ISLAND				
Solid Waste	Norms		Total	
Solid Waste Generated by Population			427	kg/day
Street Sweeping	0.125	kg/cap/day	131	kg/cap/day
Population	1045	Persons		
Total Solid Waste Generated			557.4	kg/day
			0.56	MT/day
TOTAL				
Solid Waste	Norms		Total	
Solid Waste Generated by Population			1174	kg/day
Street Sweeping	0.125	kg/cap/day	439	kg/cap/day
Population	3510	Persons		
Total Solid Waste Generated			1612.5	kg/day
			1.61	MT/day

Electricity

SITE 1 - NALOH TIKKA PALANGI				
Power Demand	5.35	MVA	Norms	
Power Demand for open areas, street lighting and utilities running	1.07	MVA	20%	of Power Demand
Total Power Demand	6.42	MVA		
Connected Load (Demand x Diversity)	4.49	MVA		
Site 2 - FAUGLI TIKKA KULARA ISLAND				
Power Demand	2.00	MVA	Norms	
Power Demand for open areas, street lighting and utilities running	0.40	MVA	20%	of Power Demand
Total Power Demand	2.40	MVA		
Connected Load (Demand x Diversity)	1.68	MVA		
TOTAL				
Power Demand	7.35	MVA	Norms	
Power Demand for open areas, street lighting and utilities running	1.47	MVA	20%	of Power Demand
Total Power Demand	8.82	MVA		
Connected Load (Demand x Diversity)	6.17	MVA		

Muck Management & Drainage

Site No	Site area (Acres)	Ground coverage area (Sqm)	Area of excavation (Sqm)	Height of excavation (m)	Total Excavation volume	Volume compensated in cut & fill	Balance volume of Muck to be disposed	Area of Muck disposal site Provided (Sqm)	Depth of Muck Disposal Site (m)	Size of Plot	
SITE 1 - NALOH TIKKA PALANGI	56.22	45503	48915	1.5	73373	58699	14675	14675	1	147	100
SITE 2 - FAUGLI TIKKA KULARA ISLAND	18.54	15006	16131	1.5	24197	19357	4839	3226	1.5	65	50
TOTAL	**74.76**	**60509**	**65047**		**97570**	**78056**	**19514**	**17901**			

S. No.	Catchment	Area of Catchment (sq m)	Run-off Coff.	Average Annual Rainfall (m)	Run-off collected (cu m)
1	Roof-Top	60509	0.9	1.7	92578
2	Paved area	15709.8717	0.7	1.7	18695
3	Green Area	219938.2038	0.1	1.7	37389
Total Available Run-off					148662

S. No.	Catchment	Area of Catchment (sq m)	Run-off Coff.	Peak Hourly Rainfall (m/hr)	Run-off collected (cu m)	
1	Roof-Top	60508.5012	0.9	0.06	3267	
Taking Retention of 15 min, run-off load is					817	
Size of RWH Pit (diameter- 10 m , depth 4 m)					314	
No. of Pits Required					3	~ 6

Assumptions:

Pathankot Average Rainfall	*1426 mm or 1.426 m*
Dhar Kalan Average Rainfall	*1770 mm or 1.770 m*
Rainfall Assumed at site	*1700 mm or 1.7 m*

Important Note:

Surface inflow shall be diverted through a network of garland drains located sufficiently. The drains can be made by cutting and digging along the contour line with appropriate design, size and structural strength.

Structural designs for the storm water drains should ensure to cater to water run-off capacities of the drains.

All structural drawings would need to be cleared by the Monitoring Committee(MC) for the implementation of the project.

12

Environment Management Plan

Environment Management Plan

The Environment Management Plan (EMP) would consist of all mitigation measures for each component of the environment due to the activities increased during the construction, operation and the entire life cycle to minimize adverse environmental impacts resulting from 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 sites including fire. The detailed EMP for the project is given below.

The Environment Management Plan (EMP) is a site specific plan developed to ensure that the project is implemented in an environmental sustainable manner where all contractors and subcontractors, including consultants, understand the potential environmental risks arising from the project and take appropriate actions to properly manage that risk. EMP also ensures that the project implementation is carried out in accordance with the design by taking appropriate mitigation actions to reduce adverse environmental impacts during its life cycle. The plan outlines existing and potential problems that may adversely impact the environment and recommends corrective measures where required. Also, the plan outlines roles and responsibility of the key personnel and contractors who will be in-charge of the responsibilities to manage the project site.

The EMP is generally:

- Prepared in accordance with rules and requirements of the MoEF and CPCB/ SPCB
- To ensure that the component of facility are operated in accordance with the design
- A process that confirms proper operation through supervision and monitoring
- A system that addresses public complaints during construction and operation of the facilities and
- A plan that ensures remedial measures is implemented immediately.
- The key benefits of the EMP are that it offers means of managing its environmental performance thereby allowing it to contribute to improved environmental quality. The other benefits include cost control and improved relations with the stakeholders.
- EMP includes four major elements:
- Commitment & Policy: The management will strive to provide and implement the Environmental Management Plan that incorporates all issues related to air, water, land and noise.
- Planning: This includes identification of environmental impacts, legal requirements and setting environmental objectives.
- Implementation: This comprises of resources available to the developers, accountability of contractors, training of operational staff associated with environmental control facilities and documentation of measures to be taken.
- Measurement & Evaluation: This includes monitoring, counteractive actions and record keeping.

It is suggested that as part of the EMP, a **Monitoring Committee(MC)** would be formed by Department of Housing and Urban Development (DoHUD), Punjab comprising of the site in-charge/coordinator, environmental group representative and project implementation team representative. The committee's role would be to ensure proper operation and management of the EMP including the regulatory compliance.

The components of the environmental management plan, potential impacts arising, out of the project and remediation measures are summarized in Table 1.

Note: Additionally, a monitoring committee under the Chairperson of CCF (Hills) with representatives from Northern Regional Office of MoEF&CC; SEIAA, Punjab; Ranjit Sagar Dam Authority shall monitor the project. The committee shall also include two members of adjoining JFMC's.

TABLE 1: SUMMARY OF POTENTIAL IMPACTS AND REMEDIAL MEASURES

S. No.	Environmental components	Potential Impacts	Potential Source of Impact	Controls Through EMP & Design	Impact Evaluation	Remedial Measures
1.	Ground Water Quality	Ground Water Contamination	Construction Phase • Waste water generated from temporary labor tents.	• Waste water will be managed to achieve zero discharge and to maintain hygienic condition at site	No significant impact as majority of labors would be locally deployed	• Waste water arising from the project is to be disposed conforming to CPCB by portable toilets. Portable toilets will be provided only away from water body
			Operation Phase • Discharge from the project site	• No untreated water will be discharged • Surplus treated water will be given to nearby farmers for irrigation or to nearby areas for construction purpose free of cost. Else will be discharged to external drains	No negative impact on ground water quality envisaged.	• Waste water generated will be treated in STP Proposed inside the Project Premises and used for flushing/irrigation of green areas
2.	Ground Water Quantity	Ground Water Depletion	Construction Phase • No impact as ground water will not be used	• No water ponding will be allowed at site	No impact	• Water will be taken from private water takers

			<u>Operation Phase</u> • Source of water will be the existing water works located on either side of the Ranjit Sagar Reservoir and ground water	• Water management will be practiced to conserve water. Rain water harvesting will be carried out.	No Impact	• Using water efficiently • Re-cycle & Re-use of water • Use of Water Efficient fixtures like flow regulators & dual flushing cisterns • Provision of RWH pits to collect rain water for ground water recharge.
3.	Surface Water Quality	Surface water contamination	<u>Construction Phase</u> • Surface runoff from site during construction activity.	• Water & Sewage management will be carried out at the site to control water pollution	Measures will be taken to restrict the run-off from site.	• Silt traps and diversion ditches will be constructed to control surface run-off during site development • Curing will be done by spraying water to reduce run-off
			<u>Operation Phase</u> • Discharge from Project Site	• No untreated water will be discharged outside project site	No negative impact on surface water quality envisaged.	Treated water will be recycled and re-used within the project site for flushing and horticulture within the project site. Surplus water is available during monsoon season only which may given to the farmers for irrigation or to nearby construction

						site, if required. Else surplus treated water will be disposed off to external drains.
4.	Air Quality	Dust Emissions (PM)	<u>Construction Phase</u> • Construction activities • Vehicular movement	• Suitable control measures will be adopted for reducing the PM level in the air as per air pollution control plan.	Dust generation will be temporary and will settle fast due to dust suppression techniques. Impact will be restricted to small area.	• Water sprinklers will be provided • Regular sweeping of construction site • Construction material & debris carrying vehicles will be covered.
		SO_2, NO_2 and CO	<u>Construction Phase</u> • Vehicular exhaust • Running D.G. set (back up)	• Rapid on-site construction	Impact will be for short duration	• Regular monitoring of emissions and control measures will be taken to reduce the emission levels. • Use of low sulfur diesel/PNG for operating DG sets • Regular maintenance and servicing of vehicles.
		Emissions of PM, SO_2, NO_x and CO	<u>Operation Phase</u> • Vehicular movement	• Suitable control measures will be adopted for reducing emissions	Not significant. Regular monitoring of air quality will be	• Stack height of DG as per CPCB standards • Use of low sulfur diesel • Traffic management • Providing Footpath

			• Vehicular exhaust • Running D.G. set (back up)		carried out to maintain air quality	• Developing Green belt & avenue plantation • All vehicles will carry PUCC* • Installation of water sprinklers/fountains
5.	Noise Environment		<u>Construction phase</u> • Construction Activities • Operation of Machinery • Operation of DG sets	• Noise Management by adopting suitable measures.	Impact will be temporary and will be restricted to small area.	• Provision of Noise shields • DG sets will be provided with acoustic enclosures • Construction activities involving high level noise generation will be restricted to day time • Provision of ear muffs to workers • Traffic Management at site to prevent honking • Use of machinery of modern make, meeting the noise standards
			<u>Operation Phase</u> • Noise from vehicular movement • Noise from DG set operation	• Noise Management by adopting suitable measures	Not Significant.	• Development of green belt • DG sets will be provided with acoustic enclosure • DG sets will be provided with acoustic enclosure • Proper traffic management & circulation. • Honking will be prohibited in the premises

*PUCC - Pollution Under Control Certificates

						• All vehicles will carry PUC certificate
6.	Land Environment	Soil contamination	<u>Construction Phase</u> • Disposal of construction debris • Spillage of oil or paints • Excavation of soil-excess muck	• By controlling soil erosion and maintaining soil quality by periodic soil quality monitoring	No significant impact. Impact will be restricted to project site	• Construction debris will be used for leveling or will be sent to landfill for disposal • C& D waste will be managed as per C & D Management Rules, 2016 • Muck will be managed by reusing it for filling & landscaping purpose • Proper work management to avoid spillage • Excavated soil will be re-used for landscaping in project area. • Silt traps and dykes will be develop
			<u>Operation Phase</u> • Municipal solid waste	• Solid waste management as per MSW Rules, 2000.	Since solid waste is handled by the authorized agency, waste dumping will not be practiced thus	• MSW Management as per MSW Rules, 2000 by the authorized agency. • Treatment of compostable waste within project site • Recyclable waste will be sold to authorized dealers • Inert waste will be disposed-off by authorized agency

			• Used oil from D.G. set • Bio-medical waste from dispensary		impact is not significant. Negligible impact.	• Used oil generated will be disposed as per norms to authorized vendors • Will be disposed off through authorized vendors only • Premises will be made plastic free by prohibiting use of plastics • Disposable material usage will also be prohibited at the site
7.	Biological Environment	Displacement of Flora and Fauna on site	<u>Construction Phase</u> • Site Development during construction • Vegetation & tree removal	• Tree cutting will be minimized by efficient planning • Making existing trees as part of green belt • Compensatory plantation will be carried out as per state forest policy • Development of peripheral green belt & avenue plantation	No significant vegetation exists at project site so no tree felling involved.	• Tree cutting to be carried out only after obtaining NOC from forest department • Compensatory plantation to be carried out as per the state forest policy • Greening the site as per the bye laws and development of thick tree belt
			<u>Operation Phase</u> • Site operation	• Development & maintenance of Green Belt	Positive Impact	• Green belt will be maintained

						• Avenue plantation will be maintained
8.	Socio-Economic Environment	Population displacement	<u>Construction Phase</u> • Influx of construction labor	• Generation of employment for local people especially labor • Increased pressure on existing facilities like road, water supply etc. due to increased material transportation of construction material, increased water demand for construction and construction workers etc.,	Positive & Negative Impact	• Generation of employment for skilled, unskilled and semiskilled people • Development of infrastructure of the area • Employment preferably to be given to local people • Improvement of quality of life of people
			<u>Operation Phase</u> • Site operation	• Generation of employment • Enhanced aesthetics of the area	Positive impact	• Generation of employment for skilled, unskilled and semiskilled people • Tourism development and improved economy of the area • Improved quality of life of people

9.	Traffic Pattern	Increase in traffic	<u>Construction Phase</u> • Import of construction material at site • Export of construction debris from project site	• Proper Traffic Management & circulation	Impact will only be for short time (construction phase)	• Provision of adequate parking space • Proper traffic circulation system at site • Proper signage system • Restrict hours of material transport
			<u>Operation Phase</u> • Vehicles of residents, guests, staff & visitors	• Proper Traffic Management & circulation	Not Significant as project site is well connected via network of roads	• Provision of adequate parking space • Proper traffic circulation system at site • Informatory & directive Sign boards will be provided • Provision of pedestrian path to encourage parking • Development of internal and approach roads of adequate width

ENVIRONMENT MANAGEMENT PLAN

An Environmental Management Plan (EMP) will be required to mitigate the predicted adverse environmental impacts during construction and operation phase of the project and these are discussed in later subsections.

EMP for Air Environment

Construction Phase

To mitigate the impacts of PM during the construction phase of the project, the following measures are recommended for implementation:

- Dust control plan
- Procedural changes to construction activities

Dust Control Plan

The most cost-effective dust suppressant is water because water is easily available on construction site. Water can be applied using water trucks, handled sprayers and automatic sprinkler systems. Furthermore, incoming loads could be covered to avoid loss of material in transport, especially if material is transported off-site.
Procedural Changes to Construction Activities
Idle time reduction: Construction equipment is commonly left idle while the operators are on break or waiting for the completion of another task. Emission from idle equipment tends to be high, since catalytic converters cools down, thus reducing the efficiency of hydrocarbon and carbon monoxide oxidation. Existing idle control technologies comprises of power saving mode, which automatically off the engine at preset time and reduces emissions, without intervention from the operators.
Improved Maintenance: Significant emission reductions can be achieved through regular equipment maintenance. Contractors will be asked to provide maintenance records for their fleet as part of the contract bid, and at regular intervals throughout the life of the contract. Incentive provisions will be established to encourage contractors to comply with regular maintenance requirements.
Reduction of On-Site Construction Time: Rapid on-site construction would reduce the duration of traffic interference and therefore, will reduce emissions from traffic delay.
Operation Phase
To mitigate the impacts of pollutants from DG set and vehicular traffic during the operational phase of the Project, following measures are recommended for implementation:

- DG set emission control measures
- Vehicular emission controls and alternatives
- Greenbelt development

Diesel Generator Set Emission Control Measures

Adequate stack height will be maintained to disperse the air pollutants generated from the operation of DG set to dilute the pollutants concentration within the immediate vicinity. Hence no additional emission control measures have been suggested.
Vehicle Emission Controls and Alternatives
During construction, vehicles will be properly maintained to reduce emission.
Footpaths and Pedestrian ways: Adequate footpaths and pedestrian ways would be provided at the site to encourage non-polluting methods of transportation.
Greenbelt Development
Increased vegetation in the form of greenbelt is one of the preferred methods to mitigate air and noise pollution. Plants serve as a sink for pollutants, act as a barrier to break the wind speed as well as allow the dust and other particulates to settle on the leaves. It also helps to reduce the noise level at large extent. Table 10 above enlists various species of the greenbelt that can be used to act as a barrier.

EMP FOR NOISE ENVIRONMENT

Construction Phase
To mitigate the impacts of noise from construction equipment during the construction phase on the site, the following measures are recommended for implementation.
Time of Operation: Noisy construction equipment would not be allowed to use at night time.
Job Rotation and Hearing Protection: Workers employed in high noise areas will be employed on shift basis. Hearing protection such as earplugs/muffs will be provided to those working very close to the noise generating machinery.
Operation Phase
To mitigate the impacts of noise from diesel generator set during operational phase, the following measures are recommended:

- Adoption of Noise emission control technologies
- Greenbelt development

Noise Emission Control Technologies

The DG set sound pressure level will be maintained to be 75 dB(A) at 1 m meter from enclosed surface as per E (P) Act, GSR 371 (E) and its amendments if DG sets are less than 1000 kjVA. The DG set room will be provided with acoustic enclosure to have minimum 25 dB(A) insertion loss or for meeting the ambient noise standard whichever is on higher side as per E (P) Act, GSR 371 (E) and its amendments if DG sets are more than 1000 kVA. Therefore, no significant impact due to operation of machinery is anticipated.
It would be ensured that the manufacturer provides acoustic enclosure as an integral part along with the diesel generators set.
Greenbelt Development
The following species can be used, as in a greenbelt, to serve as noise breakers:

- Polyalthia longifolia
- Delonix regia
- Cassia fistula

EMP FOR WATER ENVIRONMENT

Construction Phase

To prevent degradation and to maintain the quality of the water source, adequate control measures have been proposed. The following management measures are suggested to protect the water source being polluted during the construction phase:

- Avoid excavation during monsoon season
- Care would be taken to avoid soil erosion
- Common toilets will be constructed on site during construction phase and the waste water would be channelized to the septic tanks in order to prevent waste water to enter into the nearby water bodies
- Any area with loose debris within the site shall be planted
- To prevent surface and ground water contamination by oil and grease, leak-proof containers would be used for storage and transportation of oil and grease. The floors of oil and grease handling area would be kept effectively impervious. Any wash off from the oil and grease handling area or workshop shall be drained through imperious drains
- Collection and settling of storm water, prohibition of equipment wash downs and prevention of soil loss and toxic release from the construction site are necessary measure to be taken to minimize water pollution

Operation Phase
In the operation phase of the project, water conservation and development measures will be taken, including all possible potential for rain water harvesting. Following measures will be adopted:

- Water source development.
- Minimizing water consumption.
- Promoting reuse of water after treatment and development of closed loop systems for different water streams.

Water Source Development

Water source development shall be practiced by installation of scientifically designed Rain Water Harvesting system. Rainwater harvesting promotes self-sufficiency and fosters an appreciation for water as a resource.

Rain water from roof-top of proposed building will be collected and will be used for ground water recharge 6 Nos. of RWH pits will be provided to recharge collected storm water into the ground. Surface run-off will be collected in the tanks and will be re-used at site for cleaning and landscaping purpose. A detailed storm water management plan will be developed which will consider the possible impacts from recharging the roof-top storm water into the ground water aquifers. The plan will incorporate best management practices which will include following:

- Regular inspection and cleaning of storm drains
- Clarifiers or oil/separators will be installed in all the parking areas. Oil / grease separators installed around parking areas and garages will be sized according to peak flow guidelines. Both clarifiers and oil/water separators will be periodically pumped in order to keep discharges within limits
- Covered waste storage areas

- Avoid application of pesticides and herbicides before wet season
- Conducting routine inspection to ensure cleanliness
- Provision of slit traps in storm water drains
- Good housekeeping in the above areas

Minimizing Water Consumption

Consumption of fresh water will be minimized by combination of water saving devices and other domestic water conservation measures. Further, to ensure ongoing water conservation, an awareness program will be introduced for the residents. The following section discusses the specific measures, which shall be implemented:

Domestic and Commercial Usage

- Use of water efficient plumbing fixtures (ultra low flow toilets, low flow sinks, water efficient dishwashers and washing machines). Water efficient plumbing fixtures uses less water with no marked reduction in quality and service
- Leak detection and repair techniques.
- Sweep with a broom and pan where possible, rather than hose down for external areas.
- Meter water usage: Implies measurement and verification methods.
- Monitoring of water uses is a precursor for management.

Horticulture

- Drip irrigation system shall be used. Drip irrigation can save 15-40% of the water, compared with other watering techniques.
- Plants with similar water requirements shall be grouped on common zones to match precipitation heads and emitters.
- Use of low-angle sprinklers for lawn areas.
- Select controllers with adjustable watering schedules and moisture sensors to account for seasonal variations and calibrate them during commissioning.
- Place 3 to 5 inches of mulch on planting beds to minimize evaporation.

Promoting Reuse of Water after Treatment

It is expected that the project will generate approx. 300 KLD of sewage. Sewage will be treated in STP of capacity 360 KLD to be constructed within project site. STP will be developed in modules as per requirement. Treated water from STP will be re-used within project site for flushing & landscaping, purpose within the project site. 1362 KLD of water will be recycled within the project site. Extended aeration technology of sewage treatment will be installed for treatment of the sewage generated. Any excess water during monsoon season will be discharged into sewer/ drains after meeting the required standards for discharge. This water can be given to nearby construction sites, if any. Major occupation of people there is agriculture. Thus the water can also be given to farmers. This will reduce their cost for water and also the water is rich in NPK and will be good for irrigation structures. Discharge standards for treated water will be maintained as per CPCB norms.

EMP FOR LAND ENVIRONMENT

Construction Phase

The waste generated from construction activity includes construction debris, biomass from land clearing activities, waste from the temporary make shift tents for the labors and hazardous waste. Following section discuss the management of each type of waste. Besides waste generation, management of the topsoil is an important area for which management measures are required.

Construction Debris

Construction debris is bulky and heavy and re-utilization and recycling is an important strategy for management of such waste. As concrete and masonry constitute the majority of waste generated and this waste can be recycled by conversion to aggregate which can be further used as construction raw material.
Mixed debris with high gypsum, plaster, shall not be used as fill, as they are highly susceptible to contamination, and will be send to designated solid waste landfill site.
Metal scrap from structural steel, piping, concrete reinforcement and sheet metal work shall be removed from the site by construction contractors. A significant portion of wood scrap will be reused on site. Recyclable wastes such as plastics, glass fiber insulation, roofing etc shall be sold to recyclers

Hazardous waste

Construction sites are sources of many toxic substances such as paints, solvents wood preservatives, pesticides, adhesives and sealants. Hazardous waste generated during construction phase shall be stored in sealed containers and disposed off as per The Hazardous Waste (Management, Handling & Trans-boundary) Rules, 2008
Some management practices to be developed are:

- Herbicides and pesticide will not be over applied (small-scale applications) and not applied prior to rain
- Paintbrushes and equipment for water and oil based paints shall be cleaned within a contained area and will not be allowed to contaminate soil, water courses or drainage system
- Provision of adequate hazardous waste storage facilities. Hazardous waste collection containers will be located as per safety norms and designated hazardous waste storage areas which will be located away from storm drains or natural watercourses
- Segregation of potentially hazardous waste from non-hazardous construction site debris
- Well labeled hazardous waste containers with the waste being stored and the date of generation
- Instruct employees and subcontractors in identification of hazardous and solid waste
- Waste from Temporary Makes Shift Tents for Labors
- Wastes generated from temporary make shift labor tents will mainly comprise of household domestic waste, which will be managed by the contractor at the site. The sullage generated will be channelized to the portable toilet collection tank .

Top Soil Management

To minimize disruption of soil and for conservation of top soil, the contractor shall keep the top soil cover separately and stockpile it. After the construction activity is over, top soil will be utilized for landscaping activity. Other measures, which would be followed to prevent soil erosion and contamination include:

- Maximize use of organic fertilizer for landscaping and green belt development
- To prevent soil contamination by oil/grease, leak proof containers would be used for storage and transportation of oil/grease and wash off from the oil/grease handling area shall be drained through impervious drains and treated appropriately before disposal
- Removal of as little vegetation as possible during the development and re-vegetation of bare areas after the project is completed.
- Working in a small area at a point of time (phase wise construction)
- Construction of erosion prevention troughs/berms.

Operational Phase

The philosophy of solid waste management at the project site will be to encouraging the four R's of waste i.e. Reduction, Reuse, Recycling and Recovery (materials & energy). Regular public awareness meetings will be conducted to involve the residents in the proper segregation and storage techniques. The Environmental Management Plan for the solid waste focuses on three major components during the life cycle of the waste management system i.e., collection and transportation, treatment and disposal of the waste.
To manage and minimize the waste, usage of plastic and the disposable crockery will be prohibited within the project premises. Dumping of the waste in the lake and other water body by any person will be strictly prohibited. Awareness will be spread through cautionary notices displayed at the site. Person littering the waste should be penalized. Mechanism for collection, treatment and disposal at the site is defined below

Collection and Segregation of waste

- A door to door collection system will be provided for collection of waste from each facility proposed
- Local vendors will be hired for waste collection and management
- Separate colored bins for dry recyclables, wet compostable and inert waste will be provided
- Litter bin will also be provided in open areas like parks etc.

Treatment of waste

Bio-Degradable wastes

Bio-degradable waste will be treated in Organic Waste Converter to

convert it into manure which can later be used for landscaping

STP sludge is proposed to be used for horticultural purposes as manure.
Recyclable wastes

Recyclable wastes like paper, plastic, metals etc. will be sold off to authorized recyclables.

Disposal
Inert fraction of waste will be sent through authorized vendor for disposal at site designated for disposal of waste. If no such site is available, a waste disposal site will be identified within the site and will be scientifically developed for dumping of the waste
Organic Waste Convertor:

Organic waste convertor of various makes like Excel, Nachiket Engineering, Earth Care equipments are available. These OWC reduce volume of waste fed by 80% and convert it into manure that can be used for landscaping purpose. This manure can be stored, packed, sold and used for landscaping.

Apart from the municipal waste, E-waste comprising of rejected LED, bulbs, laptops, TV sets, computers etc will be generated. This waste will be insignificant in initial stage. Room will be provided within project site for storing discarded electronics. These will be sold to authorized vendors on regular basis.

EMP FOR ECOLOGICAL ENVIRONMENT

An area development project affects the ecology of the area but brings development in the area. The project requires the implementation of following choices exclusively or in combination.

Construction Stage

- Restriction of construction activities to defined project areas
- Restrictions on location of temporary labor tents and offices for project staff near the project area to avoid human induced secondary additional impacts on the flora and fauna species
- Cutting, uprooting, coppicing of trees or small trees if present in and around the project site for cooking, burning or heating purposes by the labors will be prohibited and suitable alternatives for this purpose will be made
- Along with the construction work, the peripheral green belt would be developed with suggested native plant species, as they will grow to a full-fledged covered at the time of completion.
- Tree cutting to be minimized by efficient planning. Tree cutting o be carried out only after obtaining NOC from forest department and in line with the NOC issued. Compensatory plantation to be carried out as per state forest policy.
- Total green area measures 219939 m2 i.e. 70% of the total plot area which will be area under landscaping. Evergreen, native species will preferably be planted at the project site. Landscape plan is attached as Annexure VI.

Green Belt development Plan

For this project area of 219939 m2 is proposed to be put under green cover. Green cover will comprise of:

- A peripheral green belt
- Avenue plantation
- Lawns/parks & grass cretes
- Planters

After Care and Monitoring

Plants grown will be cared for first three years. Nutrients will be supplemented and the juveniles provided protection. Following measures will be taken:

- Adequate nutrient supply will be maintained by providing manure timely
- Absence of water stress
- Construction of the protection wall all around to protect from animals and outsiders from damage

Regular inspection of the site will be kept. Record keeping of number of saplings planted and surviving will be kept. Regular pruning of road side trees will be done as per requirement. Weeding will be carried out along with regular manuring & watering. Treated water from STP will be used for watering plant which is rich in nutrients.

EMP for Socio-Economic Environment

The socio-economic management plan has been designed to take proactive steps and adopt best practices, which are sensitive to the socio-cultural setting of the region. The Socio-economy Management Plan for planned project focuses on the following components:

- Income Generation Opportunity during Construction & Operation Phase: The project would provide employment opportunity during construction and operation phase. There would also be a wide economic impact in terms of generating opportunities for secondary occupation within and around the project site. The main principles considered for employment and income generation opportunities are out lined below:

i) Employment strategy will provide for preferential employment of local people
ii) Conditions of employment would address issues like minimum wages and medical care for the workers. Contractors would be required to abide to employment priority towards locals and abide by the labor laws regarding standards on employee terms and conditions.

- Improved Economy of the State: Enhanced tourism in the area will increase the revenue generation in the area through tourism activities and will boost the economy of the area.
- Improved Living Standard and Quality of Life: Employment generation for local people will enhance the purchasing power of the people and thus will help in improving their quality of life
- Development of Infrastructure in the Area: At present, major portion of the land is unused. After development of the project, the whole land will be put into use. Development will be aesthetically sustainable not causing much net impact on ecology of the area. Development of project will lead to enhanced infrastructure development in the area such as water supply, roads, power supply, waste management, sewage collection and management etc.

EMP FOR ENERGY CONSERVATION

Energy conservation program will be implemented through measures taken both on energy demand and supply. Energy conservation is integral part of our project planning. Energy saving will help saving the energy as well as the cost for the power usage. The conservation efforts would consist of the following:

Building design
- Maximum utilization of solar light will be done.
- Maximize the use of natural lighting through design.
- The orientation of the buildings will be done in such a way that maximum soft daylight is available.
- The green areas will be spaced, so that a significant reduction in the temperature can take place.
- Energy Saving Practices
- Energy efficient lamps will be provided within the project site
- Constant monitoring of energy consumption and defining targets for energy conservation.
- Adjusting the settings and illumination levels to ensure minimum energy used for desired comfort levels.

Behavioural Change on Consumption

1) Promoting resident/staff/guests/visitors awareness on energy conservation
2) Training staff on methods of energy conservation and to be vigilant to such opportunities.

ENVIRONMENTAL MANAGEMENT SYSTEM AND MONITORING PLAN

For effective implementation of proposed EMP, an Environmental Management system (EMS) would be established at the site. The EMS would include the following:

- Environment Management Budget
- Environmental Monitoring.
- Personnel Training.
- Regular Environmental audits and Correction measures.
- Documentation – standards operation procedures Environmental Management Plan and other records.

Environmental Management Budget

Implementation cost for environmental management plan during operation & construction phase of the project is given below in Tables 2 & 3 below.

Environmental Monitoring

The purpose of environmental monitoring is to evaluate the effectiveness of implementation of Environmental Management Plan (EMP) by periodic monitoring. The important environmental parameters within the impact area are selected so that any adverse effects are detected and time action can be taken. The project proponent will monitor ambient air Quality, Ground Water Quality and Quantity, and Soil Quality in accordance with an approved monitoring schedule.

Awareness and Training

Training and human resource development is an important link to achieve sustainable operation of the facility and environment management. For successful functioning of the project, relevant EMP would be communicated to:

Residents, staff, Guest, Visitors & Contractors

All must be made aware of the importance of waste segregation and disposal, water and energy conservation. The awareness can be provided by periodic Integrated Society meetings. They would be informed of their duties.

Environmental Audits and Corrective Action Plans

To assess whether the implemented EMP is adequate, periodic environmental audits will be conducted by the project proponent's Environmental division. These audits will be followed by Correction Action Plan (CAP) to correct various issues identified during the audits.

Table 2: EMP budget for Construction Phase

S. No.	Activity	Capital Cost (Lacs)	Recurring Cost (Lacs)
1.	Temporary Construction Raw material storage yard	2.5	0.5
2.	Temporary excavated soil storage yard	1.0	0.1
3.	Solid waste Management	5.0	1.0
4.	Health & safety of Workers	3.0	0.5
5.	Environmental Monitoring	2.5	2.5
	Total	**14.0**	**4.6**

Table 3: EMP budget for Operational Phase

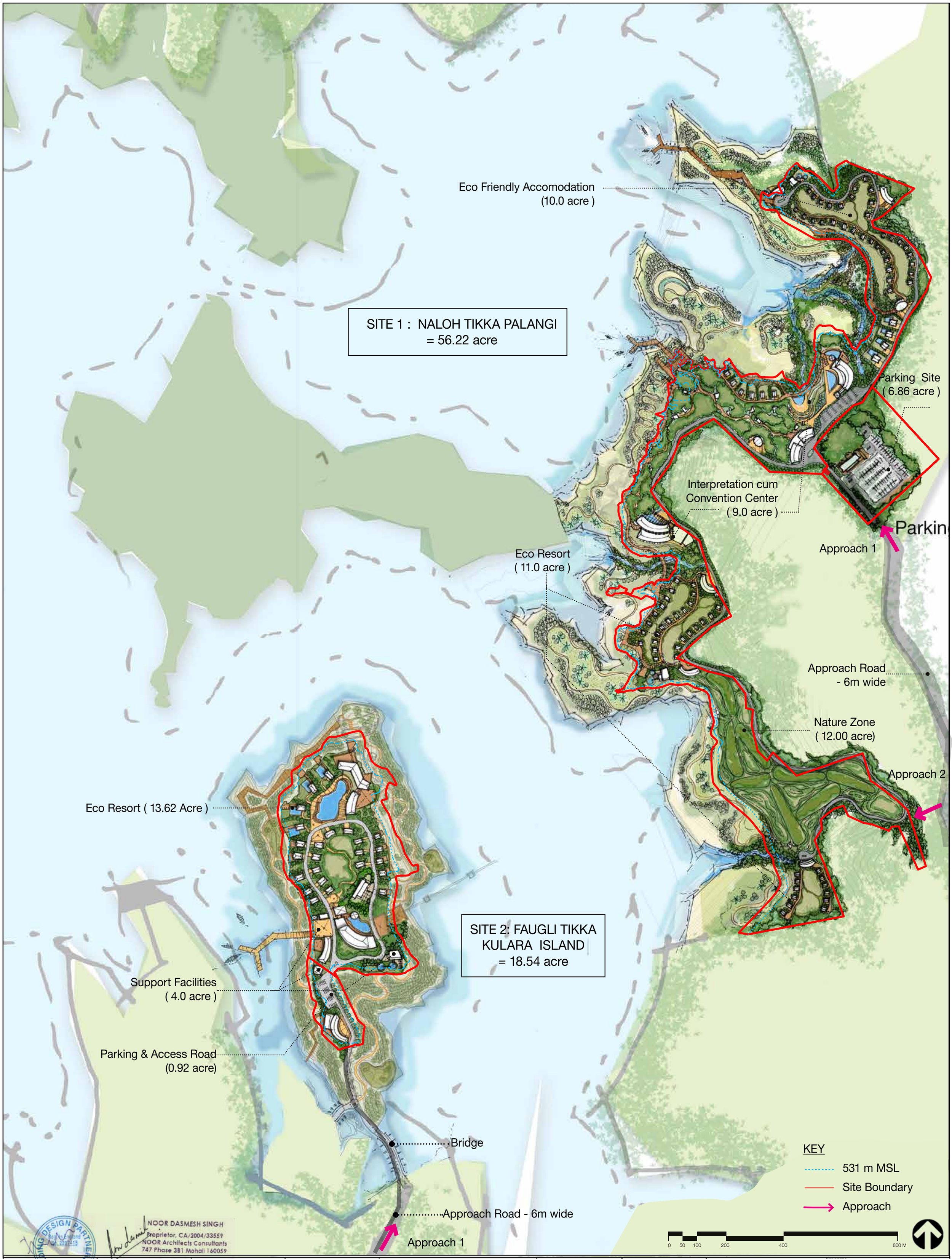
S. No.	Activity	Capacity/ Area/Nos./parameters	Capital Cost (Lacs)	Annual Recurring Cost (Lacs)
1.	STP	360 KLD	77	2
2.	Landscaping & planting trees		35	10
3.	Solid waste Management	1073 Kg/day	5	3
4.	RWH Pit Installation	6 Pits	30	1.5
5.	Energy Saving	29.4 % using efficient lightning	20	5
6.	Environmental Monitoring*	Air, Water, Soil & Noise	2.5	5.0
	Total		170	27

***** Environment monitoring to be carried out twice in year so recurring cost per annum is double that of onetime cost of environmental monitoring.

Table 4: Suggested Monitoring Program for Project

S. No.	Type	Locations	Parameters	Period and Frequency
1.	Ambient Air Quality	Project Site & 2 nearby sites	Criteria Pollutants: SO_2, NO_2, $PM_{2.5}$ & PM_{10}	Half yearly (24 hr average samples) during construction phase and annual during operation phase.
2.	Groundwater (Portability testing)	Project Site & 2 nearby sites	Drinking water parameters as per IS 10500.	Half Yearly
3.	Ambient Noise	Project Site & 2 nearby sites	dB (A) levels	Half Yearly (Hourly day and night time l_{eq} levels) during construction phase and every year during operation phase.
4.	Potable water quality	Drinking water supply at site	As per IS 10500 potable water standards	Half Yearly
5.	Soil quality	Project Site & 2 nearby sites	Organic matter, C.H., N, Alkalinity, Acidity, heavy metals and trace metal, Alkalinity, Acidity.	Half Yearly
6.	Waste Characterization	Residential/ Commercial at site	Physical and Chemical composition	Daily
7.	Treated water	Outlet of STP	BOD, MPN, coliform count, etc.	Monthly

Annexures



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DRAWING ISSUES					ISSUED AS
REVISIONS		DRAWN	CHECKED	DATE	
R3	Name & Areas Revised	RM	MB	13.02.20	
R2	Name changed	RM	MB	16.03.18	
R1	Reissue and update based on meeting on 14/03/18	RM	MB	15.03.18	
FIRST ISSUE		DC	RM	18.09.17	

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CLIENT

Department of Housing & Urban Development,
Govt. of Punjab

PROJECT TITLE
Development of Tourist Destination at Pathankot Dalhousie Road around Ranjit Sagar Lake

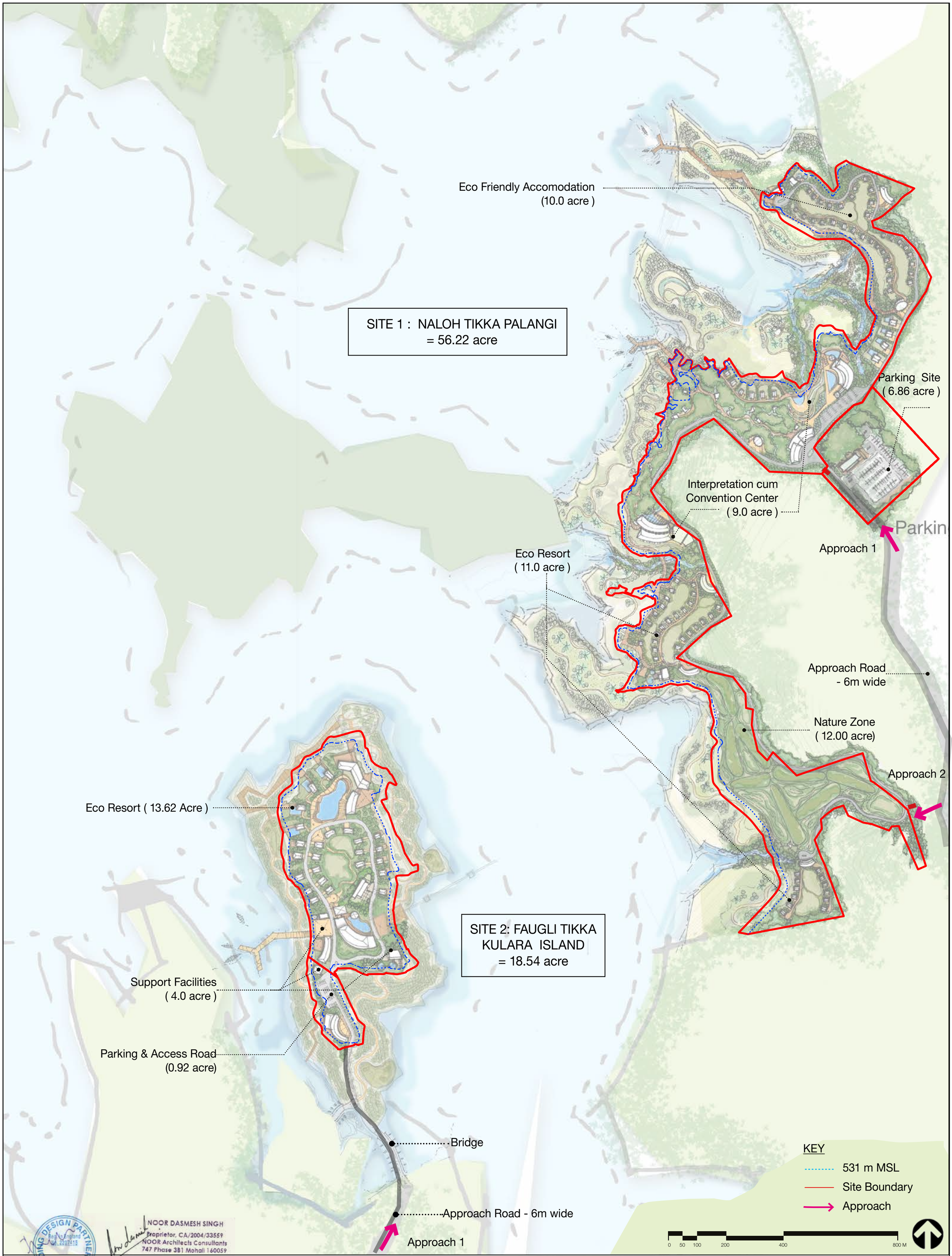
DRAWING TITLE
Detail Layout Plan

SCALE
As indicated

DATE
13.02.2020

DRAWING No.
Z2 (90) UP 011

REVISION
R3



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R2	Name changed	RM	MB	16.03.18
R1	Reissue and update based on meeting on 14/03/18	RM	MB	15.03.18
FIRST ISSUE		DC	RM	18.09.17

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CLIENT

Department of Housing & Urban Development,
Govt. of Punjab

PROJECT TITLE
Development of Tourist Destination at Pathankot Dalhousie Road around Ranjit Sagar Lake

DRAWING TITLE
Detail Layout Plan

SCALE
As indicated

DATE
06.08.2019

DRAWING No.
Z2 (90) UP 011

REVISION
R2

SITE 1 : NALOH TIKKA PALANGI
= 56.22 acre

Site 1

Site 2

SITE 2: FAUGLI TIKKA
KULARA ISLAND
= 18.54 acre

Legend

- Primary Drainage Channels
- Secondary Drainage Channels
- Tertiary Drainage Channels (Gully)
- 531m MSL
- Site Boundary

0 50 100 200 400 800 M

BUILDING DESIGN PARTNERSHIP Regd in England No. 2207415

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PROJECT TITLE
Development of Tourist Destination at Pathankot Dalhousie Road around Ranjit Sagar Lake

DRAWING TITLE
Drainage Plan

SCALE
As indicated

DATE
13.05.2019

DRAWING No.
Z2 (90) UP 011

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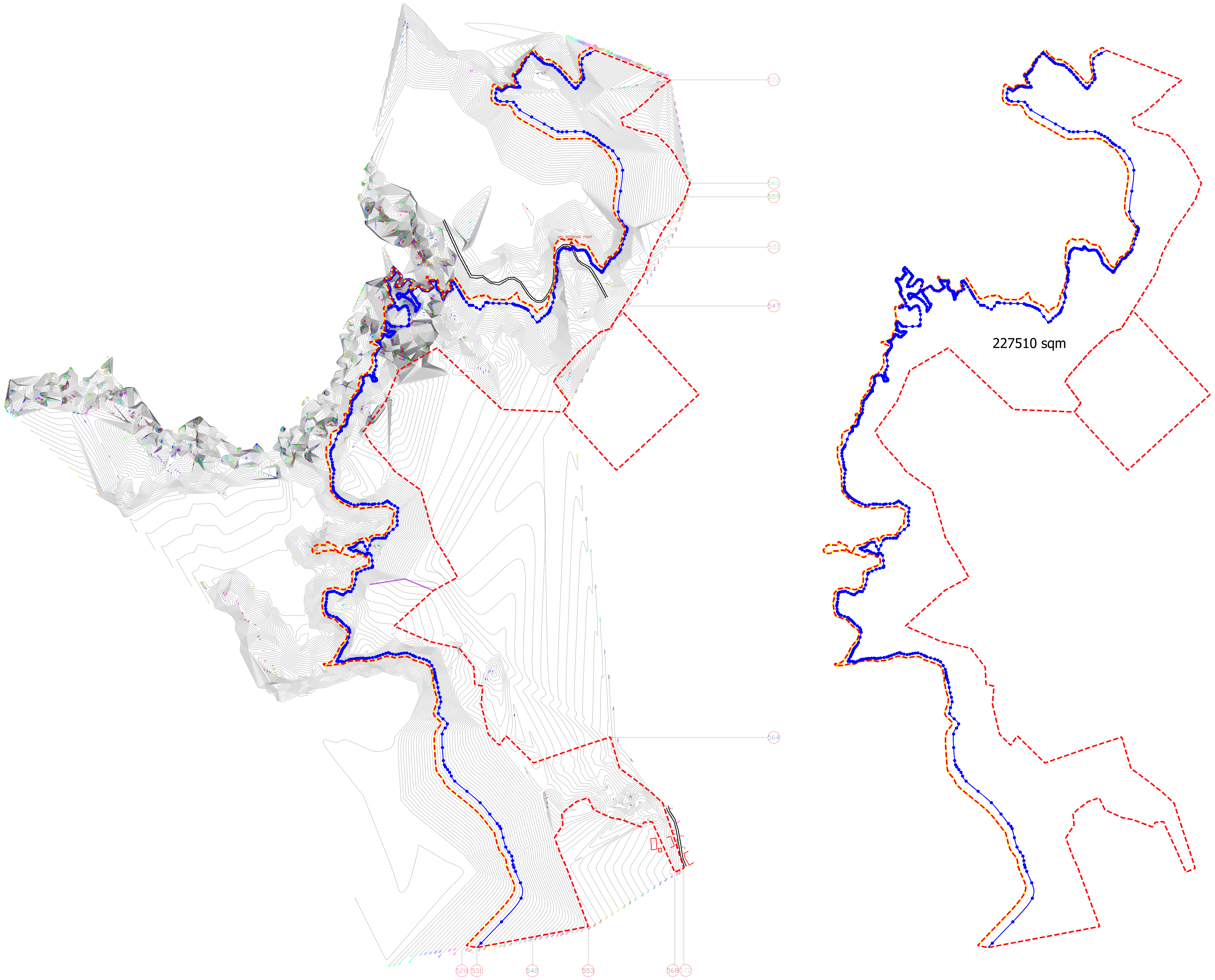
NOTES

SITE 1

Niloh Tikka Palangi

Site Area = 56.22 Acres



HFL = 527.91 m

528 m Level

531 m Level (@ 3.0 m buffer from HFL)

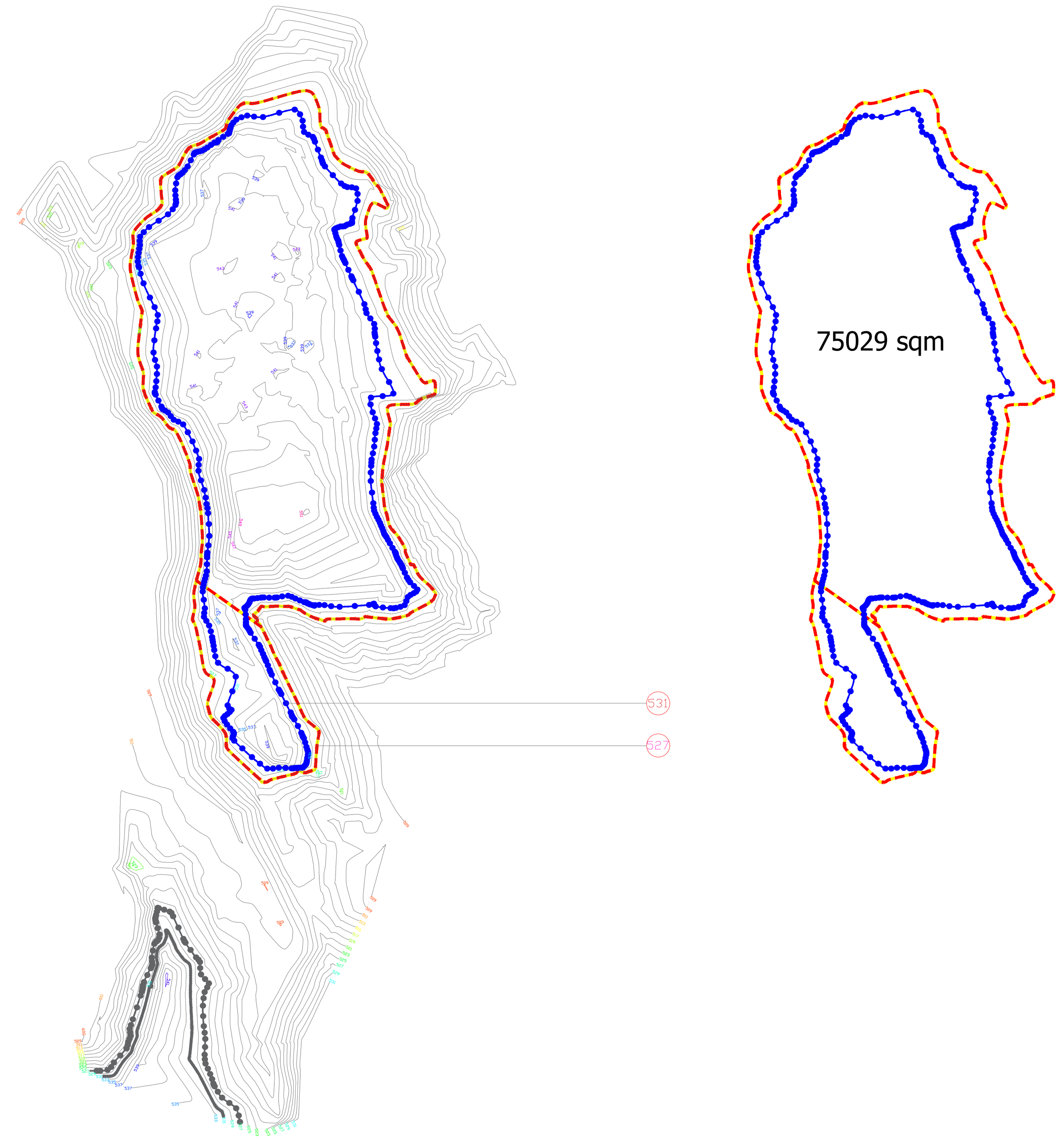
Site Boundary=227510 sqm = 56.22 Acres = 22.75 Ha

(NOTE :- The contour interval is 1m.)

SITE 2

Faugli Tikka Kulara Island

Site Area = 18.54 Acres



HFL = 527.91 m

527 m Level

531 m Level (with 3.0 m buffer from HFL)

Site Boundary=75029 sqm=18.54 Acres =7.50 Ha

(NOTE :- The contour interval is 2m.)

KEY PLAN

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FIRST ISSUE

REVISION / DESCRIPTION DRAWN CHECKED DATE 12.02.2020

CLIENT

Department of Housing
and Urban Development
Govt. Of Punjab

PROJECT TITLE

Development of Tourist Destination at Pathankot Dalhousie Road around Ranjit Sagar Lake

DRAWING TITLE

Digital Elevation Map (DEM)

SCALE @ A1

DRAWING SOURCE

SOIGNÉ ENGINEERING CONSULTANTS
All Engineering services Survey, Testing, Design Consultancy, Project Management under single roof
S.C.F. 23, Motor Market, Manimajra, Chandigarh
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DATE 12.02.2020

DRAWING No.

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